NAME OF THE EVENT : Free Eye Check-up Camp

DATE : 9th of April 2022

PLACE : SABHABHAVAN, BANDIWAD.

- Under the central government scheme of "Unnath Bharat Abhiyan" Free Eye check up camp was organized by KLE Technological University in collaboration with M.M.Joshi Hospital in Bandiwad village of Dharwad district.
- Camp was organized in the Sabha-Bhavan of Hanuman temple of the village.
- Dr. Ashwini Kulkarni with her staff of M.M.Joshi hospital was incharge of the camp. Gram Panchayat members were also the part of this camp.
- The camp was initiated by inaugurating the program. Motto of the camp was successfully conveyed to the villagers. All the Panchayat members, Medical staff, College faculty, volunteers and all the citizens were part of the program.
- Detailed registration – Total 130 registrations.
- Primary check-up followed by segregated check-up for Cataract detected Patients was carried out.
- All the detected conditions and required treatments were explained to the Patients. The treatment procedure and the other provisions were conveyed in detail.
- The entire service lasted for 4 hrs i.e. from 10 am to 2pm.
- Event was successfully carried out in active association of Student Secretary Council.

Follwing are some photos captured from the event


KLE Technological University
National Service Scheme, Hubballi
KLE Technological University, Hubballi

Department of Humanities and Social Sciences
Outreach Programmes - 2021

Plantation Drive- Green Belt of Hubli-Dharwad

Nature is God's most beautiful creation. It felicitates the growth, development and nourishment of all its creatures. The objective of the drive was to enable the students to enhance their intellectual, social, personal and emotional growth. Apart from this, this initiative was a humble step towards spreading greenery. **Under the Outreach Programmes and to celebrate Tecaher's day, a "TREE PLANTATION DRIVE" was organized on 5 September 2021.** The campaign's main aim was to direct student's mind in constructive activities with the positive outcome through the facilitation of contributing to the society.
The students brought various saplings including Ashoka, Neem, Belpatra, Saptparni, Kadamb and Kachnaar. The students participated in the drive enthusiastically and helped each other in planting the saplings. By planting trees the university has paved a path for better future on our esteemed campus. The students along with the teachers also took an oath to look after the planted saplings, plant more and more trees and encourage others to do the same. Some of the students also shared their experiences and shared their joy with others.

Such little steps taken together by the university and students will surely help in fostering strong mental and social health amongst today's children so that they connect with their peers, their elders, their community and their environment.
As an immediate emergency on climate change and global warming, we the Student Secretary council along with the whole KLE Tech family inaugurated the Green Initiative, Platform Today, For a better tomorrow.

HOD

BLOOD DONATION CAMP

On the 106th KLE Foundation Day occasion, a Blood donation camp was organized on **13th November 2021**, in KLE Technological University, BVBCET campus. All the institutions of the KLE Society in twin cities contributed to social concern and responsibility in saving many precious lives.

During the occasion, the Karnataka Institute of Medical Science (KIMS) and Rashtrotthana Blood Centre accepted the mobile blood drive invitation. The function was inaugurated by Principals of various institutions of KLE Society, representatives from respective blood banks, and other staff members. During the occasion, Dr. Prakash G Tewari, Dean Academic, KLE Technological University, spoke on the importance of blood donation and motivated, saying all students above 18 years of age should come forward in donating blood.

Around 330 units of blood were collected during the drive. More than 380 students volunteered to donate blood, out of which about 50 students were rejected from the donation. The primary reasons for rejection were low HB percentage, low weight, menstrual cycle, and pathological blood loss issues. The in-charge doctor counseled the students and suggested the remedy to include in their diet more green leafy vegetables, dates, jaggery, animal sources of food-fish, and egg. The doctor also indicated for examination stool for hookworm and dewormed in case of pathological blood loss issues.

Prof Veeresh Angadi, Principal KLE Society's C.I.Munavalli Polytechnic, and Prof. Minal Salunke, BVB Ladies Hostel Warden, coordinated and successfully organized the blood donation camp.


In the fond memory of KLE Founders
Blood Donation Camp
Indian Red Cross Society
Organised by: KLE Technological University & Other KLE Institutions
In Association with : Rastrotthan Blood Bank & KIMS, Hubli
GPS Map Camera
Hubli, Karnataka, India
1st floor, Hubli - Dharwad Hwy, Vidya Nagar, Hubli, Karnataka 580031, India
Lat 15.370228°
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Inauguration of the Camp	Motivating Students
	
First Donar	Doctors counseling rejected Donors

EVENT SUMMARY REPORT

Name of the event: Gandhi Jayanti

Date of the event: 2nd October 2021

Venue: Mechanical Circle

Total Number of Students Engaged: 65

Event Summary

On the occasion of Gandhi Jayanti (2nd October 2021), the Student Secretary Council in association with NSS organized 'Swacchata aur Paryavaran', a tribute to Gandhiji which was followed by Campus Cleanliness Drive.

As a part of the birth anniversary celebrations of Mahatma Gandhi, Dr. Sanjay Kotabagi, paid floral tributes to the Father of our Nation followed by a melodious performance by two students of KLE Technological University, a *bhajan* that Gandhiji was very fond of - 'Vaishnav Jan To Tene Kahiye'. The students gathered for the occasion paid their tributes and prepared for the 'Campus Cleanliness Drive' to promote '*Swacchata aur Paryavaran'*, an effort to fulfill Gandhi's dream of 'Clean India'.

Cleaning equipments were provided to all the students who volunteered for the Campus Cleanliness Drive. The drive took place from 7:45 am to 8:30 am, after which breakfast was arranged for the students by the college administration.

The program was well coordinated and smoothly executed.

The faculty and students gathered to pay tributes to Mahatma Gandhi on his birth anniversary

Campus Cleanliness Drive to promote Swacchata aur Paryavaran'

Dr. Sanjay Kotabagi pays floral tribute to Gandhiji

Students actively taking part in Campus Cleanliness Drive

'Swacchata aur Paryavaran', A Tribute to Mahatma Gandhi at Mechanical Circle, KLE Technological University

WOMEN CONCLAVE 2022

March 26, KLE Technological University

Women conclave is being conducted in KLE Technological University from the past 3 years by the women empowerment cell. This event is dedicated to celebrating women. Women conclave event gives us an opportunity to interact with proficients.

This year we had Dr. Ajita Desai, Counseller; Dr. Suman Dibbad, Dermatologist and Adv. G. Meerabai, advocate with us to enlighten us about the importance of stress-free and clam mind, skin care and bring awareness of women rights respectively.

- Dr. Ajita Desai
  Dr. Ajita Desai is a consultant neuro psychiatrist. She discussed about the different types of stresses and the source of stresses and ways to relieve stress like meditating and exercising. She also discussed how to balance work life and personal life.

- Dr. Suman Dibbad
  Dr. Suman Dibbad is a consultant cosmetologist and dermato-surgeon. She spoke about different types of skin infections, acne and hair-fall. She educated us about the importance of skin care and the measures to be taken.

- Adv. G. Meerabai
  Adv. G. Meerabai is an advocate and a legal advisor. She spoke about the importance of constitution and the articles that help women and how they help.

All the three talks were very informative and interactive. Each talk was followed with a Q&A session.

This was followed by cultural performances. Classical singing, janapada song, bharatnatyam, cinematic dances and mimicry were performed.

This being a very informative and fun event was a grand success.

Department of Humanities and Social Sciences

Outreach Programmes - 2022

No Tobacco Day

The harmful impact of the tobacco industry on the environment is vast and growing adding unnecessary pressure to our planet's already scarce resources and fragile ecosystems.

Tobacco kills over 8 million people every year and destroys our environment, further harming human health, through the cultivation, production, distribution, consumption, and post-consumer waste. To bring in the awareness amongst the people the National Service Scheme, KLE Technological University in association with the Department of Oral Medicine and Radiology, SDM College of Dental Sciences and Hospital, Dharwad and Indian Dental Association, Dharwad.

World No Tobacco Day was held on 30th May, 2022 at Mechanical Seminar Hall. This event highlighted on the varied health risks associated with tobacco use. It focused on encouraging government to adopt effective methods to reduce the trade of tobacco and the use of other tobacco products among people.

The team of Doctors who graced the occasion were-

- Dr. Kirty Nandimath, Professor & Hod, Department of Oral Medicine and Radiology, SDM College of Dental Sciences and Hospital.
- Dr. Anusha CV, IDA Dharwad.
- Dr. Lijoy Abraham.
- Dr. Kruthika Guttal, Professor, Department of Oral Medicine and Radiology, SDM College of Dental Sciences and Hospital.

Dr. Kruthika Guttal gave a lecture on the bad effects of tobacco in one's life and why it should be eliminated from our lives. She gave the insights on the consequences of prolonged use of tobacco to the audience.

Then Doctors from SDM Dental Sciences and Hospital, Dharwad enacted a skit on the ill effects of consuming tobacco. They also informed the audience on the different diseases caused by different methods of tobacco consumption.

As a part of this initiation, a screening camp was organized for the audience on their oral health. Around 110 people got screened and properly guided by the doctors respectively.

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HoD

EVENT SUMMARY REPORT

Name of the event: Swami Vivekananda Jayanti Celebrations

Date of the event: 12th January, 2022

Venue / Platform: BT Auditorium

Swami Vivekananda's birth anniversary is celebrated as National youth Day. On this auspicious day, remembering Vivekananda, the Youth for Seva Team and KLE Technological University presented a very pleasant and gestural event. The 159th Swami Vivekananda Jayanti celebrations took place in the BT Auditorium on 12th January 2022.

The chief guest, Dr. Mallikarjun Balikaimath is one of the best Homeopathy doctors. He has been a successful Homeopathy Doctor for the last 12 years. He is a qualified Bachelor of Homeopathic Medicine and Surgery. He is also the State General Secretary - BJP Yuva Morcha Karnataka.

He addressed the audience with his words of wisdom. He instilled the inspiration in students to imbibe the qualities of Swami Vivekananda and also highlighted why India is one of the most culturally rich country.

Fig: Speaker addressing the event

Rural Immersion Program

School of Management Studies and Research

Introduction

KLE Society, Belgaum, Karnataka has a land mark achievements and contributions to the regional development through education, health care and research since 10 decades. Society is constantly striving in pursuit of quality services anchored with values and culture for excellence on global standards.

B.V. Bhoomaraddi College of Engineering and Technology with 7 decades legacy matured into KLE Technological University, Hubballi. The university has 8 UG, 9 PG and 12 PhD programmes. Under this legacy **School of Management Studies and Research (SMSR) is a management wing started in 2008** with the objective of impacting society through different avenues/courses. Among them Rural Immersion is avenue/course which correlates with Swachh Bharat Summer Internship initiated by GoI.

Journey of Rural Immersion

SMSR introduced Rural Immersion (RI) track into the MBA programme in 2014. It is a part of the curricula (with 4 credits and more than 100-man hours) spread across four semesters and has 4phases (RI Phase-I, II, III, and IV). Initial 2 years the RI study was restricted to only one semester and study was based on survey and analysis with respect to Social, Economical, Political, Technological and Cultural profile of the identified villages such as Yaragoppa, B.N.Jalihal, Bachangudda of Badami, and Bagalkot districts of Karanataka. In 2016, RI was divided into 4 phases. During this period SMSR informally adopted the village Budershinghi of Hubballi taluk, Dharwad district with objective of developing three projects mainly Education, Empowerment and Civic Awareness. In the recent 2020 onwards, the Rural Immersion has been given a new touch, with entrepreneurial lenses. The Rural Immersion program has been extended towards entrepreneurship building amongst the teenagers to take entrepreneurial activities in the villages.

India is a rich nation comprising of villages, development of nation lies in the development of rural villages. Rural immersion is a unique course offered at SMSR, KLE Technological University, wherein the students work on an opportunity present in the villages or related to farming activity. Program aims to implement innovative ideas and facilitating the development of particular village.

Objectives: During the one-year time period, the students are expected to work on various parameters. The parameters are set in the initial and then the students are guided throughout. The objectives/work to be carried out for the respective Semesters are mentioned below:

Semester III:

1. Operationalize the enterprise

2. Strengthen the Marketing / Operational / Organizational Plan
3. Build the customer base and develop customer relationship
4. Assess the profit and revenue flow
5. Plan for enterprise registration

Semester IV:

1. Develop the expansion Strategy
2. Develop the market and consumer base
3. Continue on enterprise registration process
4. Design the diversification strategy

No. of students enrolled: 02

No of projects and details:

1. Wormi-compost:

Aim

Obtaining buyer and competitor leads, connecting with or forming relationships with e-commerce platforms, learning about the vermicompost market in Karnataka, India, as well as the export process and potential are all goals of the research. The focus of the research is on the state of Karnataka. Additionally, study the waste materials that can be composted using worms.

Findings

- Marketing size for vermicompost
- No of dealers in Karnataka
- No of visits made, List of factories of dairies, Paper Industries, Sugar Industries, Banana growing Areas in Karnataka

Research Implications

- This will help in selling and buying of the vermicompost.
- This helps to know different type of the producers along with the method that they have used.
- This study helps to know which type of earthworm is good for the production of the vermicompost.
- This helps in searching of different raw materials.

Theoretical implications

The theory I'm using has contributed to the manufacturing of vermicompost and marketing of vermicompost, which is demonstrated. Here are some photos that demonstrate this notion.

Vermicompost Production Methodology

i) Selection of suitable earthworm

• Only surface-dwelling earthworms should be employed to produce vermicompost. The earthworm, which dwells beneath the soil, is unsuitable for the manufacture of vermicompost. The composting worm (Peronyx excavatus), red worms (Eisenia foetida), and African earthworms (Eudrillus engenia) are all promising worms used in the production of vermicompost. For the creation of vermicompost, all three worms can be combined. The African worm (Eudrillus eugenia), which generates more vermicompost in less time and more young worms throughout the composting process, is chosen above the other two varieties.

African earthworm (*Eudrillus euginiae*)

Tiger worm or Red wrinkle (*Eisenia foetida*)

Asian worms (*perinonyx ecavatus*)

ii) Selection of site for vermicompost production

Vermicompost can be created wherever that is chilly, shaded, and humid. It is possible to employ unused structures such as cow barns, chicken coops, or sheds. If it is to be manufactured outside, a shaded location is chosen. To shield the procedure from direct sunlight and precipitation, a thatched roof might be offered. Vermicomposting trash should be piled high and covered with moist gunny sacks.

iii) Containers for vermicompost production

A cement tub can be built up to 212 feet in height and 3 feet in width. Depending on the size of the room, the length may be fixed at any level. To drain the extra water from the vermicompost unit, the bottom of the tub is designed with a sloped structure. The drain water must be collected in a shallow sump.

• To have a quick harvest, hollow blocks or bricks may be stacked in compartments to a height of one foot, a width of three feet, and a chosen level. This alternative to the hand floor. Moisture assessment will be simple with this procedure. Nothing overflowing will be emptied. Additionally, vermicompost can be created in plastic buckets, wooden boxes, or any other containers with a drain hole in the bottom.

Cement tub

Coir waste

Saw dust

Sugarcane trash

iv) Vermiculture bed

After saw dust, husk, coir waste, or sugarcane garbage can be placed in the bottom of a tub or container to create a vermiculture bed or worm bed (3 cm). The culture bed should be covered with a layer of fine sand (3 cm), then a layer of garden soil (3 cm). Water must be used to dampen each layer.

Research Problem

How to turn biodegradable waste into vermicompost, which promotes plant development naturally. Find out about India and Karnataka's respective vermicompost markets' sizes globally. Various earthworm species will be used in experiments, and lab reports will be taken.

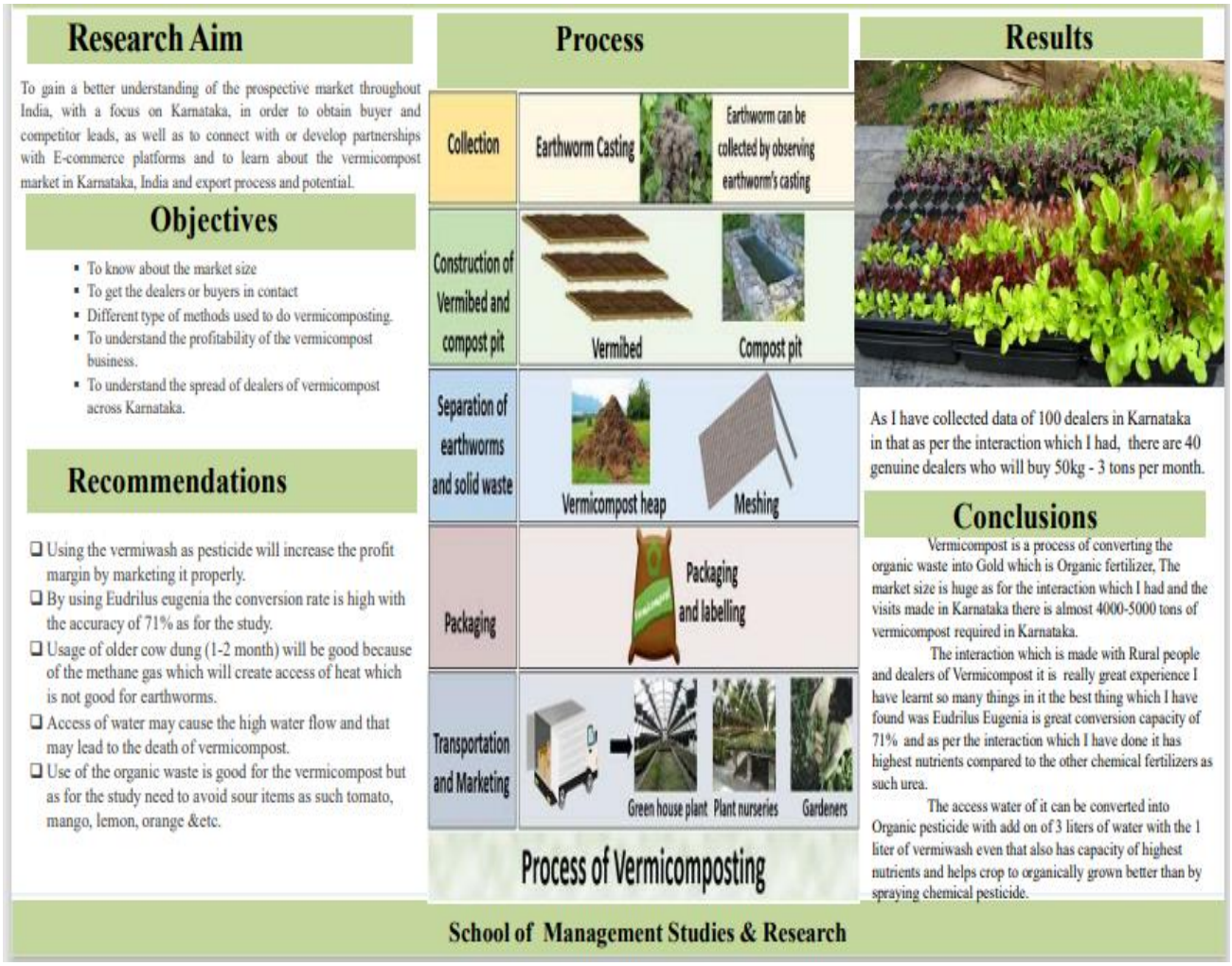
Project Scope

Rich in nutrients, vermicompost can be utilised as an organic fertiliser. It can be used in plantations and agriculture. Earthworms are also used in the treatment of sewage.

Project Objectives:

- To understand the magnitude of the market and increase sales
- There are various vermicomposting techniques.
- To comprehend the distribution of vermicompost merchants throughout Karnataka.
- To comprehend the 30 tons vermicompost unit business plan profitably
- To comprehend Karnataka's banana-growing regions, paper industries, sugar industries, and dairy factories.

The project implementation is described below in the poster:



Photographs:

Research Implications

According to the study, Eudrilus eugenia has a high conversion rate and a 71 percent accuracy rate when compared to Eisenia fetida. Utilizing cow dung that is 1-2 months old will be beneficial because the methane gas it contains will prevent earthworms from benefiting from heat.

Practical implications: -

Use of organic waste is excellent for the vermicompost but as for the study need to avoid sour things as such tomato, mango, lemon, orange &etc. Access to water may produce the high-water flow and that may lead to the death of vermicompost.

Conclusion

I have information on 100 dealers in Karnataka, and 40 of them are legitimate dealers who will purchase 50 kg to 3 tonnes per month based on conversations I have had with them. Vermicomposting is a process that turns organic waste into gold, or organic fertiliser. Based on our interactions and the visits we made to Karnataka, we estimate that the state needs between 400 and 5000 tonnes of vermicompost. It is a truly amazing opportunity to interact with rural residents and vermicompost vendors. I've learned a lot from it, but the nicest item I discovered was Eudrilus Eugenia, which has a great conversion capacity of 71 percent and the richest nutrients compared to other chemical fertilisers like urea. The available water can be transformed into organic pesticide by adding an additional three litters of water and one litter of vermiwash, which also has the highest nutrient content and promotes organic crop growth.

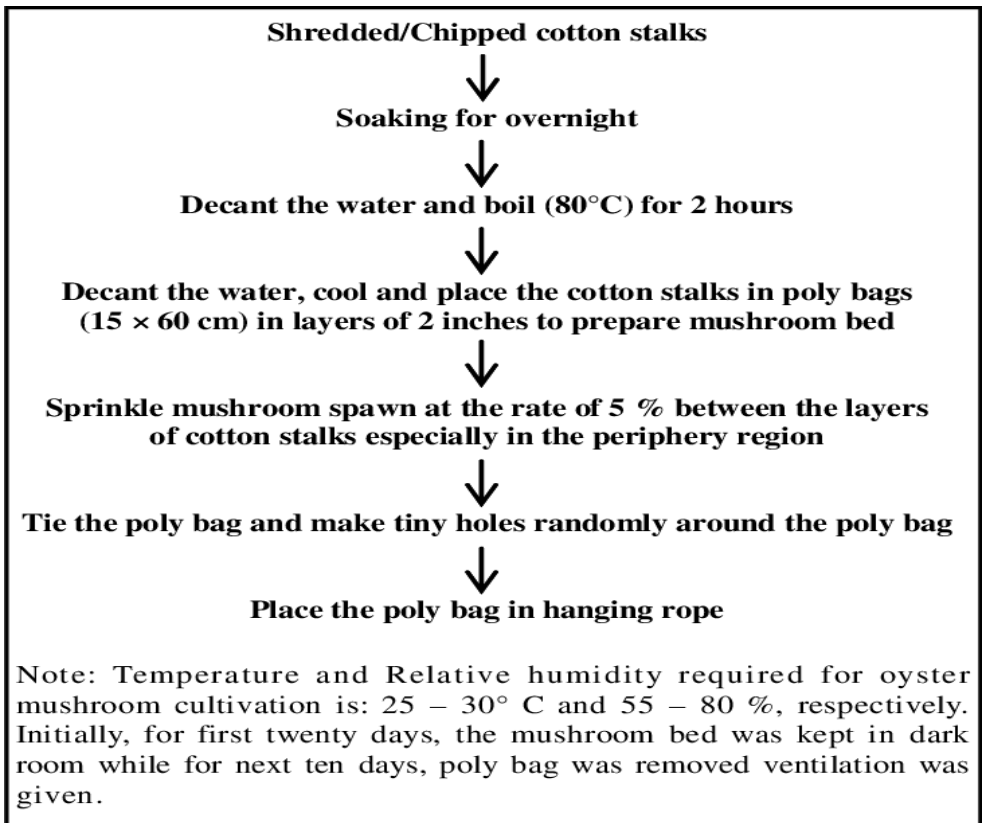
2. OYSTER MUSHROOM

Objective

The exercise's major goal is to demonstrate a small-scale, technologically advanced production unit that is feasible and bankable.

Simple Farming Technology – Pleurotus mycelium can grow on fresh or fermented straw; a composted substrate is not necessary for its growth. It is easy to prepare the substrate for oyster mushrooms. Additionally, unlike A. bisporus, this mushroom does not require carefully controlled climatic conditions because most species can tolerate a wide range of temperatures, relative humidity, and CO2 levels.

Manufacturing steps of Oyster Mushroom



Photographs:






Technical Certificate:

Approved by : INDIAN INSTITUTE OF HORTICULTURAL RESEARCH HESSARAGHATTA, BENGLORE

Om Shree Satya Sai
Oyster Mushroom Cultivation Technical Assistance Unit
Vijaya Smruti Sanjeev Nagar, Behind Canara Bank, Malmaddi, DHARWAD - 7

Om Shree Satya Sai Oyster Mushroom
Since 1983
PURE VEGETABLE RICH NUTRITIVE

Certificate

This is to Certify that ~~Shri~~ / ~~Smt~~ / Kum. Rashmi J.
has successfully completed Short Term / Long Term specialised Mushroom Cultivation Training Course of 3 Days held from 26-4-21 to 28-4-21 in both Theory and Practicals.

79 85

Date : 10-5-21

Raja L. Durg
Chief Technical Advisor

EVENT SUMMARY REPORT

Name of the event: Self Defence Techniques for Girls

Date of the event: 28/02/2022

Venue: SMSR Seminar Hall

Total Number of Students Attended: 150

MOC for the event: Neha T G

Event Summary

The most important aspect of self-defence for women is the ability to defend themselves against anything that is socially incorrect. Nothing is more empowering than having the confidence to assess a dangerous situation and take appropriate action to overcome it.

So today KLE Technology University's **Anti-Sexual Harassment** and **Women Empowerment Cell** along with **Women Doctors Wing of Indian Medical Association** have taken a step forward in achieving this and helping our generation to stand equally and to stand strong against doing anything against their will by inviting a group of trainers from **Aspire Sports Karate Academy** to our campus for this session.

The session began with the introduction of guests and trainers by the MOC. As a token of appreciation a memento was presented to the trainers. The session further continued with the demonstration of the moves and at the same time being practiced by audience present.

After a healthy practice session the day moved forward with an interactive session, a discussion between trainers and our audience by helping them to clear their doubts and assisting them to learn the moves efficiently by being friendly with the audience the trainers successfully achieved the motto of the session.

The session followed by a vote of thanks from the MOC and thanking them on behalf of the entire KLE Technological University and especially from Anti-Sexual Harassment and Women Empowerment Cell thanking them for the session.

Size : 6 x 3 feet


KLE Technological University
ANTI SEXUAL HARASSMENT & WOMEN EMPOWERMENT CELL
in association with
IMA - WOMEN DOCTORS WING & ASPIRE SPORTS KARATE ACADEMY (R)
Organise
"SELF DEFENCE TECHNIQUES FOR GIRLS"
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Hubballi, KA, India
Chaitanya Nagar, Hubballi, 580025,
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Maps


KLE Technological University
ANTI SEXUAL HARASSMENT & WOMEN EMPOWERMENT CELL
in association with
IMA - WOMEN DOCTORS WING & ASPIRE SPORTS KARATE ACADEMY (R)
Organise
Date : 28-02-2022 | Time : 4.30 pm


IMA - WOMEN DOCTORS WING & ASPIRE SPORTS KARATE ACADEMY (R)
Organise
"SELF DEFENCE TECHNIQUES FOR GIRLS"
Date : 28-02-2022 | Time : 4.30 pm | Venue : SMSR Semi
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KLE Technological University
ANTI SEXUAL HARASSMENT & WOMEN EMPOWERMENT CELL
in association with
IMA - WOMEN DOCTORS WING & ASPIRE SPORTS KARATE ACADEMY (R)
Organise
"SELF DEFENCE TECHNIQUES FOR GIRLS"
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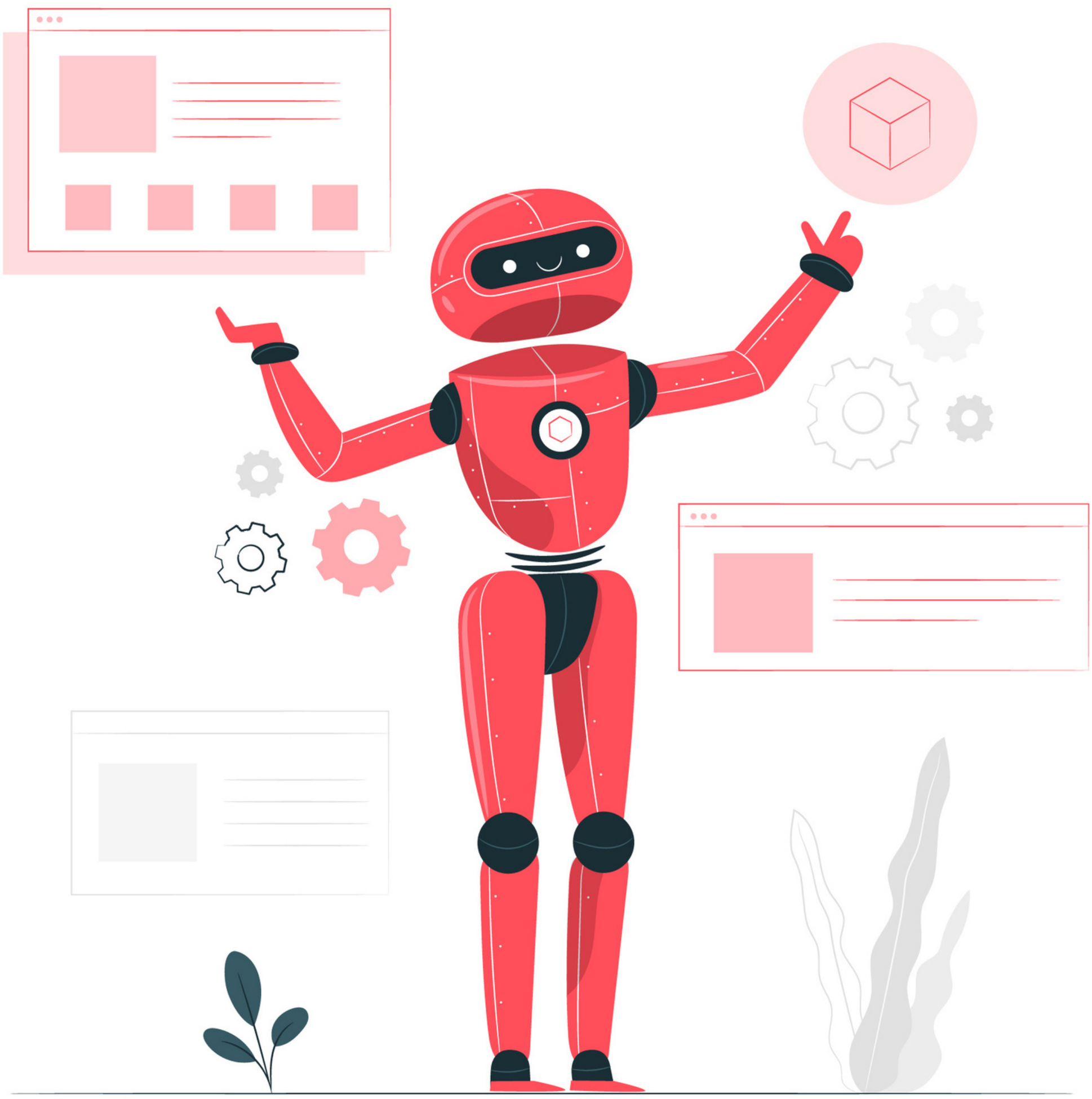
SOUVENIR & BOOK OF PROJECTS



Organized by

AUTOMATION & ROBOTICS

KLE TECHNOLOGICAL UNIVERSITY

(INCORPORATED UNDER KLE TECHNOLOGICAL UNIVERSITY ACT-2012:
KARNATAKA ACT NO. 22 OF 2013, AICTE APPROVED)

HUBBALLI – 580031, INDIA

About Mini-Project

Mini-project is offered to 5th-semester students. Mini-project focuses on the engineering design process, which acts as a scaffolding for the students to identify problems, generate requirement analysis, conceptual design, and prototype. The mini-project lays the foundation for the Minor and senior design project.

Objectives

- carry out need analysis, market survey, research literature, and identify a suitable real-world problem, which is complex and open-ended.

- Identify and follow systematic engineering design process as per the standard VDI 2221 to design/develop solutions for the identified problem.

- Use available software tools and techniques for various activities in the design process namely modeling, analysis, simulation, sustainability analysis.

- Apply engineering and management principles to scope, plan, and implement the project based on economic and financial considerations.

- Identify the tenets of the professional code of ethics, team norms, and function effectively as an individual.

- Prepare appropriate engineering design documentation, project report, and make an effective presentation.

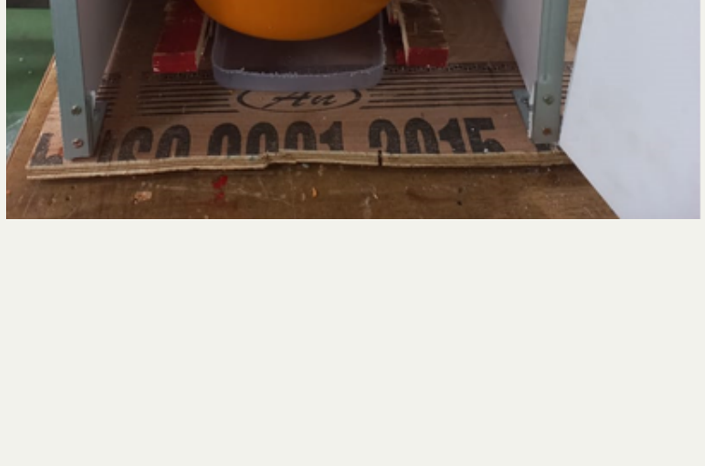
List of Teams Participated in Mini - Project

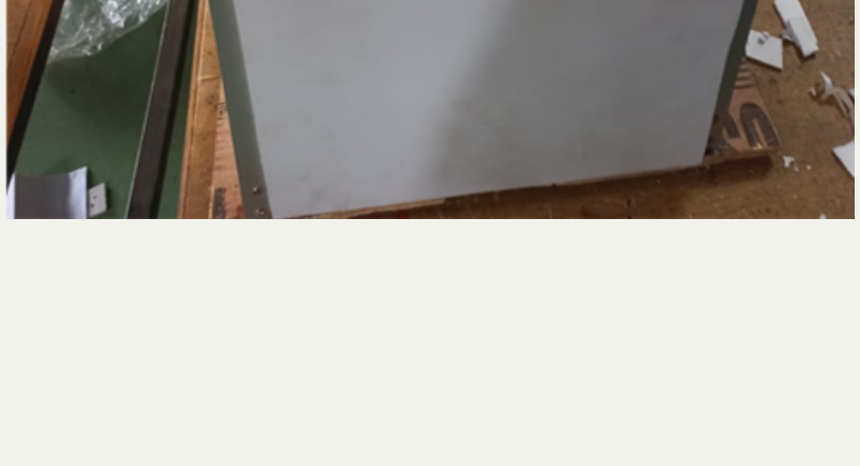
Team Number	Team Members	Title of the Project
1	VINEETH JOHNSON KARTIK AVADHANI VIRAJ KULKARNI SHRIDHAR KATKATI NEELESH BAGI	WASTE COMPRESSOR
2	SANKET S A AKARSH HIRENNAVAR AMRUT MARIHAL VAIBHAV SHREYAKAR	X-RAY FILMS RECYCLING
3	DEEPAK KUMAR BP PREETHAM GR SHREEHARI DIVATE B GANESH PURAKRAM PATEL	PLATE CLEANING MACHINE
4	KARTHIK ARALKATTI RONALD .B. PHILIPS SAMMED MUDAKANNAVAR SANTHOSH KODIHALLI	WASTE COMPRESSION BIN
5	CHINMAY KANANNAVAR VISHWACHETAN G M SUDARSHAN WAGHMARE KHUSHWANTH S KARTIK J	PCB SHREDDER
6	YOGITA G.PRIYA SUSHMA POONMA LAVANAYA	RECYCLING OF AGRO WASTE INTO A USEFUL PRODUCT
7	NEERAJ H PRAPTI K AKSHAY S NIKITA J	WASTE SEGREGATING MACHINE
8	HRITHIK DHONGADI TEJAS MUCHCHANDI P. SHRI AAKASH ATHARVA BYALI	WASTE COMPACTOR
9	SANKEERT HEMANTH VASANTH VINAYAK PRADEEP	THE WASTE SEGREGATOR
10	GURUVASANTH BHAVIKATTI RITUL SHAH VISHAL RAGI POORVI D SUMEET K	SYRINGE & NEEDLE DISPENSER
11	ABHISHEK KOPPAL YASH BORKER VIDHYADHAR KIRAN SHETTY	PLASTIC AND METAL SEPARATING MACHINE
12	ABHISHEK C TAYYAB SHAIK PAVAN KRISHNA K PREETHAM DIVATE	MEDICAL WASTE SEGREGATION

Team -1

WASTE COMPRESSOR

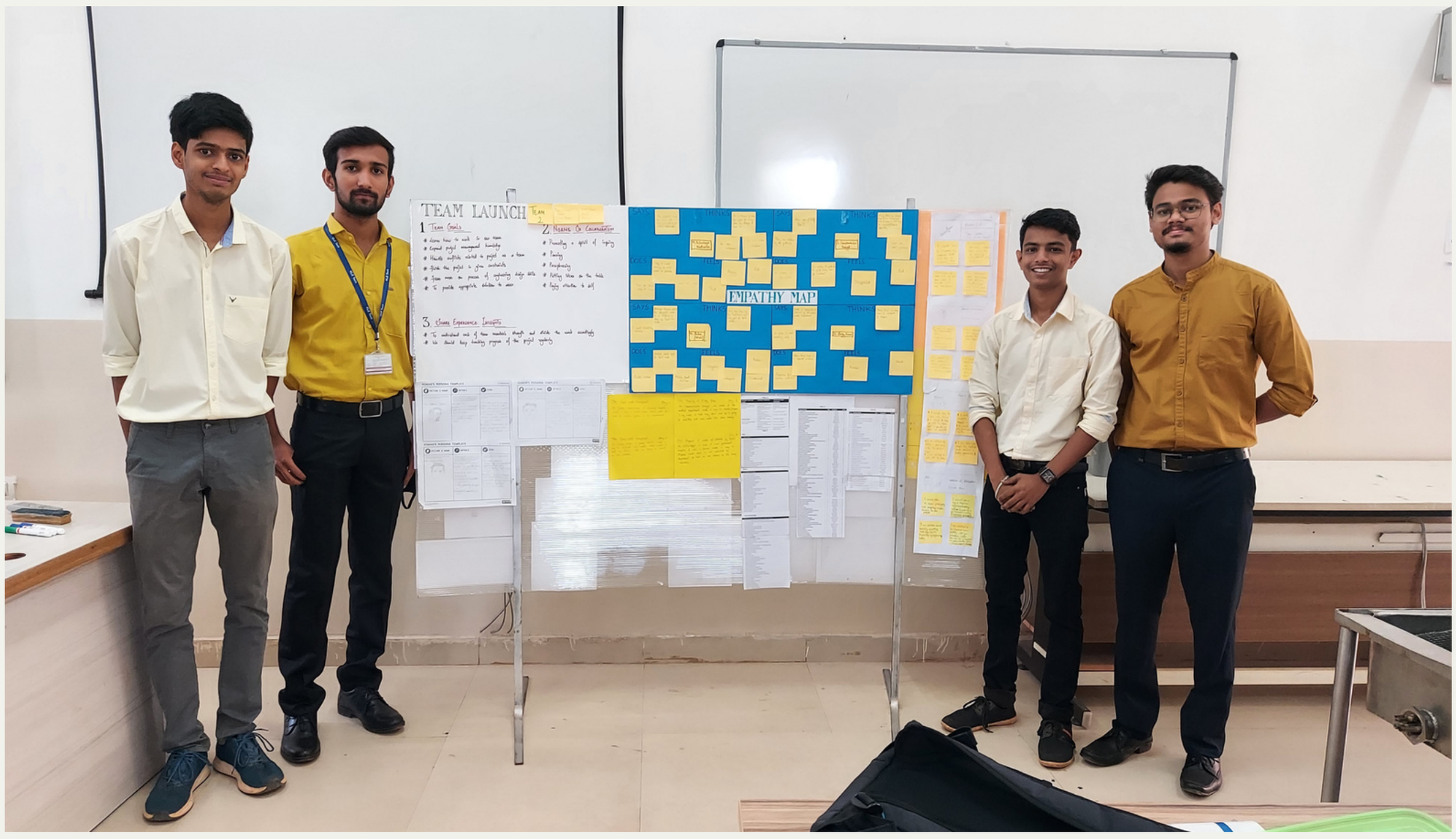
The main problem faced by the user who we interviewed is that people living in the residential areas are dumping the excess waste generated in their homes, in the nearby open site when the public garbage bin is completely filled with waste.



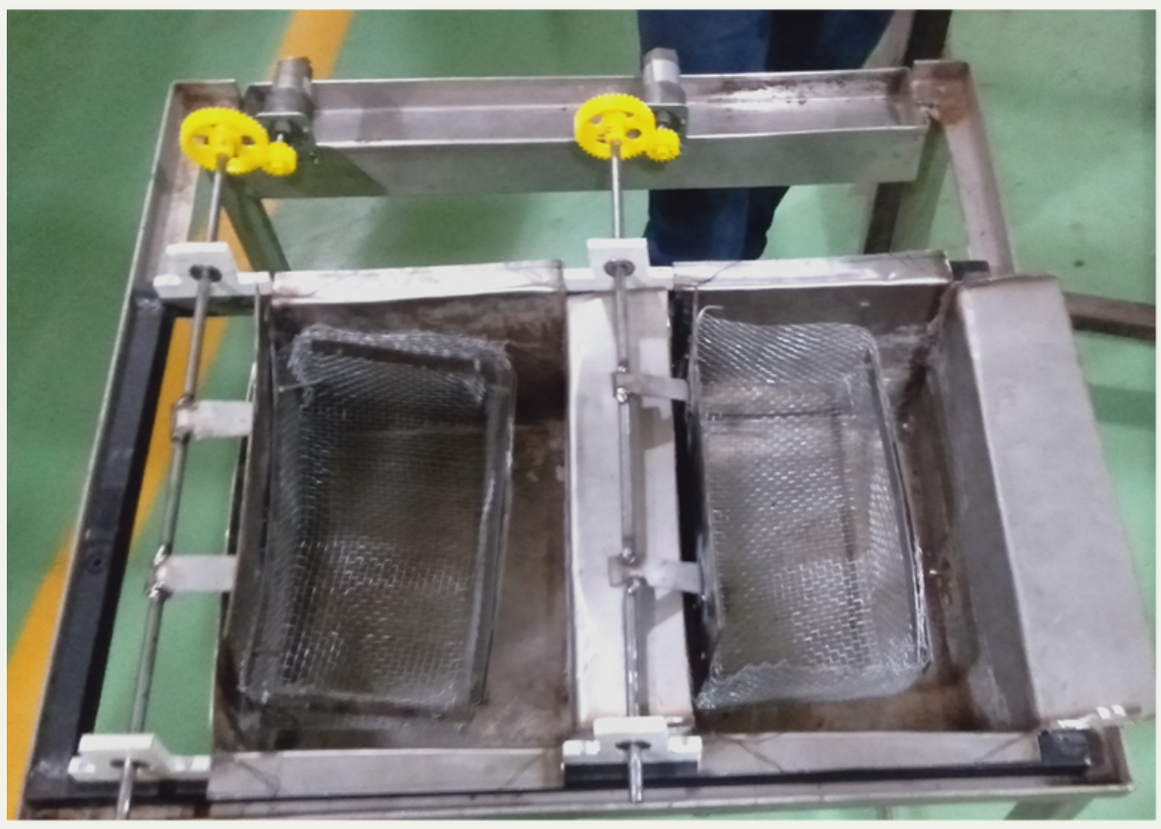


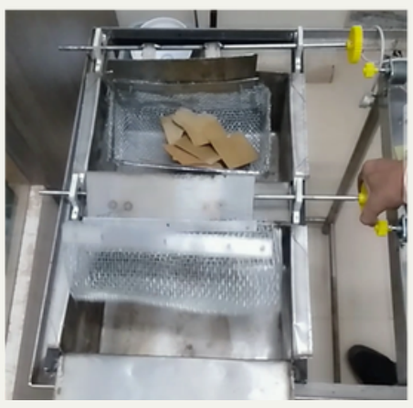
Team -2

X-RAY FILMS RECYCLING



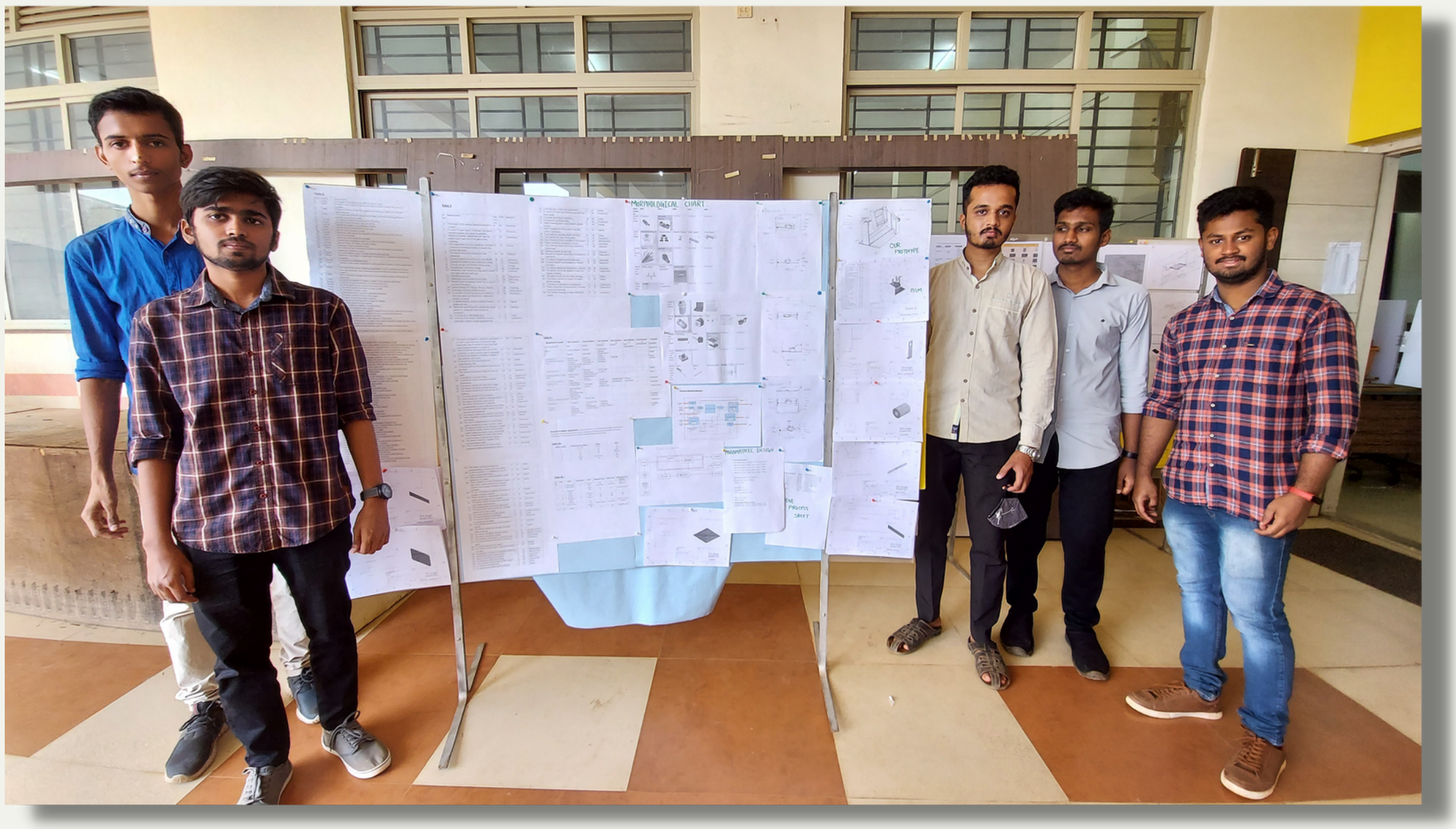
Overall function is to separate silver sludge from plastic in X-ray films of unspecified sizes in order to extract value in a cost-effective, environmentally sustainable, safe, and easy-to-use manner that has a good build quality and requires little maintenance



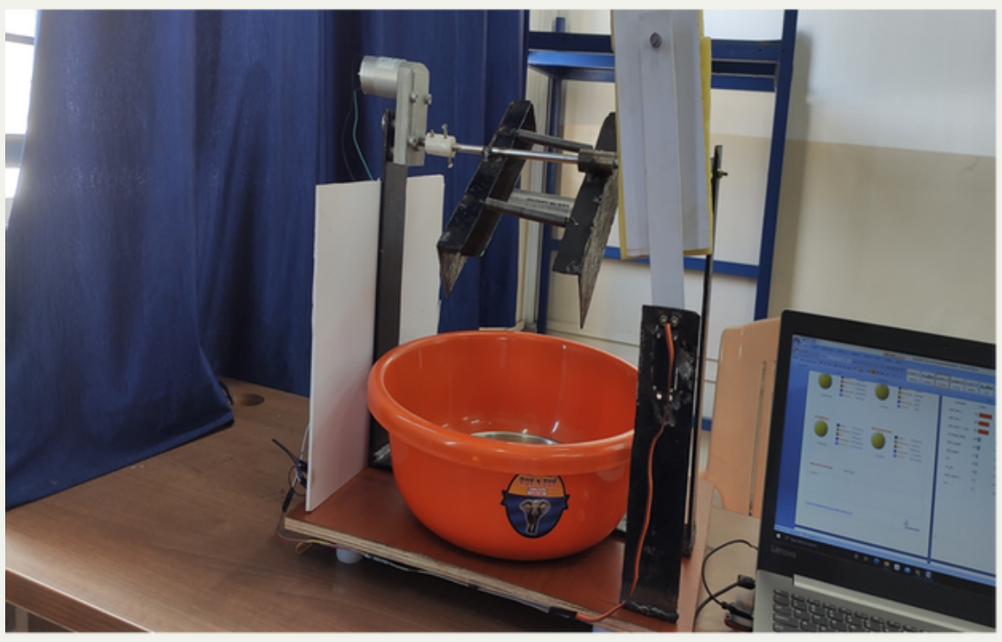


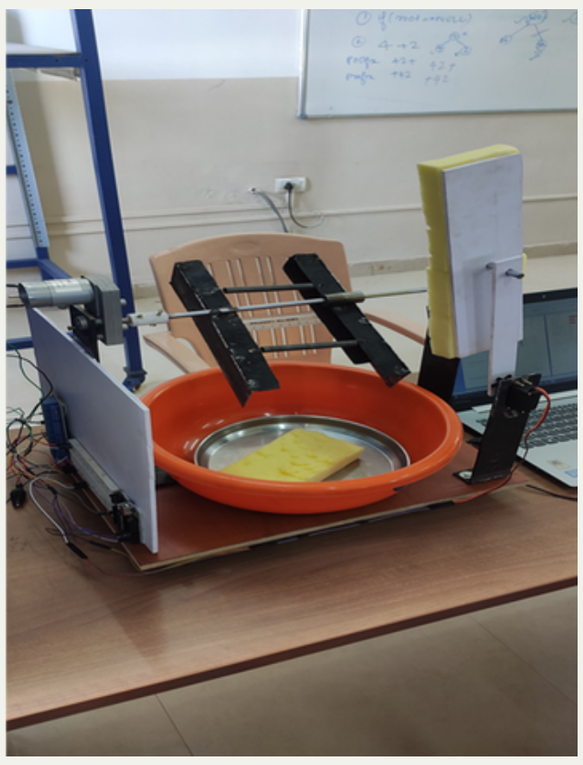
Team -3

PLATE CLEANING MACHINE



The overall function is to remove the food waste efficiently from the plates of different sizes and shapes kept in cleaning area without scratching the plates and without involvement of human hand so that the future cleaning of plates becomes easier.

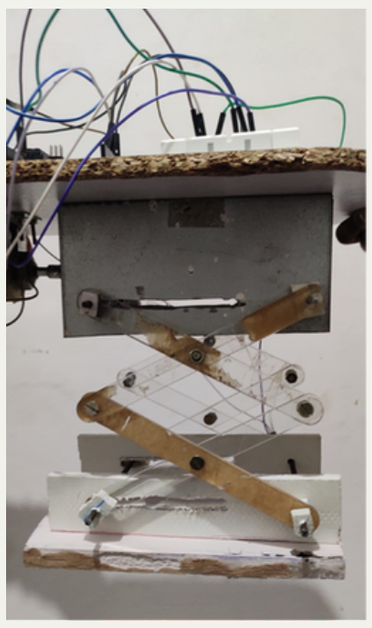


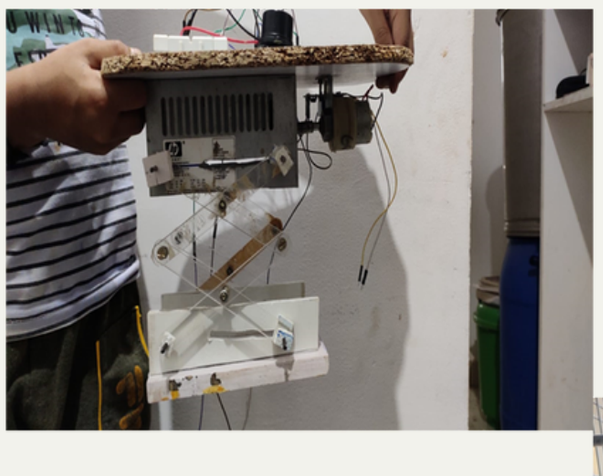


Team -4

WASTE COMPRESSION BIN

Overall function is to eliminate the empty spaces in a bin to hold more quantity of waste of unspecified sizes, for Food Vending Stalls i.e., (plastic and paper waste), to be safe with minimal operation, also have the ability to suppress waste from leaking while transporting, to easily dispose the waste in it and to have an attractive design with good built quality.





Team -5

PCB SHREDDER

- There is no proper e- waste disposal unit.
- E-waste is consuming large space for storing as the municipal doesn’t collect e-waste for a longer period of time.
- People are not aware of how to dispose e-waste.
- E-waste contains a large amount of hazardous substances which harm both the environment and the human life.

Team -6

RECYCLING OF AGRO WASTE INTO A USEFUL PRODUCT

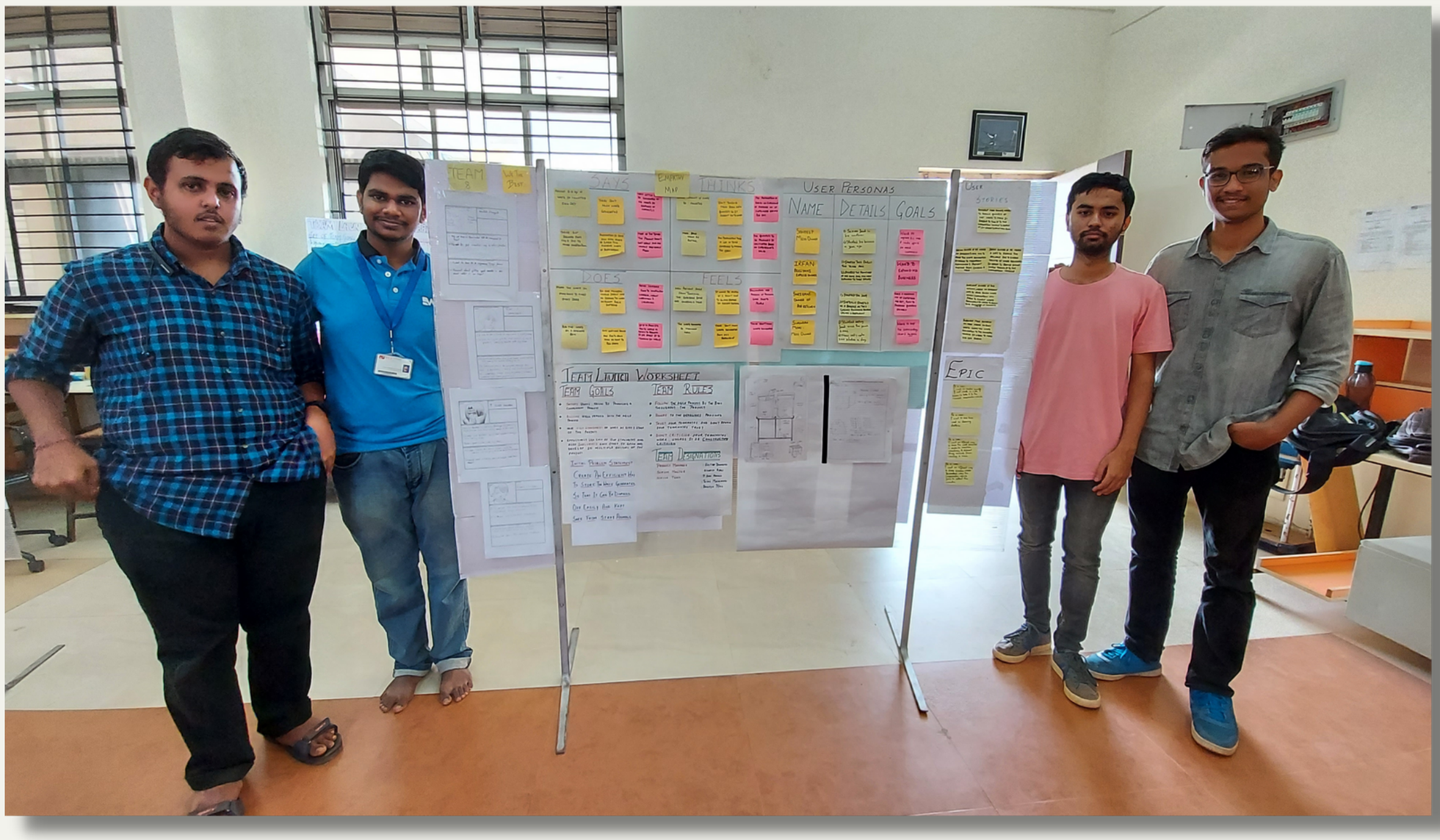
The overall function is to efficiently handle agro waste and convert it to a useful product for the packaging industry, and at the same time it is easy to use and maintained by the users.

Team -7

WASTE SEGREGATING MACHINE

We want to build a machine to segregate the waste produced separately into their categorical order so that proper measures can be taken to dispose them without harming the environment.

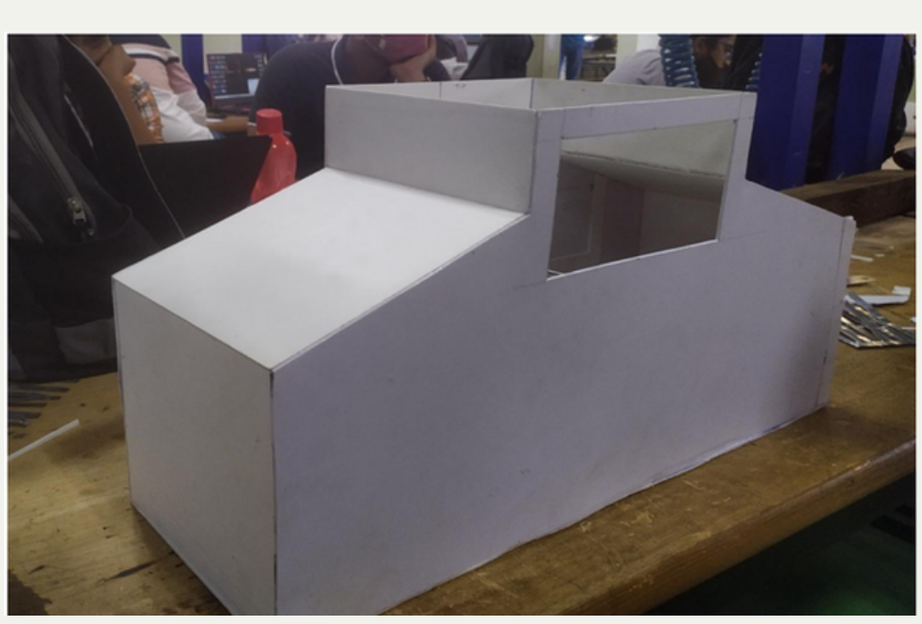
Team -8
WASTE COMPACTOR



THE OVERALL FUNCTION IS TO EFFICIENTLY STORE DIFFERENT QUANTITIES AND TYPES (WET & DRY) OF KITCHEN WASTE FOR EASY DISPOSAL LATER IF MUNICIPAL VEHICLE DOES NOT COLLECT AND AT THE SAME TIME BEING SAFE TO USE WHILE KEEPING UNWANTED AGENTS LIKE FLIES AND STRAY DOGS AWAY.

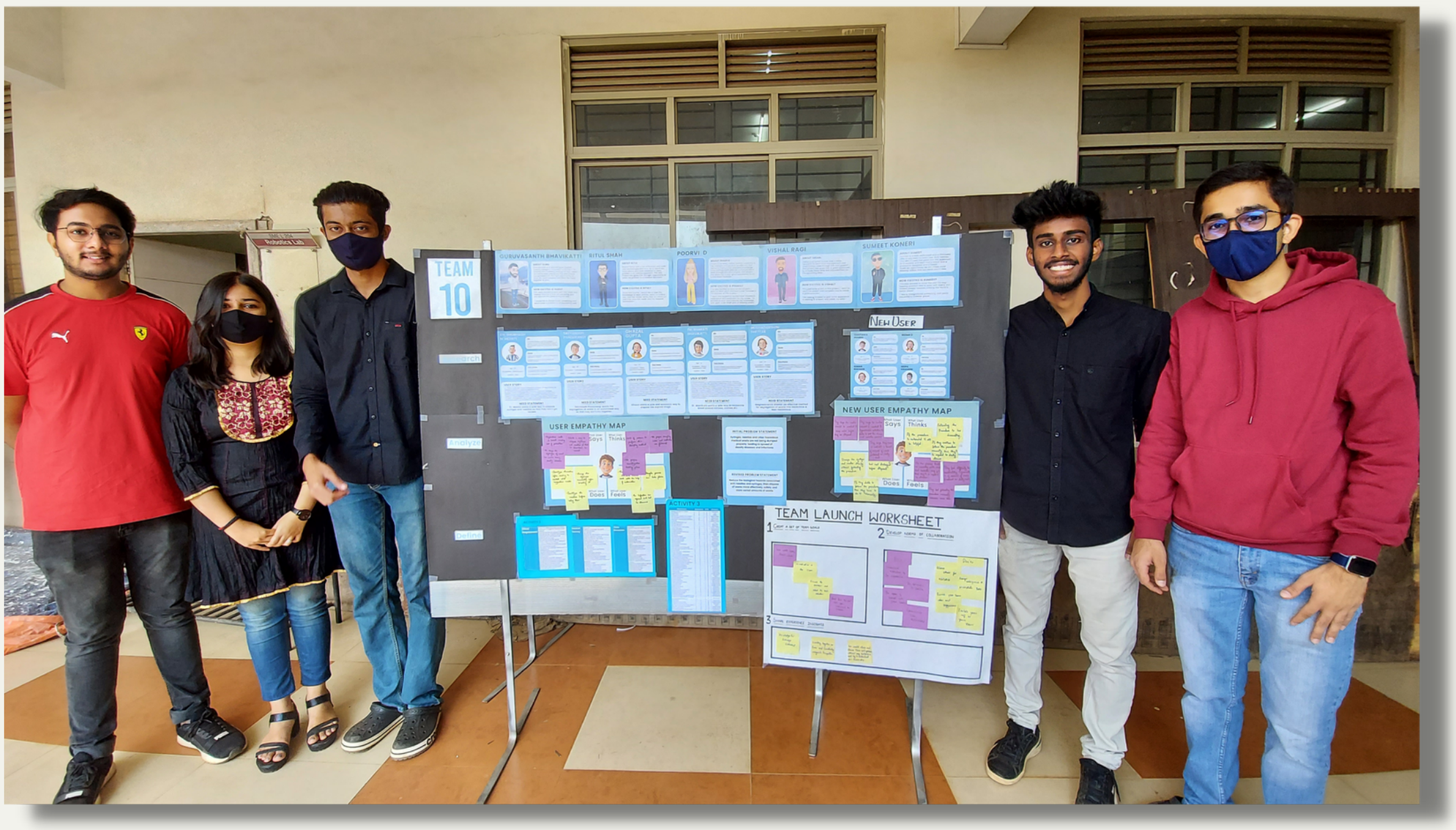
Team -9
THE WASTE SEGREGATOR

- People not segregating the garbage in spite of awareness campaigns.
- Unauthorised garbage throwing habits.
- Avoid to use to separate bins for wet and dry waste.
- Unnecessary usage of landfills for the disposal of mixed waste.
- Eventually leading to the land , water and air pollution.



Team -10

SYRINGE & NEEDLE DISPENSER



Reduce the Biological Hazards Associated with Needles and Syringes, and disposal of the waste effectively, safely, and store varied amounts of waste.

Team -11

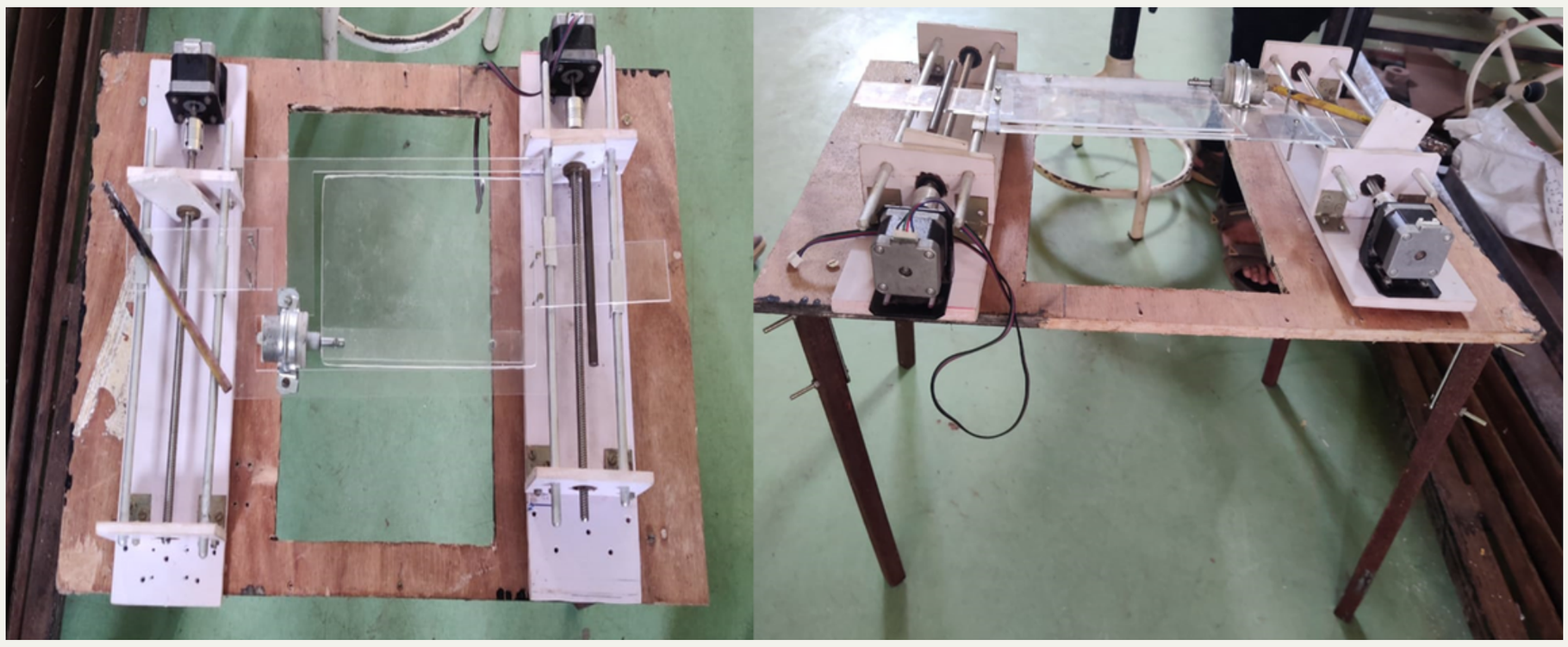
PLASTIC AND METAL SEPARATING MACHINE

The main problem faced by the user who we interviewed is that to separate plastic from metal waste which is generated in industries with minimal human intervention

Team -12

MEDICAL WASTE SEGREGATION

- We will be solving the medical waste management problem
- We found that segregating waste manually takes lot of time and manpower
- As large number of clinics don’t have enough space to maintain different bins
- It is helpful for even the clinics or hospital situated at higher floors
- It will reduce the health issues caused to the workers segregating it



2021 -2022
18EARW301

Community Projects-Minor Project_Mechanical_2021-22

S.NO	BATCH	STUDENTS NAMES	TITLE	YEAR
1	TEAM A3	Ananya R Sattigeri Prakhyath S Nayak Shakainah P Achary Veena N Hubballi Harsha Kunnal	Retro fitment for Manual Wheelchair.	2021-22
2	TEAM A12	Karthik Kulkarni Vishalram Patil Puneet B Savalgi Vasanthmadhav Kulkarni Rahul Nayak Abhinandan Samnekar	Shirodhara Unit	2021-22
3	TEAM B3	Malatesh Kesari Naveen Rakaraddi Samee Khan Bhagewadi Ritish Mirje Shivanand Guraddi Prajwal J Kadagi	Portable smoke purifier for passive smokers	2021-22
4	TEAM B4	Chandrashekar Pattar Ramesh Battur Sharanbasappa Sathyam Rane Kedar Naik Darshan Chavan	UPI based cash dispensing machine	2021-22
5	TEAM C1	Dhanashri U Sobarad Pradyumna G Bijapur Ritish Hegde Abhishek M Chabbi	Ornithopter for secret services	2021-22
6	TEAM C5	Samarth Gurav Vinay S Kulkarni Aditya Revankar Danish A K Vidushi Bhagat Kumar Waddar	Prasadam Vending Machine	2021-22

A Minor Project Report on

ECONOMICAL, AUTOMATED RETROFIT KIT FOR MANUAL WHEELCHAIR

Bachelor of Engineering in

Mechanical Engineering

Submitted by

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Name :Veena Hubballi	USN:01fe19bme188

Under the Guidance of

Prof. Shivprasad M

Prof. Mahesh Gorawar

2021-2022

School of Mechanical Engineering

K.L.E Technological University,

Vidyanagar, Hubballi 580031

CERTIFICATE

This is to certify that Capstone Project entitled **"Economical and Automated Retrofit kit"** submitted by **Team 03 to** the **KLE Technological University**, Hubli-580031, towards partial fulfillment for the award of the degree of Bachelor of Engineering is a bona-fide record of work carried out by him/her under our supervision. The contents of project report, in full or in parts, have not been submitted to any other institute or university for award of any degree or diploma.

Prof.Shivprasad M.

Guide

Dr. B. B. Kottursheттar

Head of department

ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without mentioning the people who made it possible and whose guidance and encouragement has made our efforts successful.

At the outset, we would like to express our deep sense of gratitude for our guide **Prof. Shivprasad M** for making this project report successful through their invaluable guidance at every stage of the project report.

We also thank **Dr. B. B. Kottursheттar** for his encouragement in undertaking the task of this project.

We express our sincere regard and gratitude to our project co-ordinators **Prof Shivprasad M** and course mentors**, Prof Mahesh Gorawar, Prof Nagaraj Ekbote, and Prof. Arun Patil** School of Mechanical Engineering, KLE Tech,, Hubli

We also thankful to all faculty members of the Mechanical Engineering Department of KLE Technological University, for helping us directly or indirectly in different stages of our project work.

Student signatures

(Team 3)

Phase wise Contents:

1. Refined problem statement		*(Tick mark the cell once each activity is completed)*
1.1	Identifying end users (Customers)	
1.2	Identify customer needs	
1.3	Analyzing the needs	
1.4	Requirements List	
2. Product benchmarking		
2.1	Studying and exploring competitive products	
2.2	Patent search	
2.3	Literature survey	
3. Design Specifications		
3.1	Objectives	
3.2	Constraints	
3.3	Objective tree (affinity diagram)	
3.4	Design Specifications	
4. Concept generation		
4.1	Defining Functions	
4.2	Morphological chart	
4.3	Generating design alternatives	
4.4	Selecting best alternatives (Pugh chart)	
5. Design		
5.1	3D Model	
5.2	Assembly models	
5.3	2D drawing	
5.4	Design Calculations	
6 Prototype Planning		
6.1	Raw materials	
6.2	Bill of Materials	
6.3	Joining techniques/ methods	
6.4	Flow Chart	
6.5	Sub-Assembly Planning	

Phase 1

1 Refined problem statement

1.1 Identifying end users (Customers)

- Aged people
- Disabled people
- Patients

1.2 Identify customer needs

- A device that is easy for the end users to operate
- A device that is safe to use
- A device that is affordable
- A device that is easily operated either by remote, joystick, or app controlled.

1.3 Analyzing the needs.

Needs are analyzed by following customer needs:

Customer: Basavaraj Age: 73 Interviewer(s): Shakainah Date:8-02-2022
Place: Hubballi

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
1) Do you think a person on a manual wheelchair can move independently?	No, in most of the cases we need someone's help.	A wheelchair where the users can move independently.
2) Will buying new electric wheelchair be affordable or converting your manual wheelchair with just a device preferred.	New electric wheelchair is expensive and is not possible to be purchased by everyone. Therefore by converting manual wheelchair with a device is preferred.	A retrofit kit which can convert manual wheelchair into electrical wheelchair is on the affordable side.
3) What are the problems faced by wheelchair users?	I have faced blister problem most of the time. I'm always dependent on someone to move around and finish my works. My hands become filthy.	The wheelchair should be electrically driven to overcome such problems.

4) What are the suggested improvements?	To have an electrically driven wheelchair. Should be affordable by the users.	Hence converting manual wheelchair into electrically driven by a retrofit kit. Cost efficient.

1.4CustomerRequirements List:

Customer	Requirements
Basavaraj, Hubballi	The manual wheelchair should be electrically driven. It should be cost efficient.

Customer: Papatamma Age: 79 Interviewer(s): Shakainah P

Date: 8-02-2022

Place: Hubli

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Do you think a person on a manual wheelchair can move independently?	No, its difficult to move around without any help.	Need of a wheelchair where the users can move independently.
Will buying new electric wheelchair be affordable or converting your manual wheelchair with just a device be preferred.	New electric wheelchair is expensive and is not possible to be purchased by everyone. Therefore by converting manual wheelchair with a device is preferred.	A retrofit kit which can convert manual wheelchair into electrical wheelchair is on the affordable side.
Will wheelchair users prefer regulating the speed on their own?	Yes, regulating the speed is helpful.	Speed regulation for rising or falling areas.
Suggested Improvements	To have an electrically driven wheelchair.	Hence converting manual wheelchair into electrically driven by a retrofit kit.

2.4 Customer requirements

Customer	Requirements
Papatamma Hubballi	The manual wheelchair should be electrically driven.
	Cost efficient.

Customer: DrYalagi (Physiotherapist) Interviewer(s): Shakainah P

Date: 8-02-2022

Place: Hubballi

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Do you think a person on a manual wheelchair can move independently?	No, it is difficult to move around because for most of the people the upper and lower limbs will be weak.	Need of an electrical wheelchair for ease movement.
Will buying new electric wheelchair be affordable or converting your manual wheelchair with just a device preferred.	Buying new electric wheelchair is on the expensive side. Therefore by converting manual wheelchair with a device is preferred.	A retrofit kit which can convert manual wheelchair into electrical wheelchair is on the affordable side.
Will wheelchair users prefer regulating the speed on their own?	No, speeding on their own is not preferred to all users because some users are also mentally disabled.	Speed regulation is not preferred for mentally disabled people.

Suggested Improvements	To have an electrically driven wheelchair.	Hence converting manual wheelchair into electrically driven by a retrofit kit.
	Should be affordable by the users.	Cost efficient.

.

3.4 Customer Requirements

Customer	**Requirements**
DrYalagi Hubli	The manual wheelchair should be electrically driven.
	Cost efficient.

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Customer: Dr Ashok (Family Physician) Interviewer(s): Shakainah P

Date: 8-02-2022

Place: Hubli

Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Do you think a person on a manual wheelchair can move independently?	No, especially for the people with weaker hands its difficult to move around without any help.	Need of a wheelchair where person can move independently.
Do you think integrating a sensor with an instant brake would help near elevation or steps?	Yes, integrating a sensor with a brake would make the situation better.	Integrating a sensor with a instant brake will help a person to stop himself/herself when any obstacle comes ahead.

Will buying new electric wheelchair be affordable or converting your manual wheelchair with just a device preferred.	Electric wheelchair available in the market is not affordable by everybody, so converting manual wheelchair into electrical with a device is better and affordable.	A retrofit kit which can convert manual wheelchair into electrical wheelchair is on the affordable side.
Suggested Improvements	To have a electrically driven wheelchair.	Hence converting manual wheelchair into electrically driven by a retrofit kit.
	Use of sensor with instant brake to avoid by getting hit by an obstacle.	Integration of sensor with a brake.
	Should be affordable by the users.	Cost efficient.

4.4 Customer Requirements

Customer	**Requirements**
Dr Ashok Hubballi	The manual wheelchair should be electrically driven.
	Integration of sensor along with brake.
	Cost efficient.

Customer: DrHiremath (Family Physician) Interviewer(s): Shakainah P Date: 8-02-2022

Place: Hubli

Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Do you think a person on a manual wheelchair can	No, moving without any help is quite difficult to them.	Manually operated wheelchairs need someone's help, so need a wheelchair where person can move independently.

move independently?		
What are the problems faced by users?	Patients/users usually face problems such as blisters, burning sensation and they always need someone to help them.	The wheelchair should be an electrically driven to overcome these problems.
	While pushing the wheels, the hands are filthy.	
Do you think integrating a sensor with an instant brake would help near elevation or steps?	Yes, I'd say that integrating a brake would be better than a sensor along with the brake. I would not recommend sensors.	Integrating a instant brake will help a person when any obstacle comes ahead.
		Sensors are not recommended for crowdy environment such as hospitals.
Suggested Improvements	To have an electrically driven wheelchair for easy movement and to avoid problems like blisters on hand, filthy hands.	Hence converting manual wheelchair into electrically driven by a retrofit kit.
	Integration of brakes.	

5.4 Customer Requirements

Customer	Requirements
DrHiremath, Hubballi	The manual wheelchair should be electrically driven for ease movement and to be independent. Integration of brakes.

Customer: Aditya		
Belgavi	Interviewer(s): Snetal	Date:8/2/2022
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**

How much did the wheel chair cost?	It cost me Rs.9000.	It is expensive.
How comfortable are you on moving with it?	Sometimes I can take it on my own. But sometimes I feel numb even in my hands.	Wheel chair should have buttons that can take in one touch.
What are the difficulties while using a manual wheel chair?	I can't go alone all the time because some elevations (some dangerous) may come.	Wheel chair must have a sensor that can sense the dangerous places.
What are your suggestions for better improvement of it?	I Just want to move all alone.	A wheel chair must have sensor.

6.4 Customer Requirements

Customer	**Requirements**
Aditya Place: Belgavi Manovikas school, Hubballi.	It should be affordable.
	It should have a sensor that should sense the dangerous things.
	Device must be automatic.
	It must be a portable.

Phase 2

Product Benchmarking

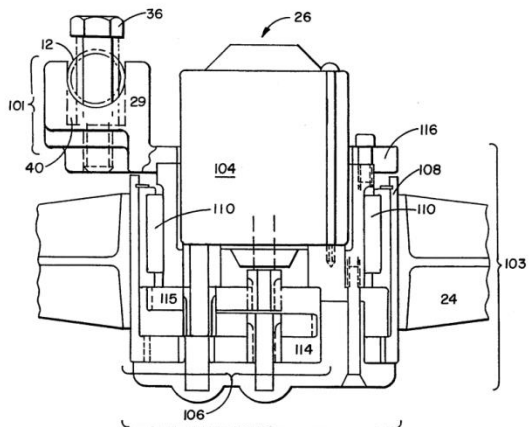
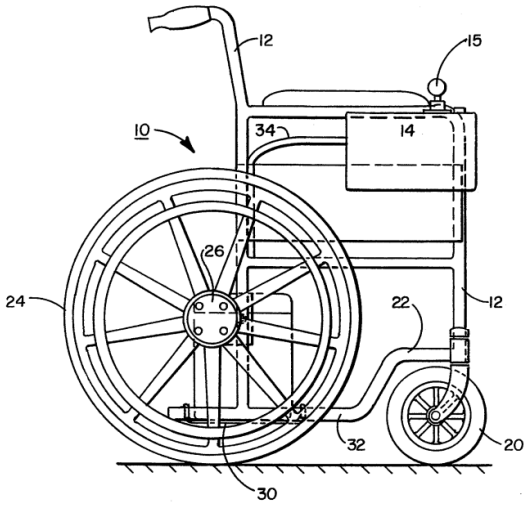
2.1 Studying and exploring competitive products

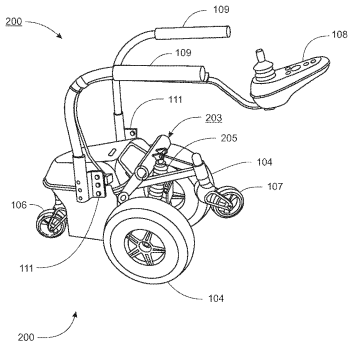
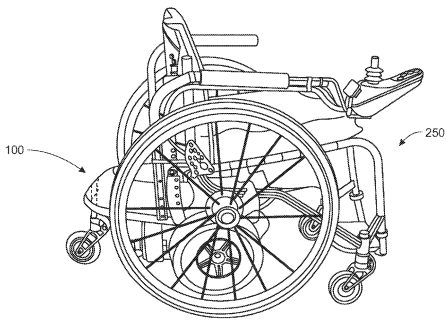
Products (Images or name)	Specifications	Advantage	Limitations	Cost & Availability

1.CNEBIKES ELECTRIC WHEELCHAIR CONVERSION KIT 	**Rated Power** 180W **Nominal Voltage** 24V **Battery** 24V 16Ah Li-ion **Load** 120kg **Wheel** 24inch **Range** 20km **Speed** 6km/h	• **Built-in EMB Parking Brake.** • **Manual Brake Release.** • **Easy Replaceable Tire Design.** • **5 Speed Settings**	**Tires of the manual wheel chair should be replaced with the tires provided along with the kit.** **Maximum load 120kg.** **High cost.**	**Available (U.S)** **https://www.cnebikes.com/product/Electric-Wheelchair-Kit.html** **Cost : 619.99 Dollar (Rs.46,273)**

2.GOLDEN MOTOR ELECTRIC WHEELCHAIR CONVERSION KIT 	Rated Power 400W Nominal Voltage 24V Load 180kg Wheel 24inch Range 18km Speed 5-6km/h	• Five speed settings • Regenerative braking • Parking brake open circuit detection • Parking brake manual release micro switch detection.	**Tires of the manual wheel chair should be replaced with the tires provided along with the kit.** **High cost.** **Battery is not provided With kit.**	**Available (U.S)** https://www.monsterscooterparts.com/wheelchair-parts/wheelchair-categories/wheelchair-conversion-kits/electric-wheelchair-conversion-kit.html#description **Cost: 1024.99 Dollar (Rs.76465)**
3. HULKWHEELS ELECTRIC WHEELCHAIR CONVERSION KIT 	Rated Power 250W Nominal Voltage 24V Load 100kg Range 30km Speed 7-8km/h	• No Need to Tool. • This Electric Wheelchair Tractor Easily install in 5 Steps and Fits in Most Wheelchair, including folding, Tilt-in space, one-arm drive and standing. • It includes a controller which will automatically lock the motor when emergency brake button is pressed.	**High cost.** **Maximum load 100kg**	**Available (India)** https://www.amazon.com/HULKWHEELS-Wheelchair-Conversion-Lightweight-Intelligent/dp/B08YMRBYLM **Cost: RS. 1,39,484**
4. Greenpedel Electric Wheelchair Conversion Kit, Portable Power Assist for Folding Wheelchair 	Rated Power 250W Nominal Voltage 24V Load 130kg Range 15km Speed 6km/h	• Dual joystick to control the wheel chair.	**Tires of the manual wheel chair should be replaced with the tires provided along with the kit.**	**Available(China & U.S)** https://greenpedel.en.made-in-china.com/product/SyJEFnjGZshL/China-Greenpedel-Electric-Wheelchair-Conversion-Kit-Portable-Power-Assist-for-Folding-Wheelchair.html **Cost: 487 Dollar (Rs.36,330)**

2.2 Patent search

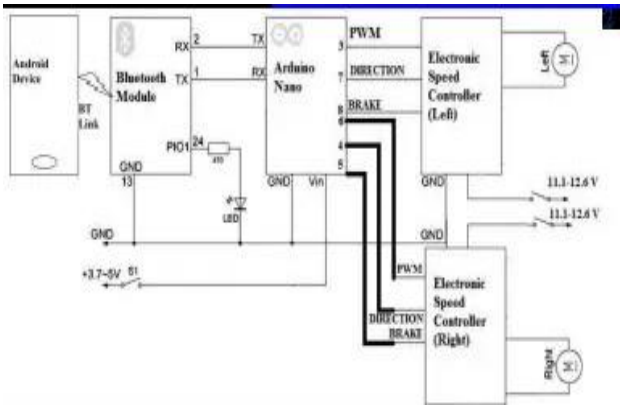
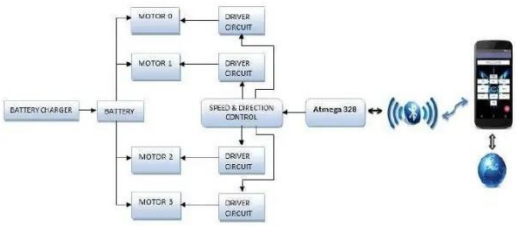
Patent Name/ Number/ Date	Information
Power conversion kit for wheelchair United States Patent: 5350032 DATE:27/09/1994   	• **A kit for power conversion of a manually powered wheelchair is provided wherein one or more power hubs are integrated into the rear drive wheels of such chair to affect propulsion thereof by means of a simple controller mounted to the armrest of the chair.** • **This kit is unique in several respects in that it mounts to the existing frame of a wheelchair of "standard" design at the same location and through the same holes provided for mounting of the original rear wheels. Moreover, the conversion kit is further provided with a supporting fixture for the powered rear wheels which is designed to both** **(a)Maintain the original clearances of the manually powered chair (so as not to subject the occupant to any inconvenience or distress in its operation).** **(b) It Effectively shifts the center of balance of the chair to enhance its stability during powered operation. This fixture has three defined area or segments; a first (coupling) segment which mounts directly to the chair frame at the same location and through the same holes of the support for the rear wheels which it replaces; a second (offsetting) segment which connects the first segment to the third segment (motor support); and, the third segment provides a stator for the power drive**

	assembly to which the rear wheel is supported and driven. • The transitional segment is unique by design in that it effectively positions the power drive assembly inboard so as to maintain the width of the chair, as thus modified, essentially the same as the manually powered chair, while insuring enhanced stability by increasing the chairs forward weight distribution during powered operation.
Power Add-On Device For Manual Wheelchair UNITED STATES PATENT: US20100300777A1 DATE: 02/12/ 2010  FIG. 6  	• A power add-on device for powering a manual wheelchair includes a motorized component including dual electric motors and a power source electrically coupled to the electric motors, wherein each of the motors is configured to turn a respective one of a set of drive wheels. • The power add-on device includes a latching mechanism adapted to attach the power add-on device to the camber tube of the manual wheelchair; and a controller, reachable by a person sitting in the manual wheelchair, that controls the latching mechanism, the motors, and a swing arm that allows the rear wheels of the manual wheelchair to be lifted off the ground. • The front wheels of the manual wheelchair are allowed to be lifted several inches off the ground to avoid obstacles, or can be lifted by the user leaning back. • Advantageously, the power add-on device can be detached from the manual wheelchair and loaded into the trunk of a

	car when travelling or may be checked in as baggage when flying.

2.3 Literature survey

Literature details	Gathered Information
RETROFIT WHEELCHAIR ENHANCEMENT (SYNERGISE) 	• Synergise is a thoughtful wheelchair add-on, retro-fittable on almost any existing model, that aims to help users navigate more effectively and efficiently. • It has bicycle brakes, the ratchet system which allows wheelchair users to negotiate angled surfaces with reduced friction and increased efficiency over endurance with reduced risks of RSI (Repetitive Strain Injury) to the user.
A Novel and Robust Wheelchair Navigation System 	• It is a robust and intelligent technique to control an electric powered wheelchair (EPW) for severely disabled persons. • It is based on the collaboration between the user cognitive skills and his head movement tracking to select the desired navigation command. EEG signals and head position are extracted with a low cost headset. • The communication between the computer and the wheelchair is via the Arduino microcontroller. • As direct implementation of new software modifications in real wheelchairs is not viable due to financial costs and risks for the safety of handicapped person, the solution is to use 3D simulations for the control model validation.

	• The average accuracies based on the head movement navigation system is 85%.
iWheel- a robotic wheelchair with mobile controlled navigation system 	• The "iWheel" robotic wheelchair system is a general purpose navigational assistant in environments that are accessible for the disabled (e.g., ramps and doorways of sufficient width to allow wheelchair to pass). • A reactive system does not use maps for navigation. • One of the advantages of this strategy is that users can navigate in multiple locations and environments.
WHEEL CHAIR USING VOICE RECOGNITION 	• This Omni-directional wheelchair was designed for the less able elderly to move more flexibly in narrow spaces, such as elevators or small aisle. • The wheelchair is developed to help disabled patients by using speech recognition system to control the movement of wheelchair in different directions by using voice commands and also the simple movement of the patient's fingers with keypad control.

Phase 3

3. Design Specifications

3.1 Brainstorming

Keywords	
• Size • Battery powered • Material • User friendly • Durable • Minimal human interaction compact(occupying less space) • Efficient • Economic • Light weight • Safety • Affordable	• Speed regulation • Joystick / Android controlled • Load bearing capacity • Storage • Easily Attachable / Detachable • Breaking system • Sensors • Range • Aesthetically pleasing • Ease of Access • Ease of maintenance • Nominal voltage

3.2 OFMC Chart

Keywords	Objectives	Functions	Means	Constraints
• Compact Size	✓			
• Cost effective	✓			
• Power consumption (Battery capacity)			✓	
• Material	✓			
• User friendly	✓			
• Aesthetically pleasing	✓			
• Speed regulation		✓		
• Durable	✓			
• Minimal human interaction	✓			
• Easily attachable / detachable	✓			
• Efficient		✓		
• Economic				✓
• Light weight	✓			
• Safety	✓			
• Joystick / Android controlled		✓		
• Ease of maintenance	✓			

• Ease of access	✓			
• Load bearing capacity				✓
• Efficient power consumption				✓
• Storage	✓			
• Sensors		✓		
• Ease of operation	✓			
• Breaking system		✓		
• Range				✓
• Nominal voltage				✓

3.3 Objectives

Objectives	
• Ease of operation	• Inexpensive
• Power consumption	• Durable and reliable
• Material	• Smooth operation
• Safe for users	• Aesthetically Pleasing
• Minimal human interference	• Storage

3.4 Constraints

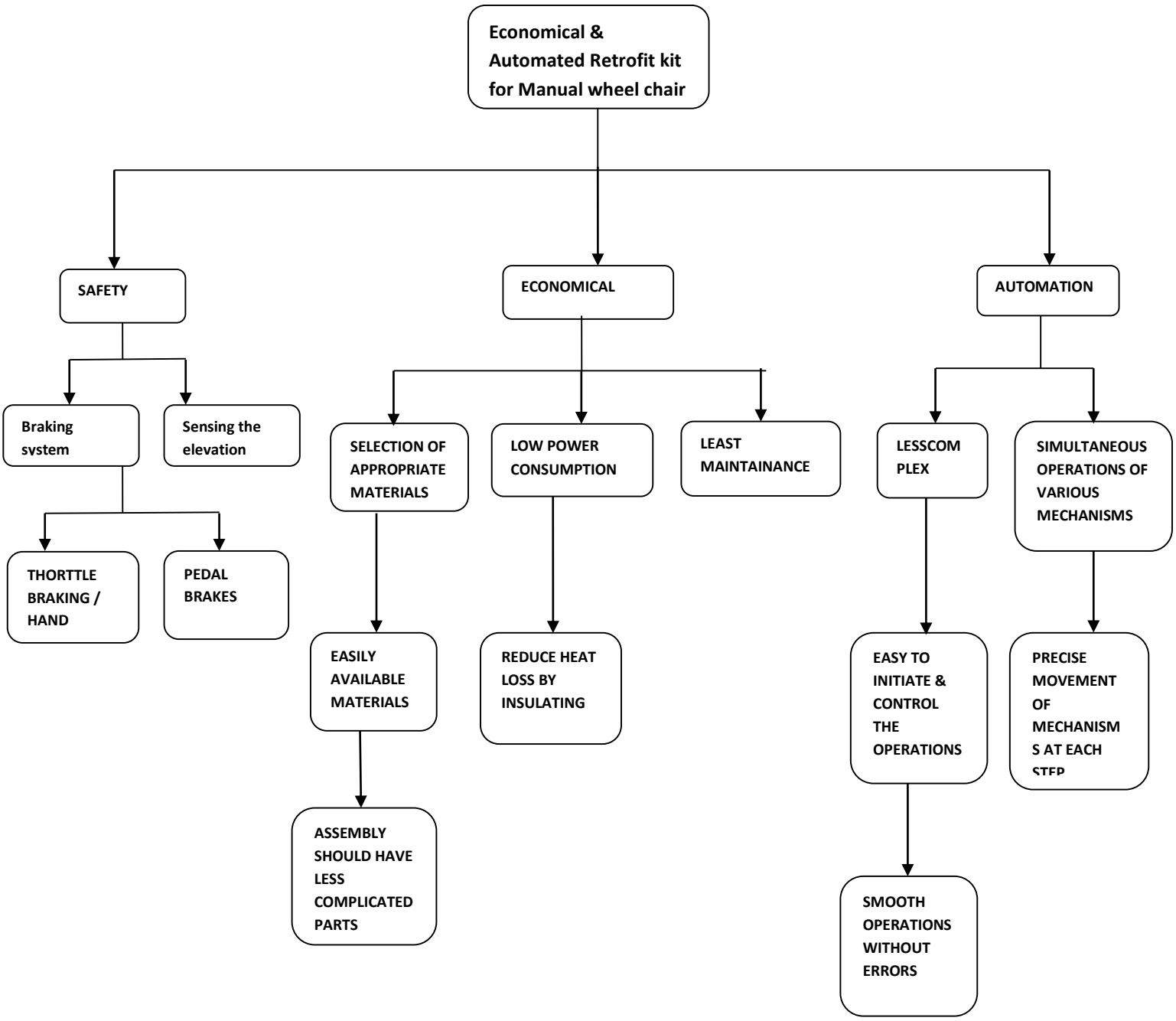
Constraints	
• Weight of machine	• Cost
• Size	• Power consumption within domestic range.
• Range	• Short Processing time.
• Load bearing capacity	• Nominal voltage

3.5 Objective tree (affinity diagram)

SI.NO	Objectives	First level Objectives	Second level Objectives	Third level Objectives
1.	Safety	Braking system		

		Sensing Elevation	Emergency brakes	
2.	Economical	Selection of Appropriate materials Low Power consumption Least maintenance	Easily available materials Reduce heat loss by insulating.	Assembly should have less complicated parts
3.	Automation (Smooth Operation)	Less complexity Simultaneous operation of various Mechanisms	Easy to initiate and control the operations Precise movement of mechanisms at each phase.	Smooth Operations without errors.

Objective tree:



3.6 Design Specifications:

Si.	Engineering Specifications	Units
1.	Nominal Voltage	
3.	Range	
4.	Joystick controlled / App controlled	
5.	Size	
6.	Load bearing capacity	
7.	Power	
8.	Speed	

Phase 4

4.1 Concept Generation

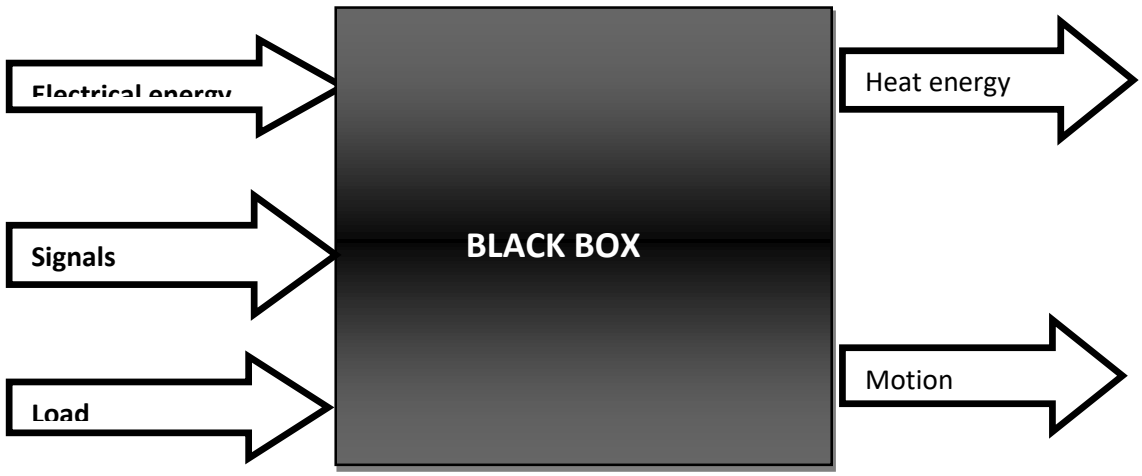
Defining Functions

Sl. No.	Functions
1.	Speed Regulation
2.	Emergency brake
3.	To control the system
4.	Propel the wheelchair
5.	To sense the elevation
6.	Power supply
7.	Mounting system
8.	Support
9.	Charging the retrofit kit
10.	Kit movement

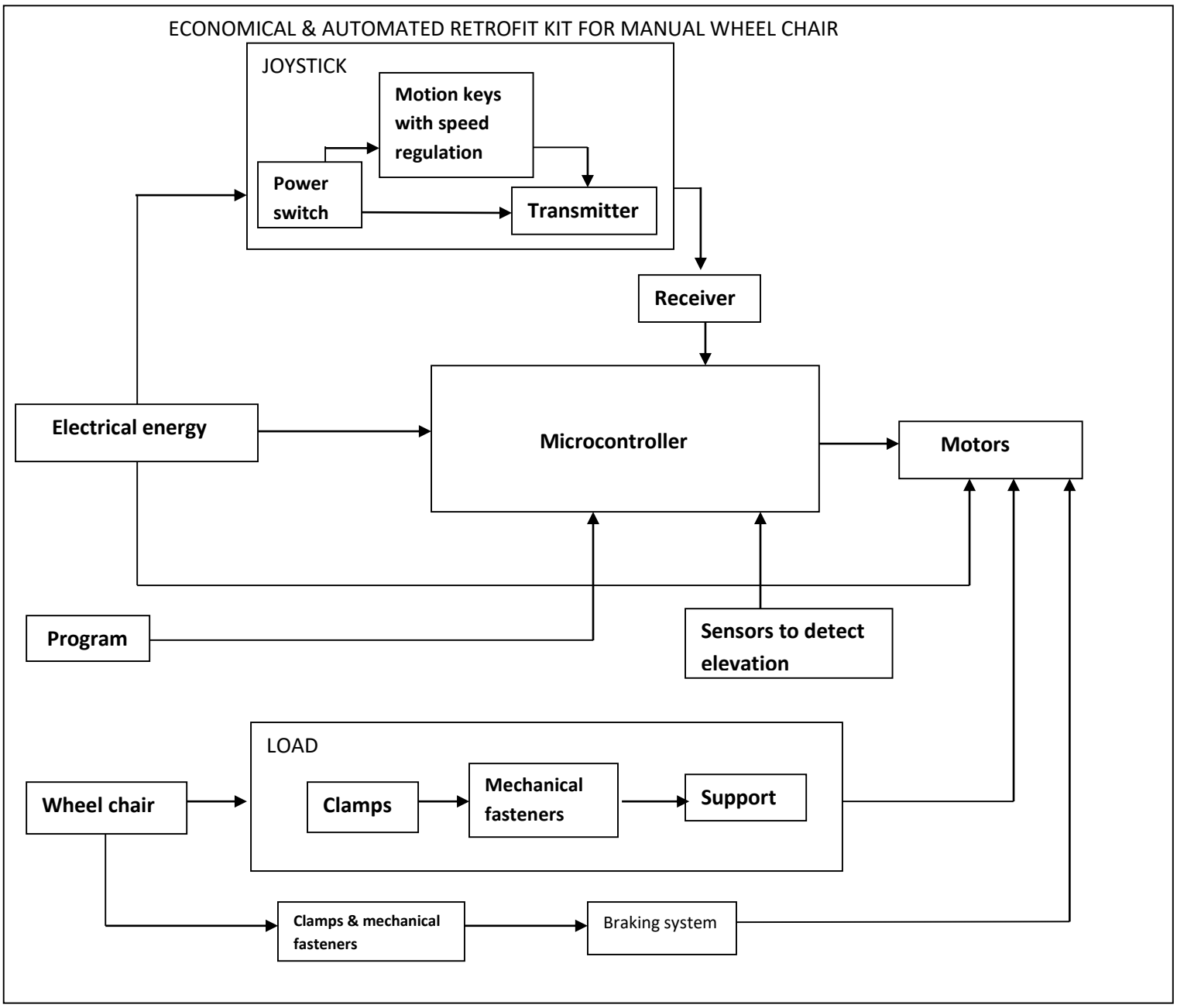
4.2 Morphological Chart

Functions ▼ Means ▶	**Means 1**	**Means 2**	**Means 3**	**Means 4**	**Means 5**
Speed regulation	From no load to full load	Voltagefluctuation	Current fluctuation	-	-
Emergency brake	Stick lever	Centre lever	Pedal	Electric or Push button	-
Microcontroller	Arduino Mega	ATmega2560	PIC Microcontroller	Arduino Nano	Raspberry pi
Mobility	Joystick	App controlled	Push button	Remote controlled	Voice recognition
Sensing the elevation	Radar scanner	Pressure sensor integrated with IR sensor	-	-	-
Power supply	Hydrogen Fuel Cells	Lithium ion battery	Lead acid battery	Alkaline battery	-
Mounting System	Clamping	Mechanical fasteners			
Support	Metal stand	Wooden Base	Box	-	-
Kit movement	Caster wheels	Rubber tyre wheels	Mecanum wheels	-	-

Black box


Electrical energy
Signals
Load
BLACK BOX
Heat energy
Motion

WHITE CHART


ECONOMICAL & AUTOMATED RETROFIT KIT FOR MANUAL WHEEL CHAIR
JOYSTICK
Motion keys with speed regulation
Power switch
Transmitter
Receiver
Electrical energy
Microcontroller
Motors
Program
Sensors to detect elevation
LOAD
Wheel chair
Clamps
Mechanical fasteners
Support
Clamps & mechanical fasteners
Braking system

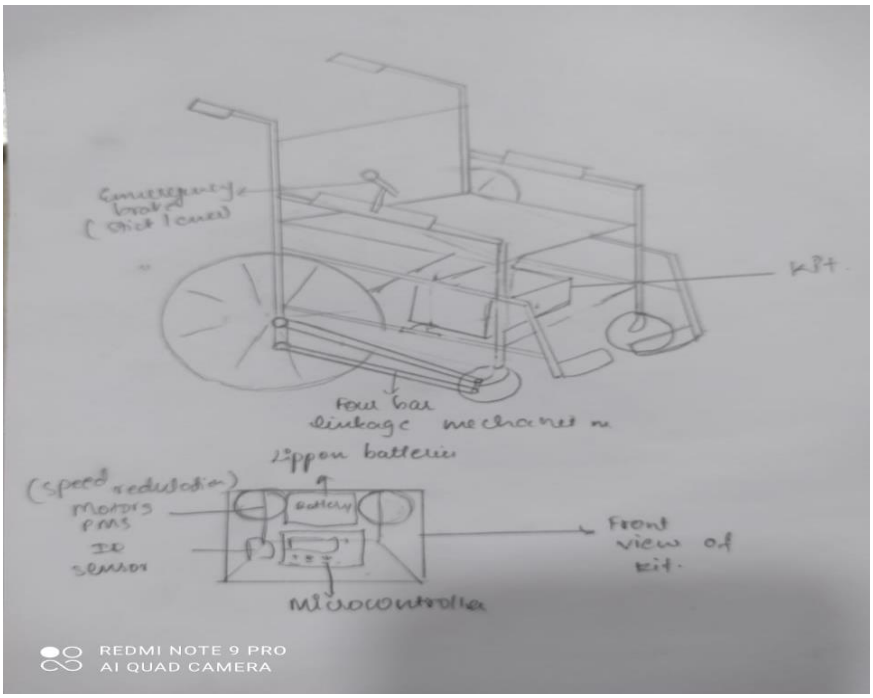
4.3 Generating design alternatives

Identified Design Alternatives:

Sl.No.	Design Alternatives
1	Belt driven retrofit kit
2	Solar Energy Driven Retrofit Kit
3	Voice controller driven Retrofit Kit
4	Cross bar support retrofit kit
5	Chain driven retrofit kit
6	BLDC Hub motors driven Retrofit Kit

Sketch of generated design concepts/ alternatives:

Design alternative 1

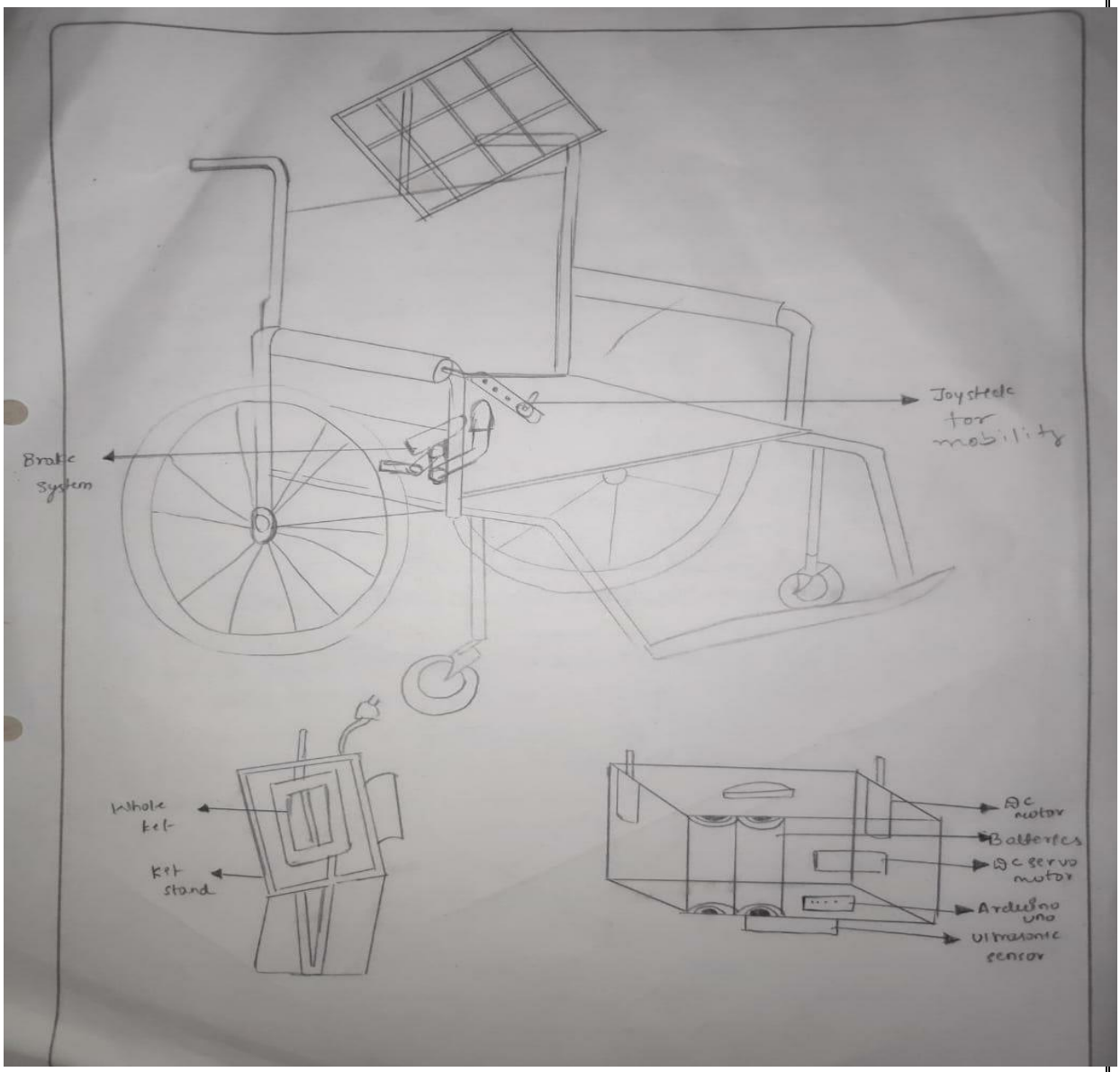


Design includes the following specifications

- Lippon battery is used as electrical energy source.
- Belt drive along with PMS motors to drive the kit.
- IR sensors to detect the elevations.

- **Speed of the PMS motors can be regulated easily using potentiometer.**
- **It includes stick lever hand brakes as emergency stop.**
- **Kit can be easily mounted on the wheel chair using clamps & mechanical fasteners.**
- **Microcontroller – ATmega 2560.**
- **Joystick / app based control.**

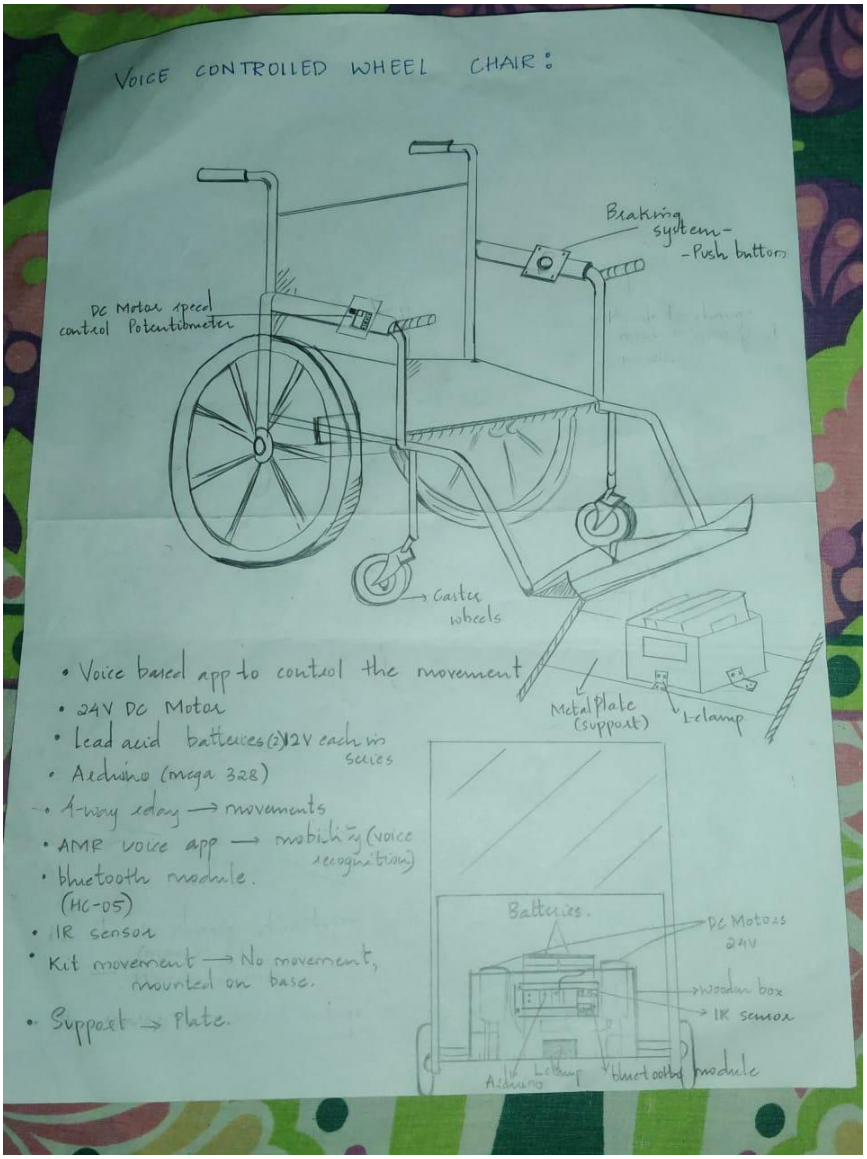
Design Alternative 2



DESIGN INCLUDES FOLLOWING SPECIFICATIONS

- **Solar panels are used to convert solar energy to electrical energy which is used as power source.**
- **Retro fit kit is mounted on stand, which can be easily fixed to wheel chair using clamps & mechanical fasteners.**
- **Joystick based control.**
- **Throttle brakes (hand brakes) are used for emergency stop.**
- **IR –Sensors are used to sense the elevations.**
- **Microcontroller – ATmega 2560**

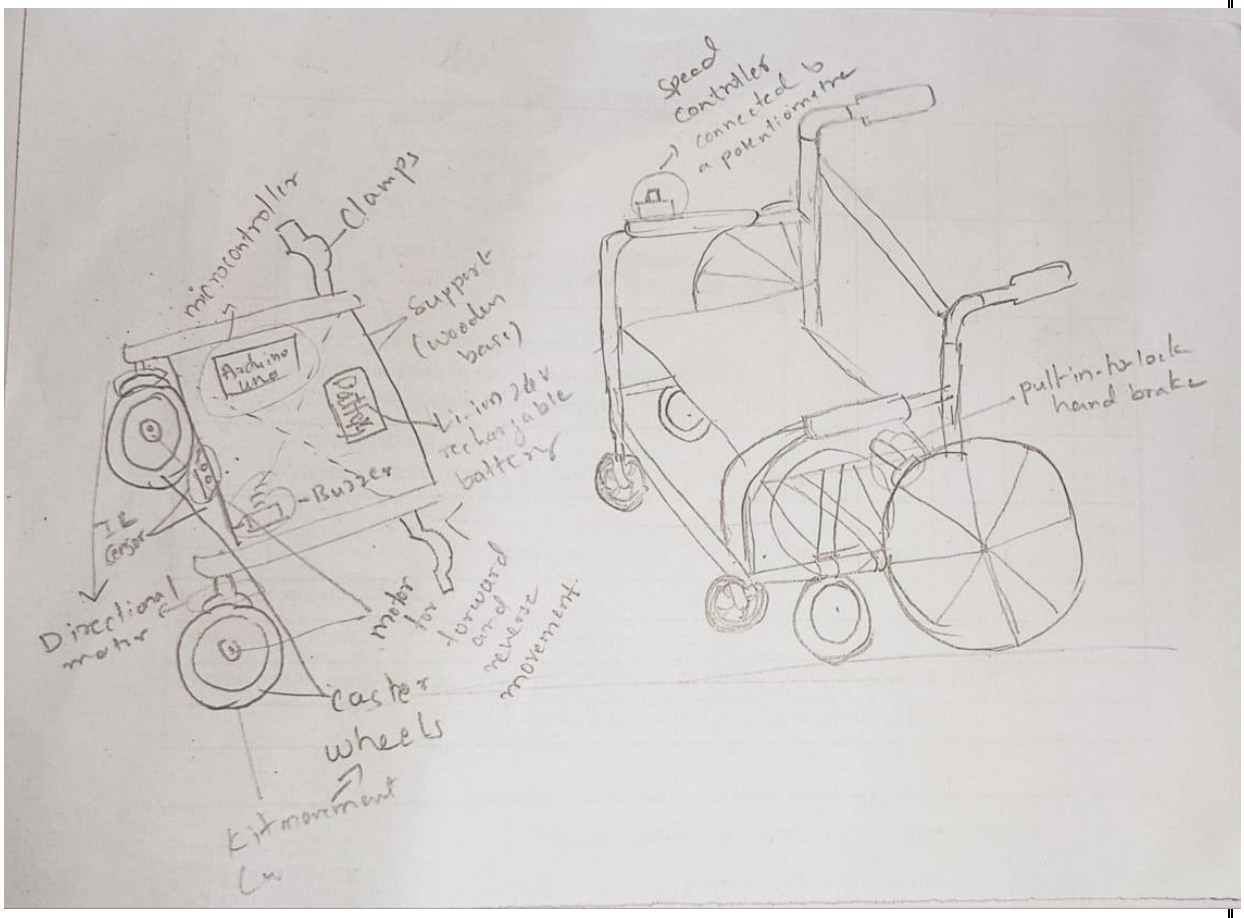
Design Alternative 3



Design includes the following specifications

- **Lead acid batteries (12V in series connection) as the electrical power source.**
- **Two 24V DC motors attached to two caster wheels to drive the kit (fixed in place of wheel chair caster wheels).**
- **Joystick & Voice based control.**
- **Speed can be regulated using potentiometer.**
- **IR sensors to detect the elevations.**
- **Power stop is used as emergency brake.**
- **Whole kit is mounted on the plate which can be easily fixed to the wheel chair using clamps & mechanical fasteners.**
- **Microcontroller – ATmega 2560.**

Design Alternative 4

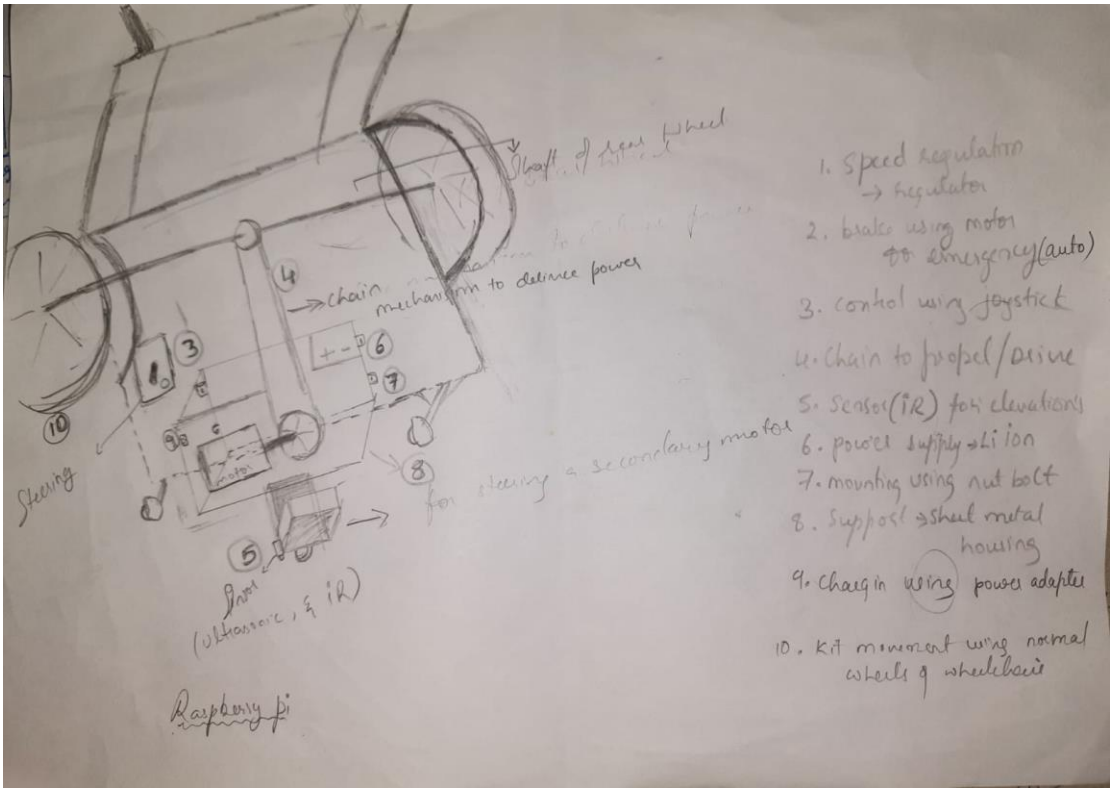


Design includes the following specifications

- **Li ion Battery is used as electrical energy source.**
- **Two DC motors are fixed to the caster wheels (at shaft) of the kit for forward & backward movement.**
- **Two DC motors are fixed above the caster wheels of the kit to change the direction.**
- **Kit can be easily mounted to the wheel chair using cross bars & mechanical fasteners .**
- **Joystick & android based Control.**

- **Microcontroller – ATmega 2560.**
- **Wooden housing to carry all kit equipments.**
- **Pull-in-to-lock hand brake.**
- **IR sensor with buzzer to notify the elevation.**

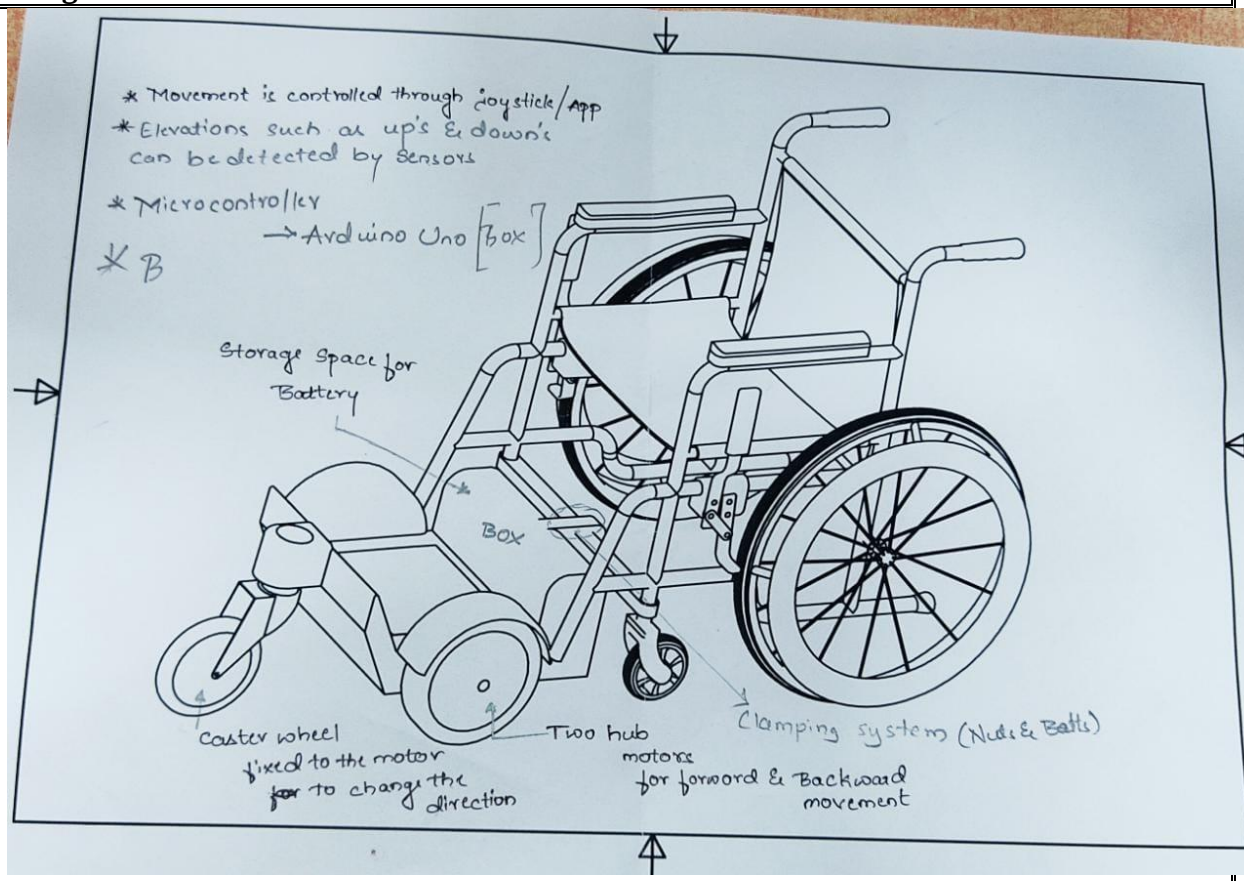
Design Alternative 5



Design includes the following specifications

- **Li ion battery as electrical energy source.**
- **Chain drives along with DC motor & gears to drive the kit.**
- **IR Sensors to detect the elevations.**
- **Power stop is used as emergency brake.**
- **Sheet metal housing is used as support to store all kit materials.**
- **Kit can be easily mounted to the wheel chair using mechanical fasteners.**
- **Microcontroller – Raspberry pi 4.**

Design Alternative 6



Design includes the following specifications

- **Li ion battery as the electrical energy source.**
- **One DC motor is fixed above the caster wheel of the kit to change the direction.**
- **Two hub motors to move the kit.**
- **Kit can be easily mounted to the wheel chair by one horizontal bar as shown in the fig. using clamps & fasteners.**
- **IR-sensors are used to detect elevations.**
- **It includes five speed regulation modes which can be adjusted using potentiometer.**
- **It includes power stop as well as throttle brakes to stop the kit in case of emergency.**
- **Joystick / App based control.**

- **5 modes of speed regulation.**
- **Microcontroller – Arduino UNO.**
- **Well insulated wooden housing/ casing to carry all kit materials.**

Reference

- **Lithium Ion Battery - 24V 6.6AH 158.4Wh**
- **8 Inch BLDC Hub Motor**
- **Travels upto 30 kms**
- **Max Carry Capacity 100KG**
- **Waterproof: IP54**
- **3 modes of speed regulation.**

4.4 Selecting Design Alternative (Using Pugh Chart)

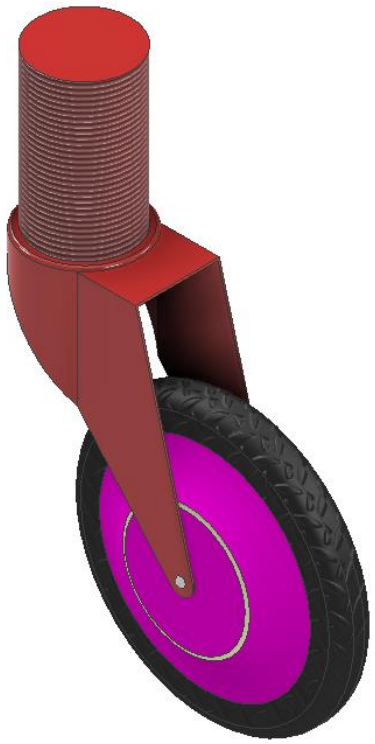
Requirements	Weight	Design1	Design2	Design3	Design4	Design5	Design6	Reference
Speed regulation	5	+	+	+	-	+	+	Datum
Emergency brakes	3	+	+	+	_	0	0	Datum
To control the system	4	+	+	+	+	+	+	Datum

To propel the wheel chair	6	-	+	+	_	-	+	Datum
Power supply	5	+	+	_	0	0	0	Datum
Mounting system	6	-	-	-	+	-	0	Datum
Support / Casing	3	+	+	+	+	+	-	Datum
Economical	7	+	-	+	+	+	+	Datum
Safety	4	-	+	+	+	-	+	Datum
Pluses		**6**	**7**	**7**	**6**	**4**	**5**	
Same		**0**	**0**	**0**	**1**	**2**	**3**	
Minuses		**3**	**2**	**2**	**3**	**3**	**1**	
Overall Total		**+3**	**+5**	**+5**	**+3**	**+1**	**+4**	
Weighted Total		**11**	**17**	**21**	**10**	**3**	**23**	
Yes / No		**NO**	**NO**	**NO**	**NO**	**NO**	**YES**	

Selected Design Alternative:

5.1 3D Model

Part Model 1
CASTER WHEEL

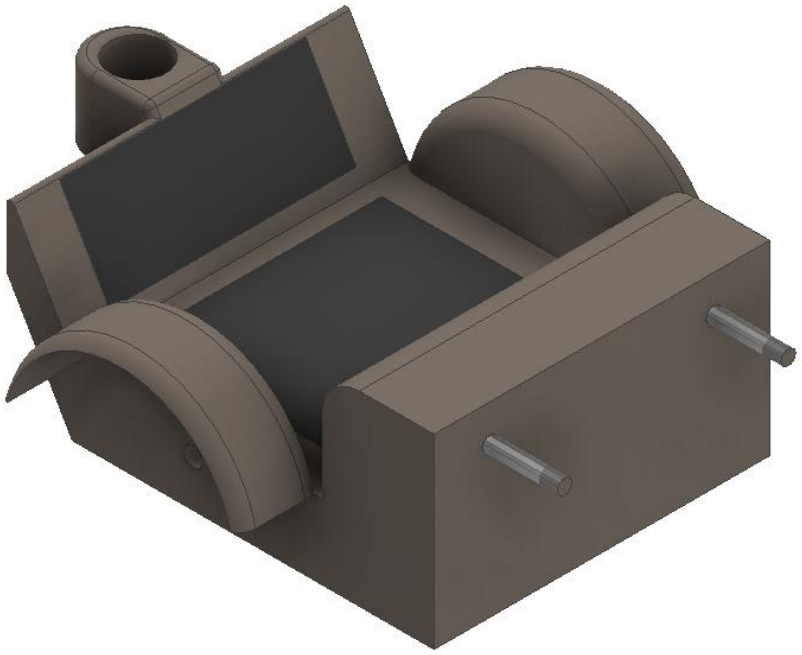


Part Model 2

HUB WHEEL

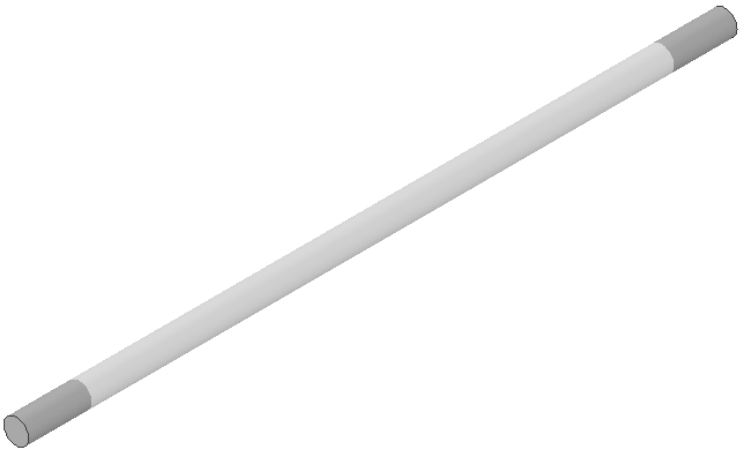
Part Model 3

HOUSING



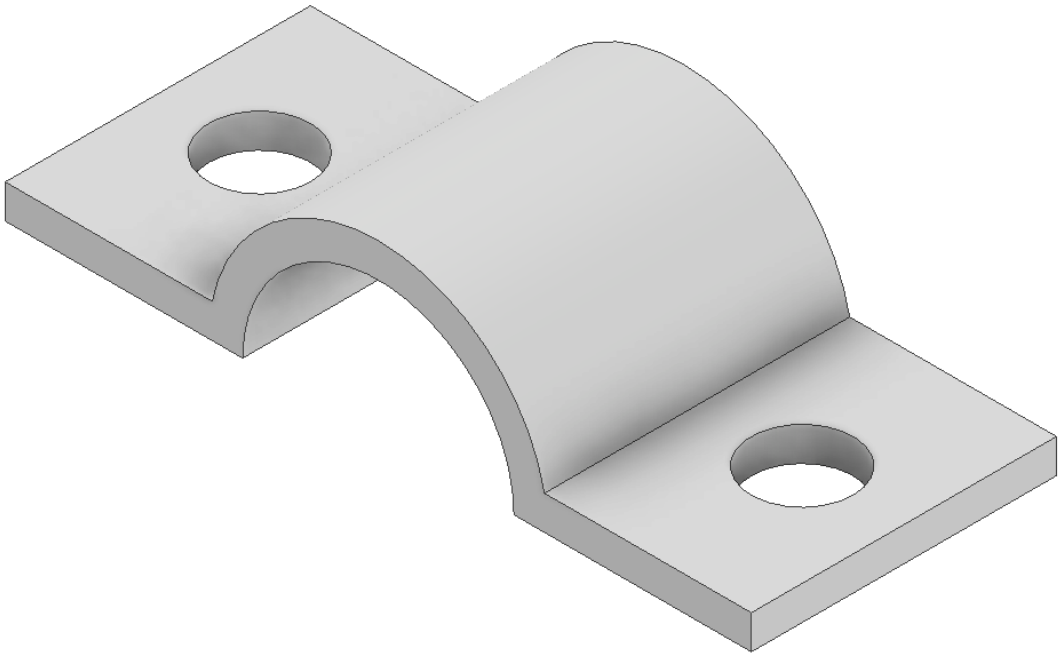
Part Model 4

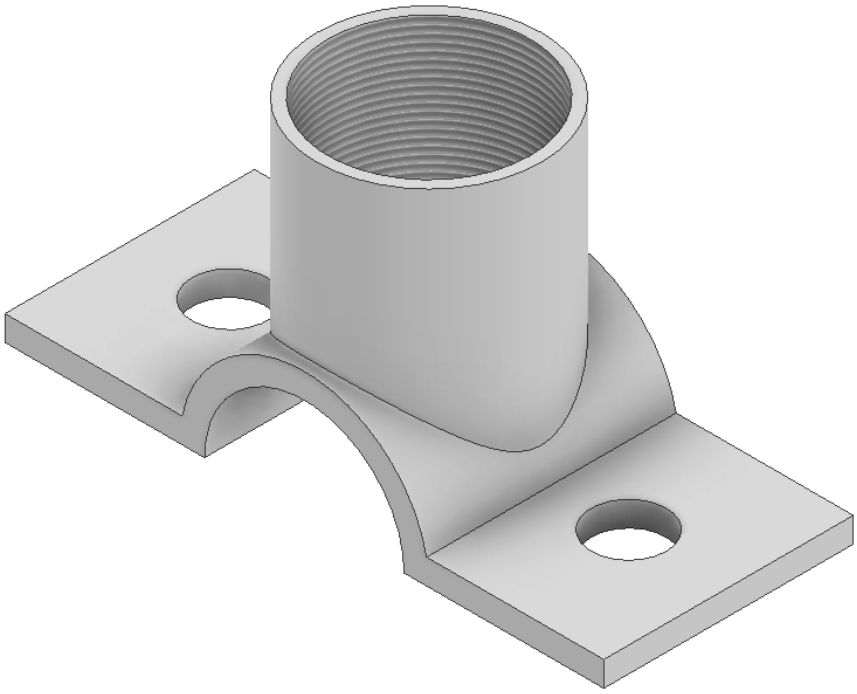
SUPPORT BAR



Part Model 5

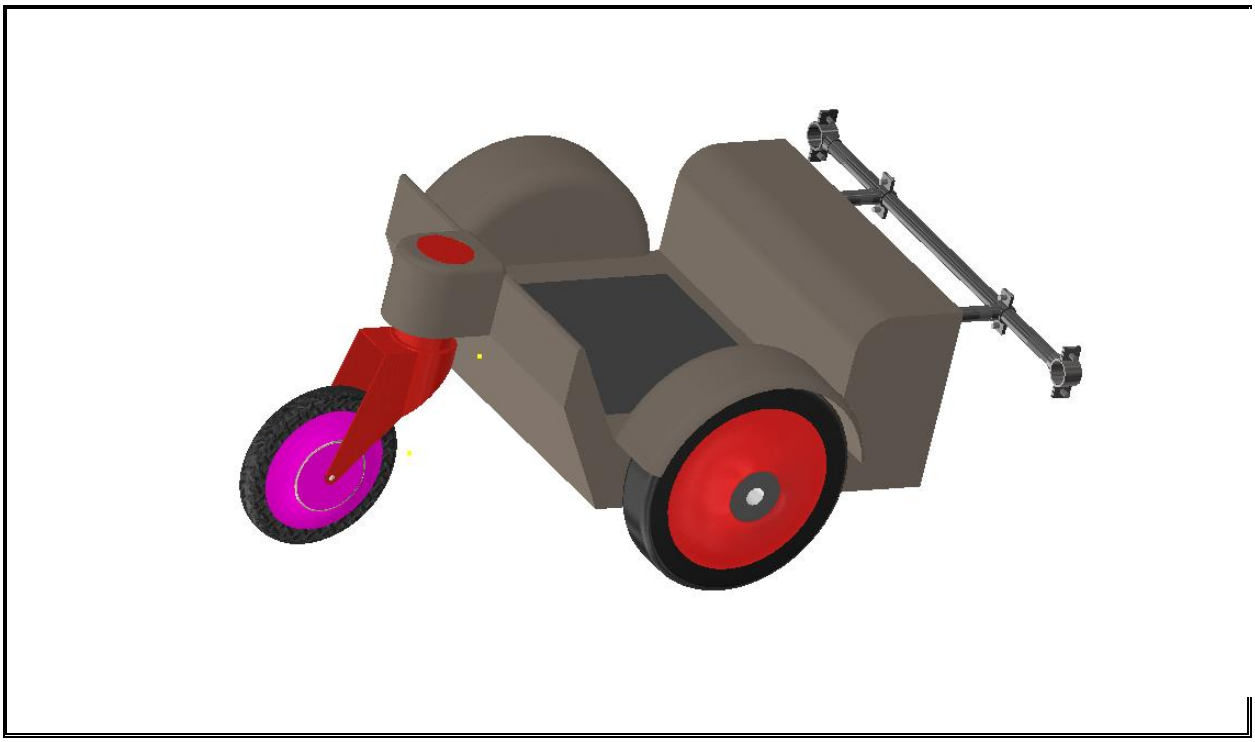
C – CLAMPS TYPE 1



Part Model 6
C –CLAMPS TYPE 2 

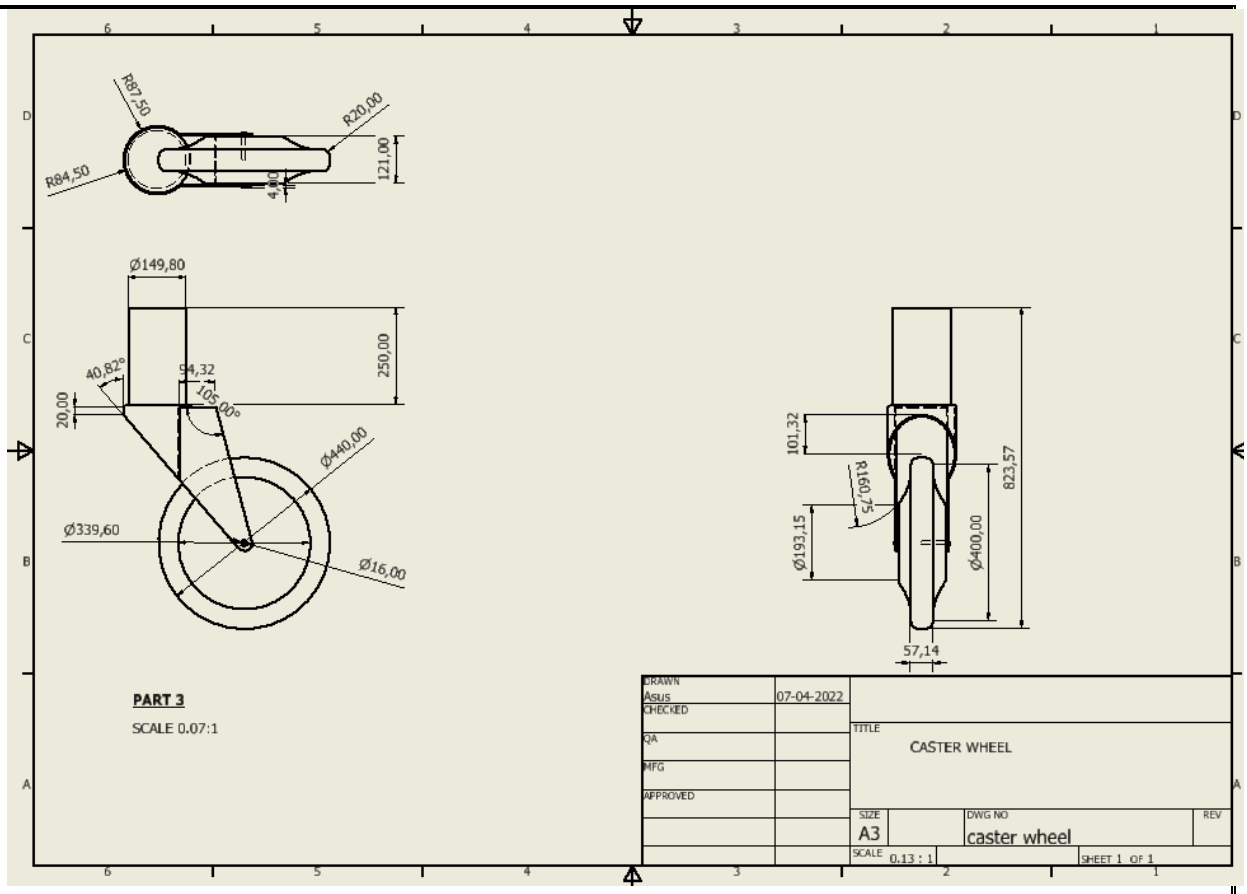
5.2 Assembly models

Assembly Model



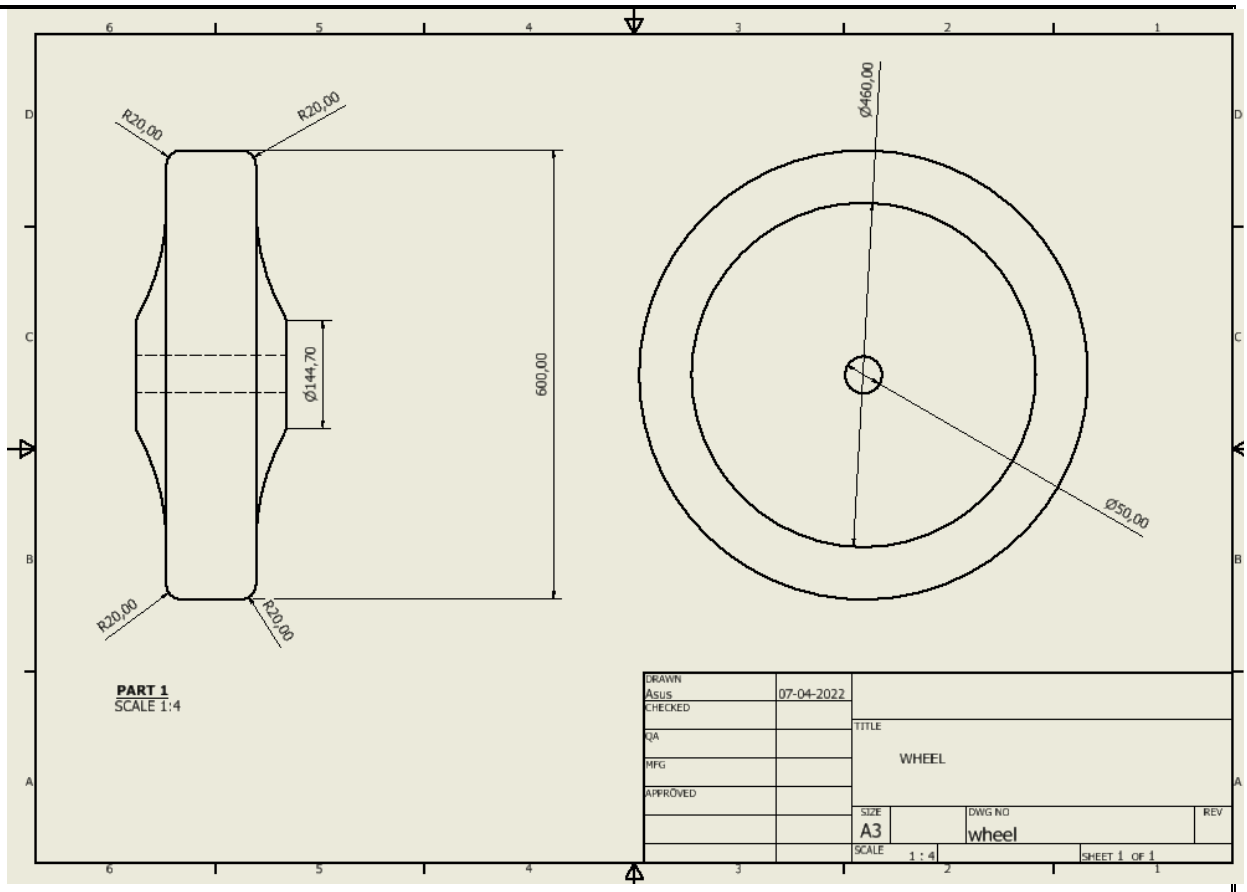
5.3 2D Drawings

2D Drawing 1
CASTER WHEEL



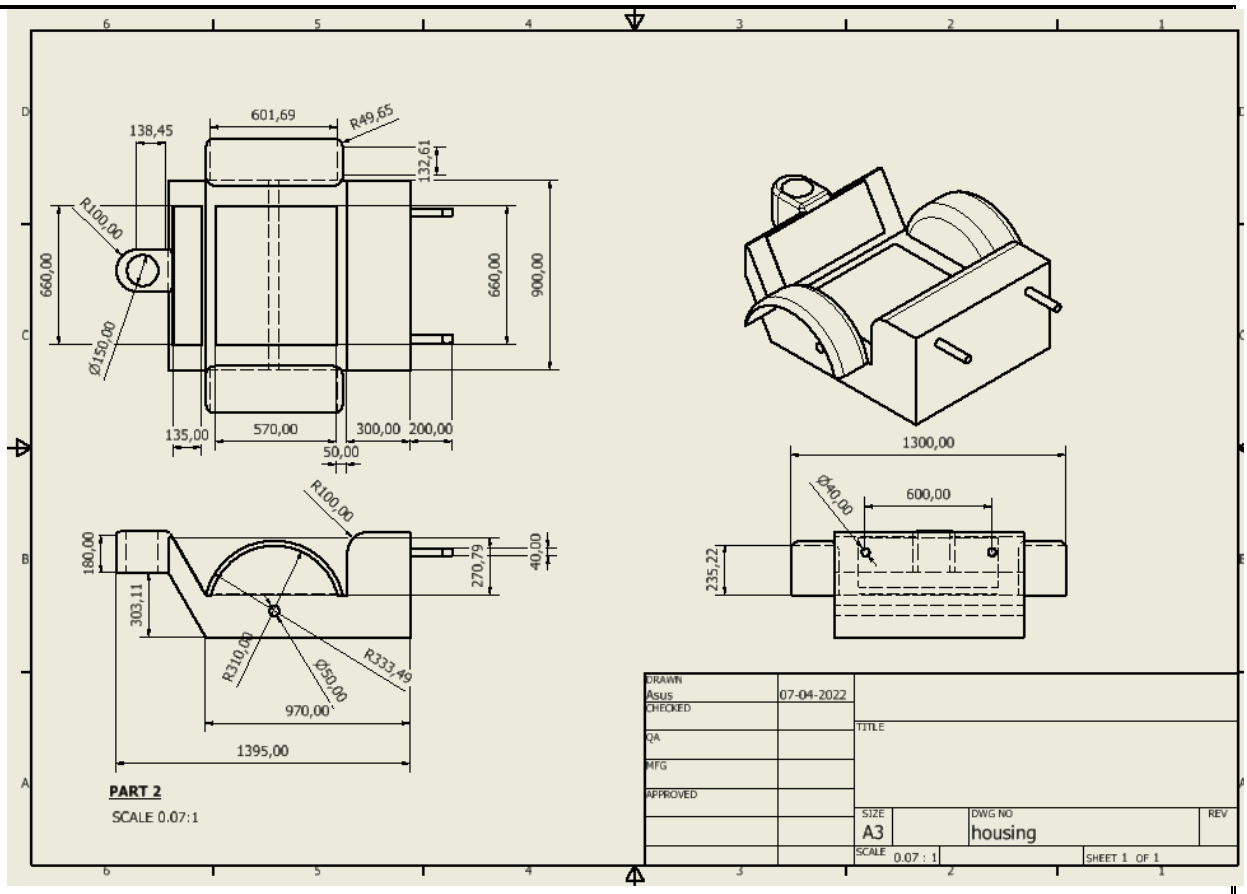
2D Drawing 2

HUB WHEEL



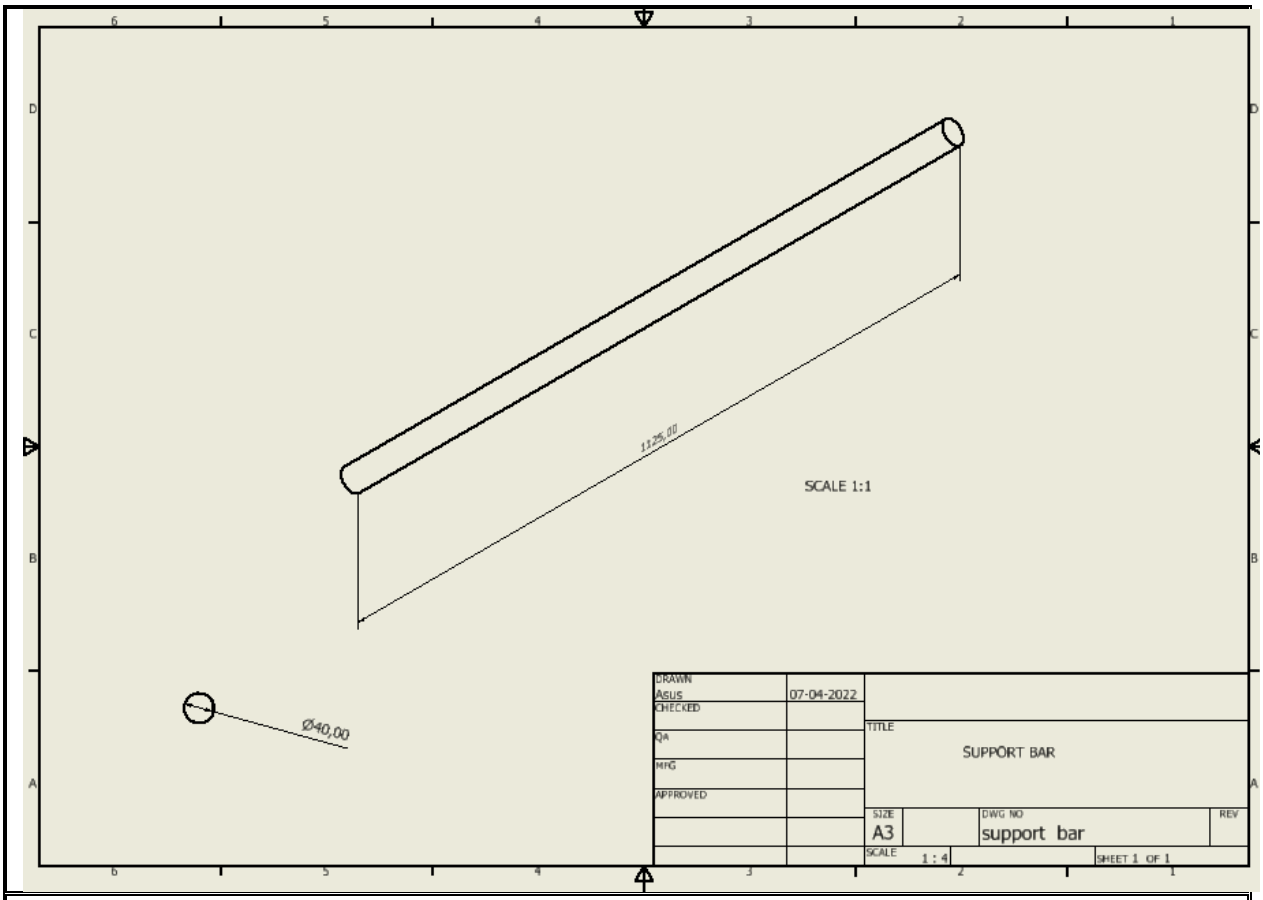
2D Drawing 3

HOUSING



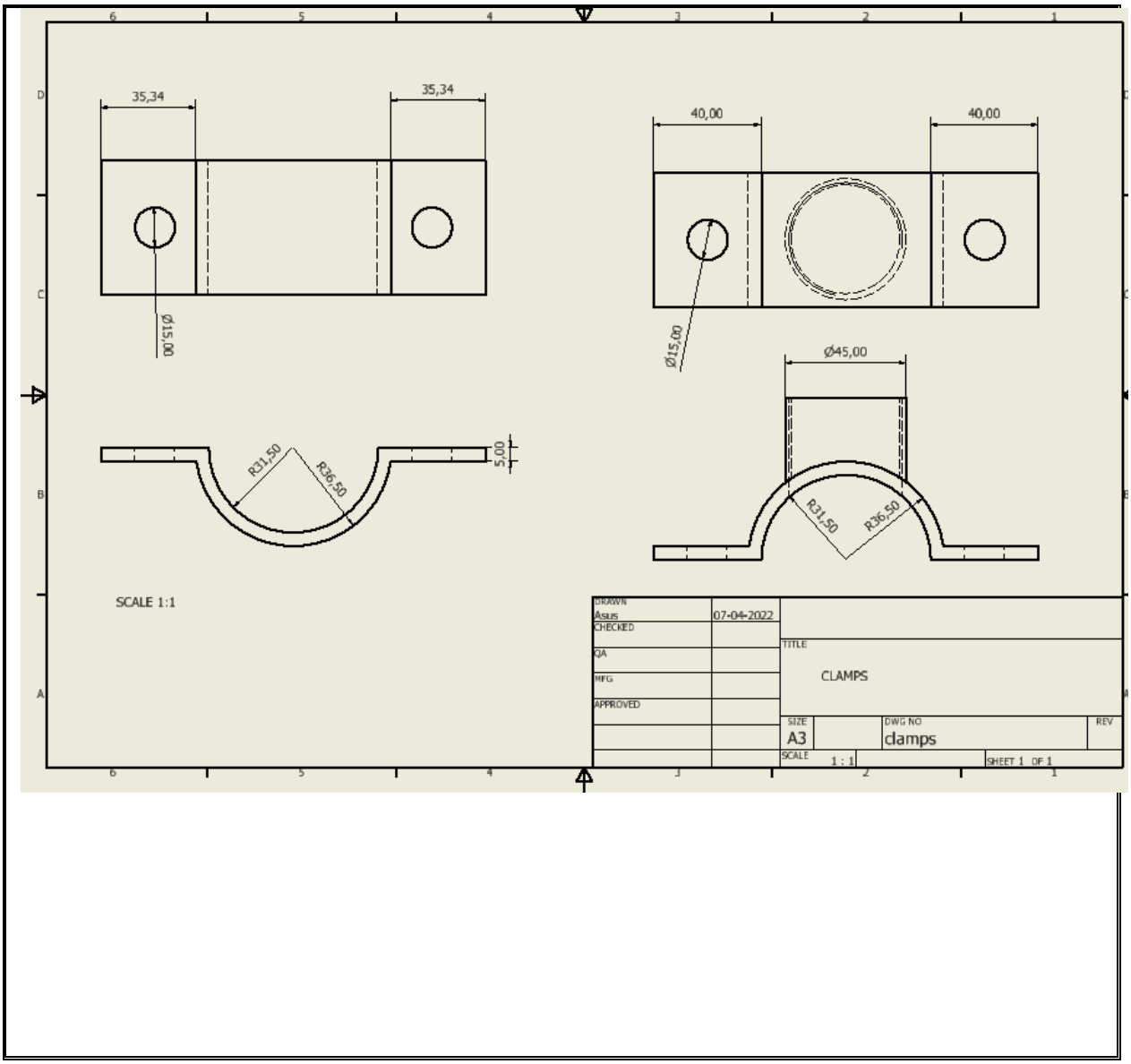
2D Drawing 4

SUPPORT BAR



2D Drawing 5

C – CLAMPS TYPE 1 & TYPE 2


35,34
35,34
Ø15,00
40,00
40,00
Ø15,00
Ø45,00
R31,50
R36,50
5,00
R31,50
R36,50
SCALE 1:1
DRAWN
Asus
07-04-2022
CHECKED
QA
MFG
APPROVED
TITLE
CLAMPS
SIZE
A3
DWG NO
clamps
REV
SCALE
1 : 1
SHEET 1 OF 1

5.4 Design Calculations

Design Calculations
You may scan and paste your design calculations here(clear image) or you may opt to type the calculations here as well.

Motor Calculations:

Weight :

(i) Weight of the wheelchair : 14 kgs
(ii) Weight of the motor : 6 kgs
(iii) Load on wheelchair : 100 kgs
Total wt. : 120 kgs

Coefficient of static friction : 0.3

$f = \mu_{max} \times W$

$f = 0.3 \times 120$

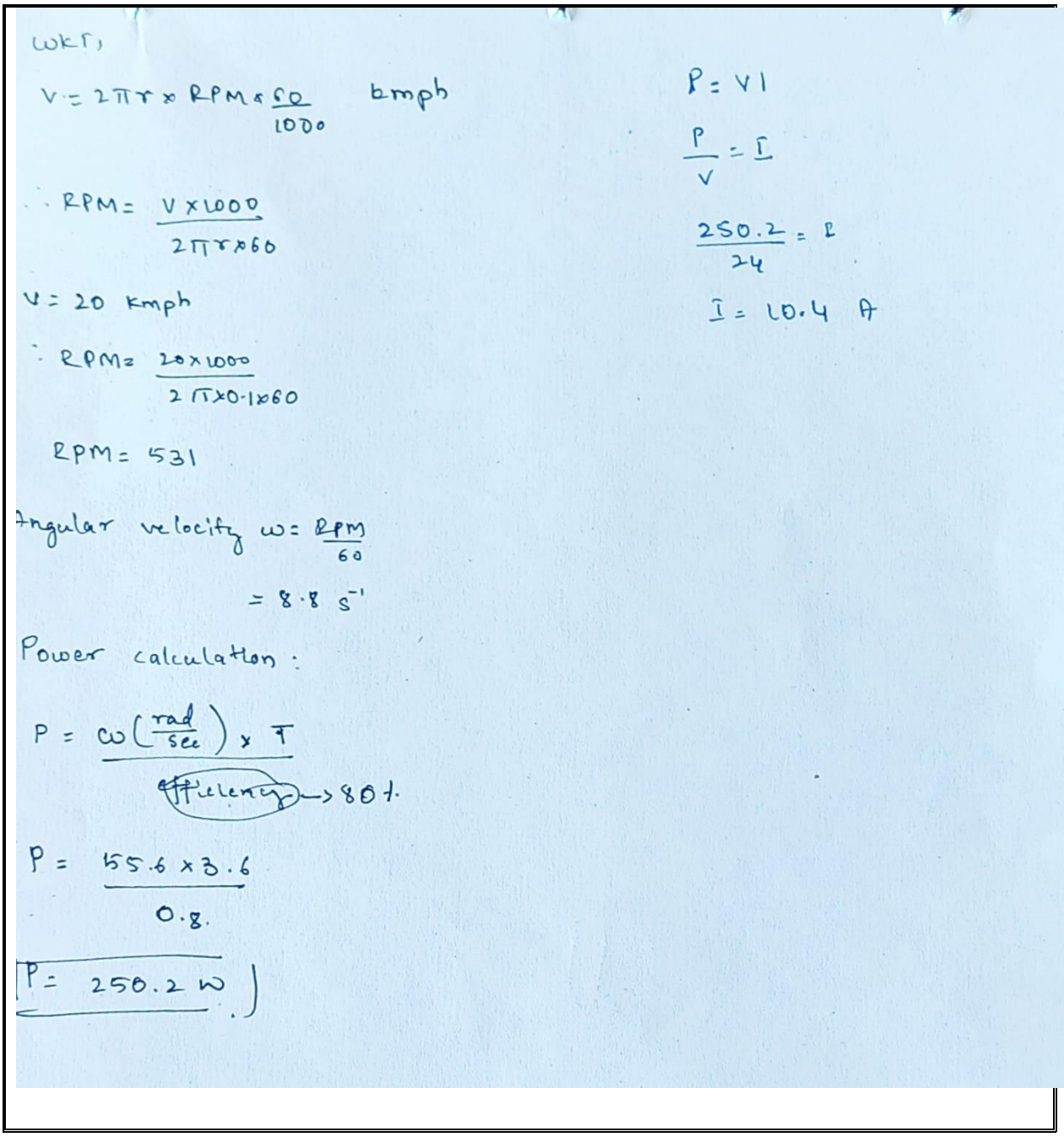
$f = 36\ N$

Torque :

$T = f \cdot r$

$= 36 * 0.1$

$= 3.6\ Nm$



wkt,

$V = 2\pi r \times RPM \times \frac{60}{1000}$ kmph

$P = VI$

$\frac{P}{V} = I$

$\therefore RPM = \frac{V \times 1000}{2\pi r \times 60}$

$\frac{250.2}{24} = I$

$V = 20$ kmph

$I = 10.4$ A

$\therefore RPM = \frac{20 \times 1000}{2\pi \times 0.1 \times 60}$

$RPM = 531$

Angular velocity $\omega = \frac{RPM}{60}$

$= 8.8\ s^{-1}$

Power calculation :

$P = \omega\left(\frac{rad}{sec}\right) \times T$

efficiency → 80 %.

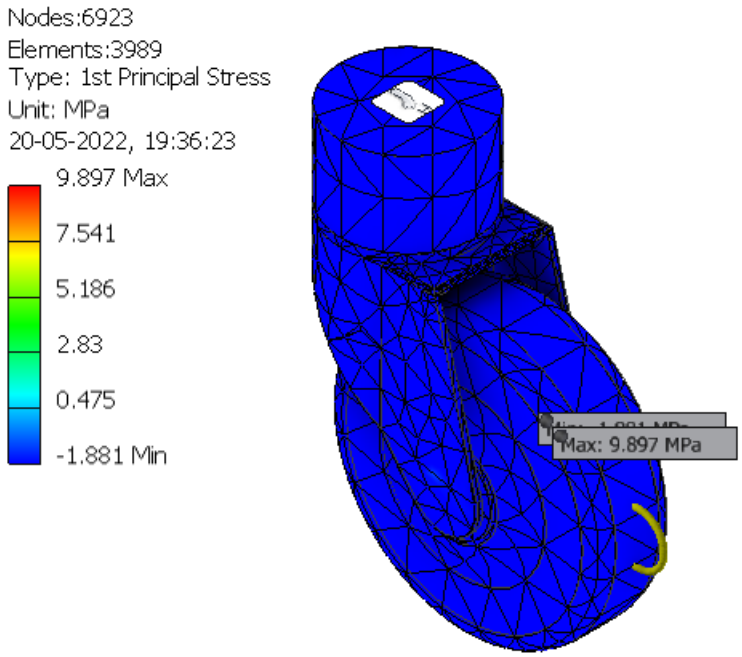
$P = \frac{55.6 \times 3.6}{0.8}$

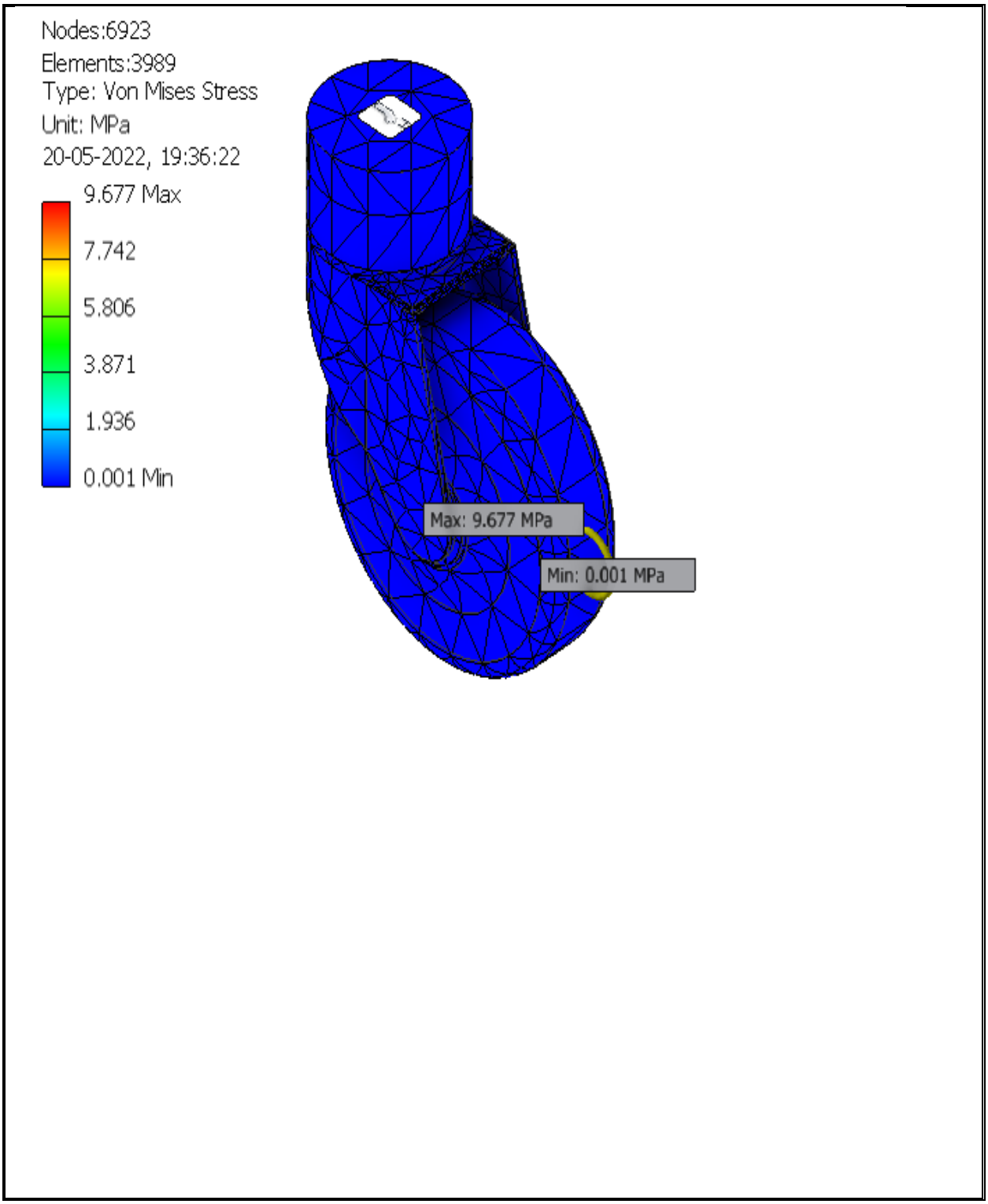
$P = 250.2$ W

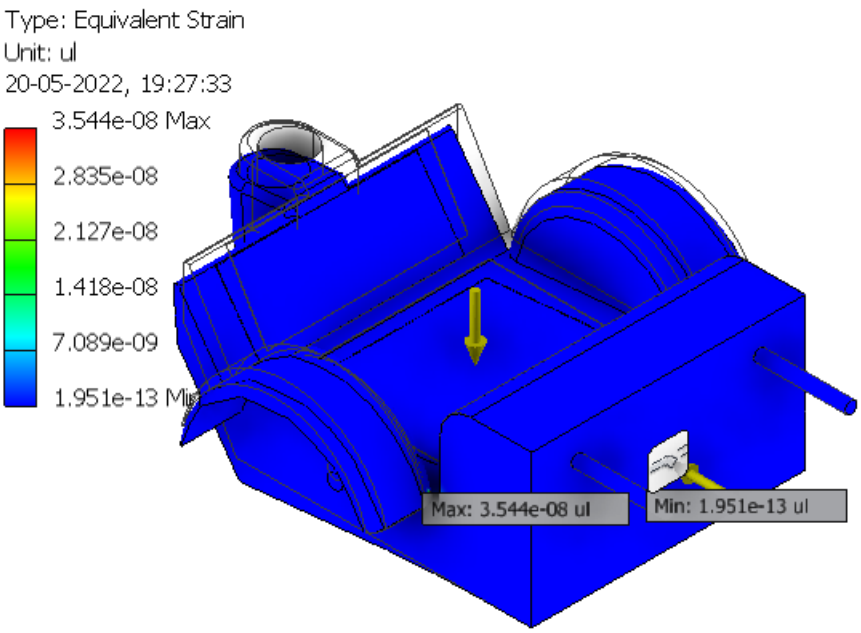
6 Analysis of critical parts and Prototype Planning

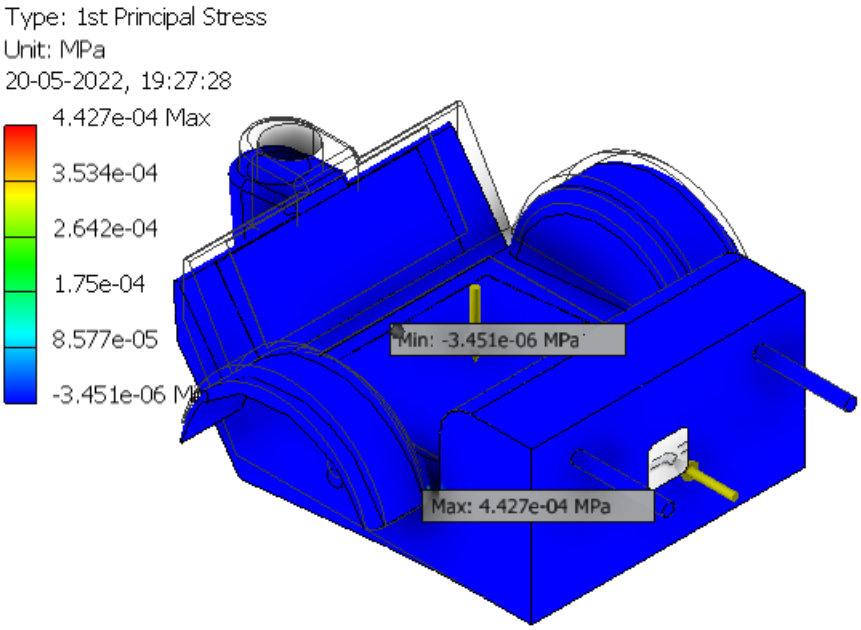
6.1 FEM Analysis of Critical Parts

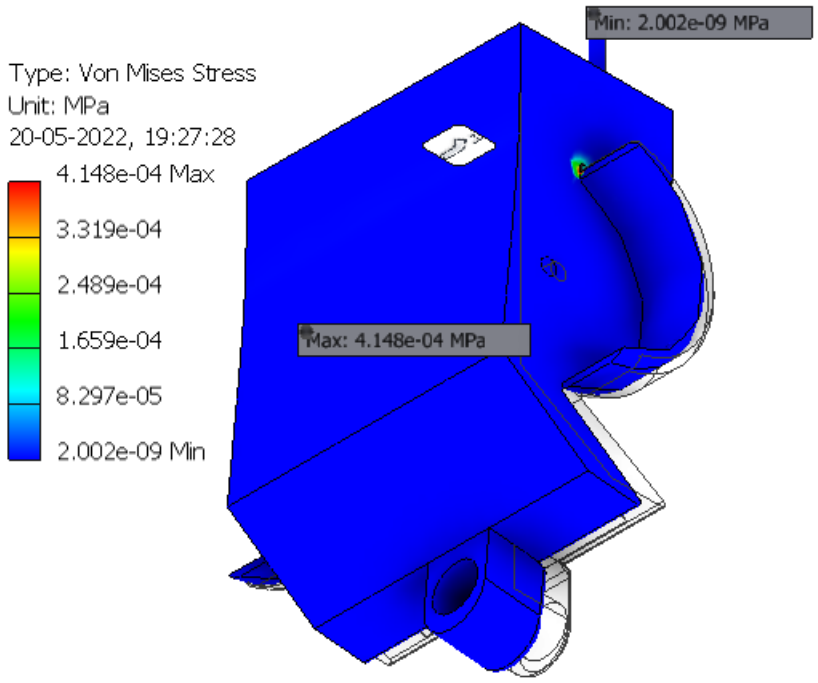
FEM Analysis of critical parts of your proposed prototype
Image of analysis

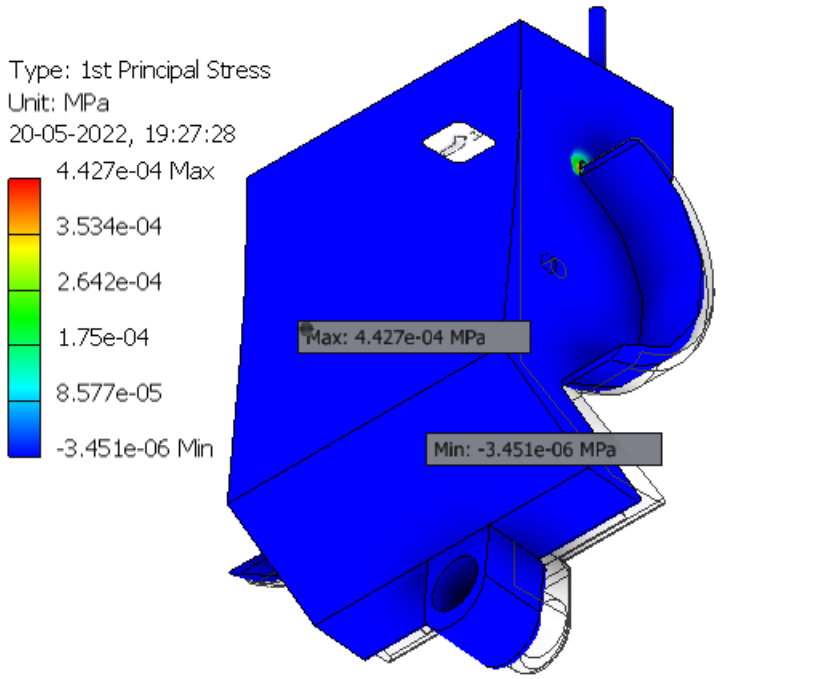


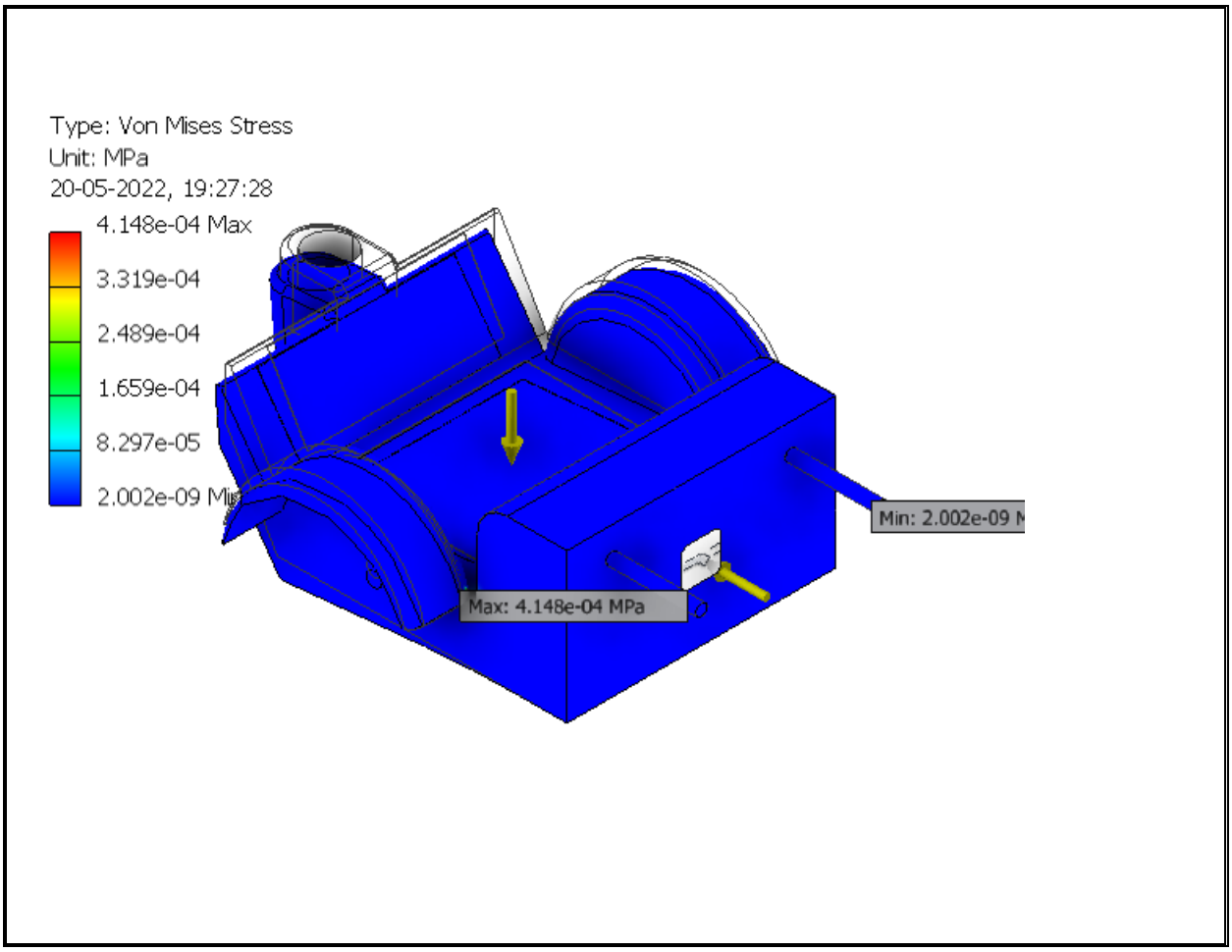

Nodes:6923
Elements:3989
Type: Von Mises Stress
Unit: MPa
20-05-2022, 19:36:22
9.677 Max
7.742
5.806
3.871
1.936
0.001 Min
Max: 9.677 MPa
Min: 0.001 MPa


Type: Equivalent Strain
Unit: ul
20-05-2022, 19:27:33
3.544e-08 Max
2.835e-08
2.127e-08
1.418e-08
7.089e-09
1.951e-13 Min
Max: 3.544e-08 ul
Min: 1.951e-13 ul


Type: 1st Principal Stress
Unit: MPa
20-05-2022, 19:27:28
4.427e-04 Max
3.534e-04
2.642e-04
1.75e-04
8.577e-05
-3.451e-06 Min
Min: -3.451e-06 MPa
Max: 4.427e-04 MPa


Min: 2.002e-09 MPa
Type: Von Mises Stress
Unit: MPa
20-05-2022, 19:27:28
4.148e-04 Max
3.319e-04
2.489e-04
1.659e-04
8.297e-05
2.002e-09 Min
Max: 4.148e-04 MPa


Type: 1st Principal Stress
Unit: MPa
20-05-2022, 19:27:28
4.427e-04 Max
3.534e-04
2.642e-04
1.75e-04
8.577e-05
-3.451e-06 Min
Max: 4.427e-04 MPa
Min: -3.451e-06 MPa


Type: Von Mises Stress
Unit: MPa
20-05-2022, 19:27:28
4.148e-04 Max
3.319e-04
2.489e-04
1.659e-04
8.297e-05
2.002e-09 Min
Min: 2.002e-09
Max: 4.148e-04 MPa

Conclusions/ Results and redesign criteria:

6.2Raw materials required for Prototyping:

List the possible materials and their properties that can be chosen for suitable parts of your prototype:

#	Material	Properties /Reason for selecting the material	Part Name and Number
1	Plywood	High strength Imapct resistance Insulation	Housing Part number: 3
2	Clamps	Ease of adjustment Holding the workpiece rigidly	Housing Part number :3
3	Copper rod	Strength and weight Good machinability	Support bar Part number:4
4	Nuts and Bolts	Non magnetic It has fatigue strength Hardness Helps in joining	Housing Part number:4

22

6.3 Bill of Materials

Si No	Part Number	Part Name	Quantity	Material Specification
1	3	Plywood	2	1.4m *1.4 m Thickness :12 mm
2	3	L clamp	8	1.5 m
3	3	Flat plate	3	1 inch Thickness:3mm
4	4	Iron rod	1	16 cm Diameter:2cm
5	3	Screws	8	Thickness:3mm,5mm
6	3	Nut	8	Thickness:3mm,5mm

6.4Joining techniques/ methods:

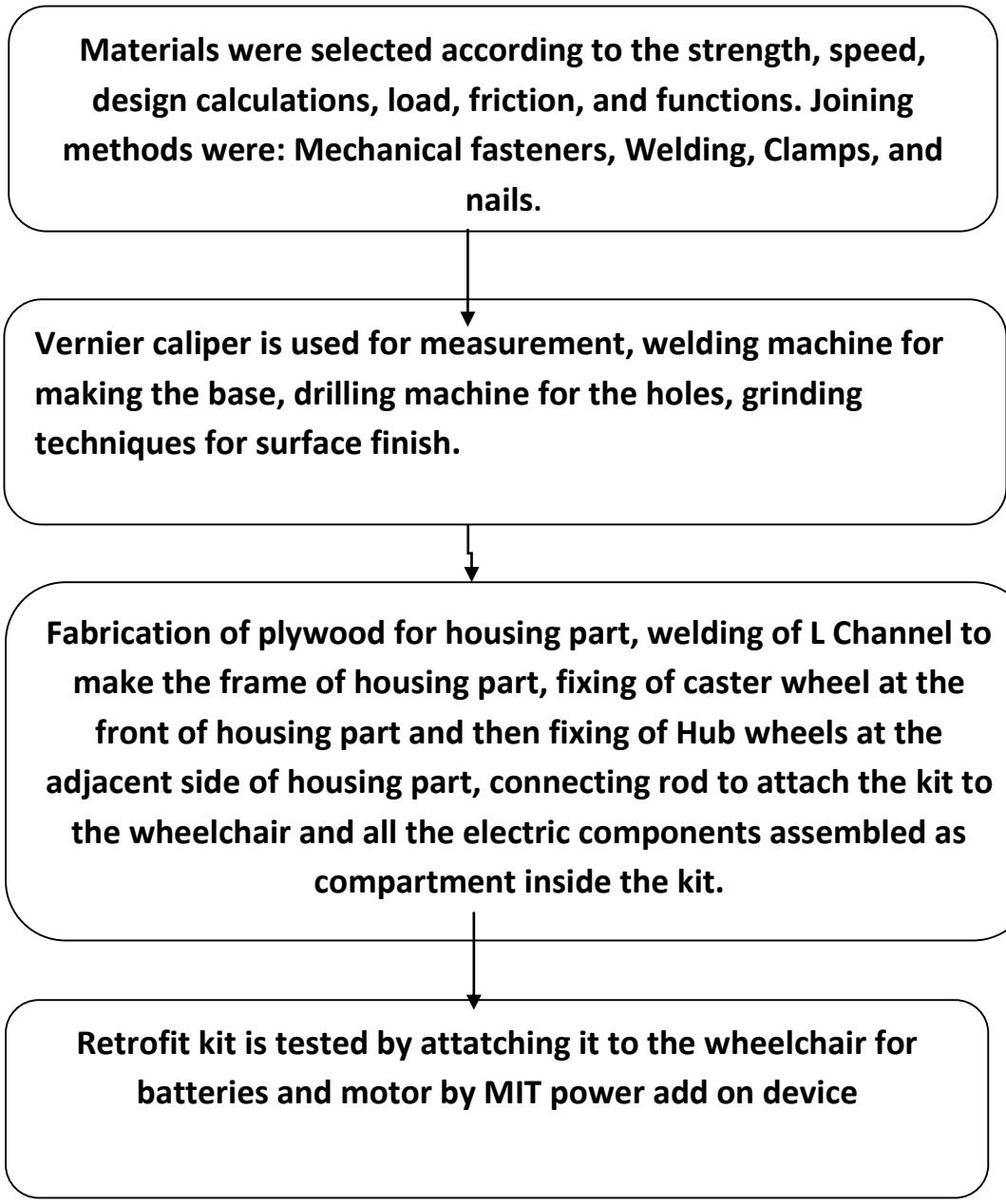
List the possible joining techniques that you may use in the prototyping process:

#	Joining Method	Material to be joined	Resources required and specification

1	Welding	L channel	Welding machine ,electode of thickness:3mm
2	Nails	Plywood	Drill bit:2mm,Drilling machine,Hammer
3	Clamps	Plywood	

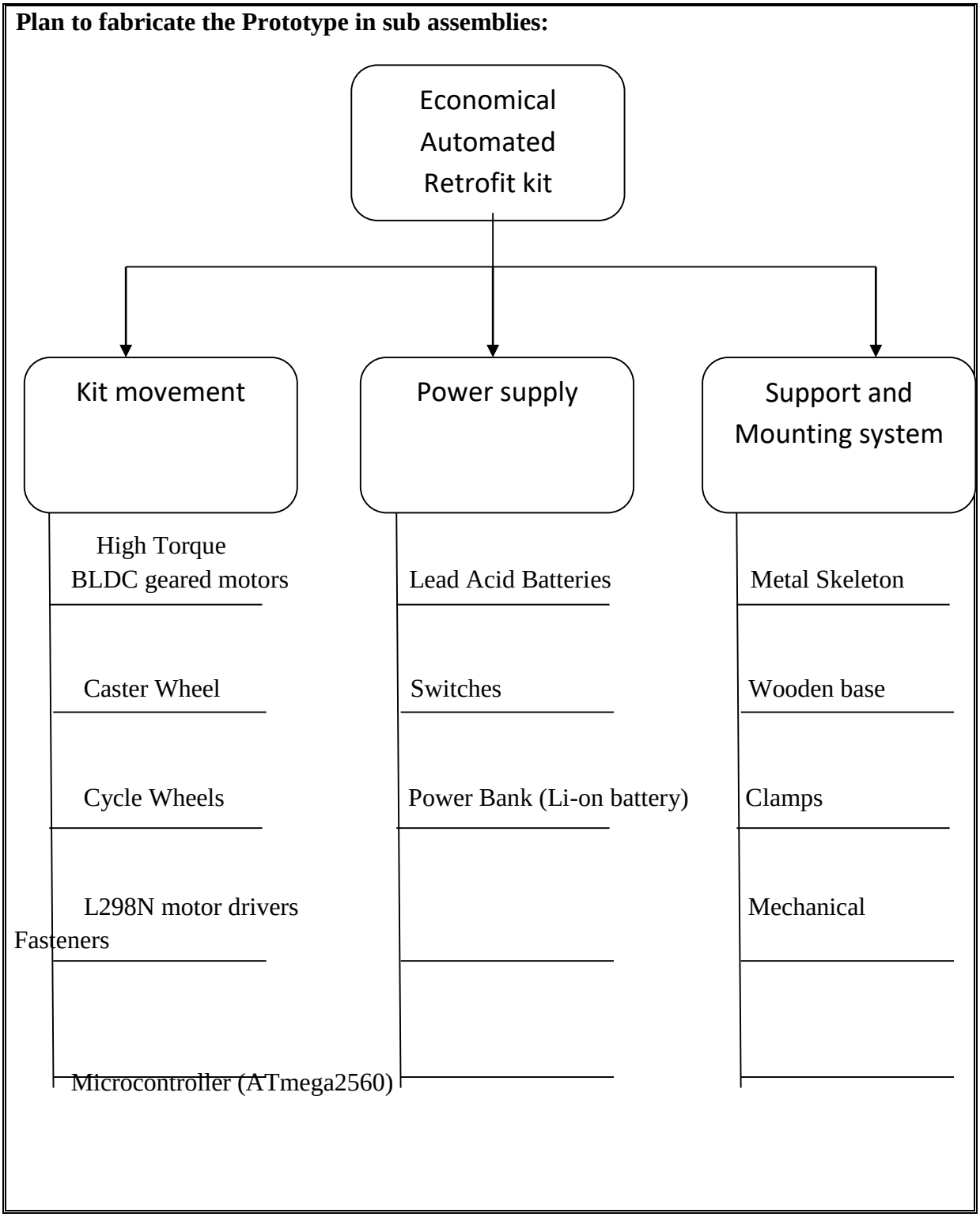
6.5Flow Chart:

Prepare tentative flow chart of series of operation to be followed for prototyping:



6.6 Sub-Assembly Planning:

Plan to fabricate the Prototype in sub assemblies:



Individual SA Part Names

Sub Assembly #	**Brought out Parts**	**Manufactured Parts**
SA 1	High Torque BLDC geared Motors	Motor Couplers
	Caster wheels	
	Cycle wheels	
	L298N motor drivers	
	Microcontroller	
SA 2	Lead Acid Batteries	
	Switches	
	Power Bank (Li-on battery)	
SA 3	Clamps	Metal Skeleton
	Mechanical Fasteners	Wooden base
	Clamps	

A Minor Project Report on

"SHIRAHSHEKA"

Submitted in partial fulfilment of the requirements of

Bachelor of Engineering in Mechanical Engineering

Submitted by

Abhinandan Samnekar	01FE19BME152
Karthik Kulkarni	01FE19BME114
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Under the Guidance of

Prof. Dr. MB. GORWAR
Prof. SHIVAPRASAD M MUKHANDMATH

School of Mechanical Engineering
KLE Technological University, Hubballi – 580031

2021-2022

SCHOOL OF MECHANICAL ENGINEERING

CERTIFICATE

This is to certify that Capstone Project entitled **"SHIRAHSHEKA"** submitted by **"Team 12"** to the **KLE Technological University**, Hubli-580031, towards partial fulfilment for the award of the degree of Bachelor of Engineering is a bona-fide record of work carried out by him/her under our supervision. The contents of project report, in full or in parts, have not been submitted to any other institute or university for award of any degree or diploma.

Guide **Head of department**

Prof. Dr. MB. GORAWAR

Prof. SHIVAPRASAD M Dr. B. B. Kottursheter

ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without mentioning the people who made it possible and whose guidance and encouragement has made our efforts successful.

At the outset, we would like to express our deep sense of gratitude for our guide **Prof. SHIVAPRASAD M** , **Prof. M B GORAWAR , CIPD (Prof. Ramesh and Chetan Sir)** for making this project report successful through their invaluable guidance at every stage of the project report.

We would like to express our deep sense of gratitude to **CIPD (Prof. Ramesh and Chetan Sir)** for making this project report successful through their invaluable guidance at every stage of the project report.

We also thank **Dr. B. B. Kottursheṭtar** for his encouragement in undertaking the task of this project.

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We also thankful to all faculty members of the Mechanical Engineering Department of KLE Technological University, for helping us directly or indirectly in different stages of our project work.

Student signature

(Team 12)

Table of Contents:

REFINED PROBLEM STATEMENT

Technical intervention to the traditional method of Shirodhara

1.1 Identifying end users(customers)

Ayurvedic doctors, Ayurvedic Institutes.

1.2 Identify customer needs

Switching from traditional Shirodhara to portable and automated device.

Customer: Dr Vasant Patil Ph. No: 8310214752
Interviewer: Puneet and Vasanth Date:4-2-22

User	Customer Statement	Interpreted Need
Ayurvedic Hospital staff and private clinics	1. It should occupy less space. 2. Adjustable to any cot. 3. It should produce less or no sound. 4. It should have temperature of about 38 to 42 degrees Centigrade.	1. Portable 2. Mobile 3. Minimal noise produced 4. Maintain the optimum temperature.

Customer: Prajwal K Ph. No: 9353247473
Interviewer: Puneet and Vasanth Date:4-2-22

User	Customer Statement	Interpreted Need
Intern at ayurvedic hospital.	1. It should not be messy. 2. It should have constant flow. 3. It should give a signal after certain time. 4. It should be easy to use.	1. Spill proof 2. Adjustable flow rate 3. Alarm system 4. User friendly

Customer: Umesh	Ph. No: 8618167320
Interviewer: Puneet and Vasanth	Date:4-2-22

User	Customer Statement	Interpreted Need
Attender	1. Material used should not be harmful or react with oil. 2. It is painful to Oscillation the container for long time. 3. Natural drip process should be done. 4. The device should pump thick oil, water and buttermilk.	1. Toxic free materials should be used. 2. Oscillation should be automated. 3. Laminar flow. 4. Should pump liquid of any given viscosity.

Customer: Mr. Ramesh	Ph. No: 9591080967
Interviewer: Karthik and Vishalram	Date:7-2-22

User	Customer Statement	Interpreted Need
Technical Expert	1. The oil should not become contaminated so that the oil can be reused. 2. Prevent the entry of oil in the ear or eyes.	1. Filter oil 2. Should be able to align head in proper position.

Customer: Mr. Chetan	Ph. No: 9590889971
Interviewer: Rahul and Abhinandan	Date:8-2-22

User	Customer Statement	Interpreted Need
Technical Expert	1. It should occupy less space. 2. It should be affordable. 3. It should display the status of process like time and temperature.	1. Compact 2. Minimum cost 3. Display output on screen.

Requirement List

1. Machine should be portable and should clamp to any bed.

2.Sound produced during the process should be minimum.

3.The oil falling on the forehead should oscillate on a fixed path.

4.Material used in the product should be non-toxic.

5.Drip nozzle thickness should be 3 to 5 mm.

6. The oil dripping on the forehead should have laminar flow.

7.Shirodhara equipment should work for different head size.

8.Temperature should be kept constant throughout the process and should be between 38˚c to 42˚c

9.The equipment should have a digital display which shows process status and temperature.

10. The Shirodhara equipment should have a temperature knob to set the desired temperature.

11.The equipment should be timer controlled.

12.The equipment should be IOT controlled.

13.When the process ends the device should signal the instructor.

14.BIS recommendations should be followed throughout the process.

15.The equipment should have oil level indicator.

16.The height of the container should be adjustable.

17.Kill switch should be provided so that the equipment can be turned off in emergency situations

18.The sink should be designed in such a way that it should avoid spillage.

19.Most of the components used must be easily replaceable and repairable.

20.The equipment should be economical, aesthetically pleasing and durable

Shirodhara is a form of Ayurveda therapy that involves gently pouring liquids over the forehead and can be one of the steps involved in Panchakarma. The name comes from the Sanskrit words Shiro (head] and Dhara (flow). The liquids used in Shirodhara depend on what is being treated, but can include oil, milk, buttermilk, Kashaya or Khadha (medicated decoction), or even plain water.

Shirodhara has been used to treat a variety of conditions including eye diseases, tinnitus, vertigo, Autism, Peripheral or vascular Headache, migraine, chronic fatigue syndrome, stress management, depression, neurological conditions, exam phobia, depression, physiological problems, stress induce disorders, allergic rhinitis, greying of hair, neurological disorders, memory loss, insomnia, hearing impairment, tinnitus, vertigo, Meniere's disease and certain types of skin diseases like psoriasis. It is also used non-medicinally at spas for its relaxing properties. This technique, known as Shirodhara in Indian Ayurvedic medicine has, until now, been practised by pouring oil from a pierced pot suspended above the head of the patient This pot must be frequently refilled. It is difficult to ensure that the oil remains at a constant temperature. In addition to its cost, the oil also has the disadvantage that it runs everywhere (over the head, hair, table, equipment, etc.), making it difficult to maintain hygiene. This technique requires a practitioner present at all times, in order to refill the pot and sweep the patient's forehead with the jet of oil.

Shirahseka, is the Sanskrit term which is commonly known as Shirodhara is an important procedure and is practiced in more abundance as compared to other procedures along with Shiro abhyanga (Head massage).

Shirodhara is divided into categories based on the type of fluid used during the procedure. Some of these are:

- Taildhara → Use of oil (taila).
- Ksheeradhara → Use of milk.
- Takradhara → Use of buttermilk.
- Jaladhara → Use of water.

Selection of Fluid- According to Dharakalpa (Ayurvedic literature), Sneha(care)is taken according to the condition of imbalance in the type of Dosha(energy)

Vata (Air +Ether) Dosha- Tila Taila (Sesame Oil)

Pitta Dosha (Fire +Water)- Ghrita (herbal cow ghee)

Kapha (Earth +Water) Dosha- Tila Taila (Sesame Oil)

Rakta (Blood +Lymph) Dosha- Ghrita (herbal cow ghee)

Vata + Pitta + Rakta- Ghrita and Taila in equal par portion {1:1}

Vata + Kapha + Rakta- ½ part Ghrita and 1-part Tila Taila. {0.5:1}.

The apparatus includes housing. The housing comprises a head unit with swing assembly mounted on upper portion of the housing and a oil container configured at lower portion of the housing. The oil container supplies oil to the head unit through a pipe by means of pump. The apparatus further includes a flow controller configured above the oil container for controlling the flow of oil to the head unit and an adjustable head rest with soft cushion configured in front portion of the housing such that when patient put his head on the adjustable head rest, the head unit with swing assembly lies above his head. The apparatus furthermore includes a collection tray positioned below the adjustable head rest for collecting the oil therein during the Shirodhara procedure, wherein the collection tray is connected to a drain valve for draining the fluid out of the housing. Moreover, the apparatus comprises a digital programmable controller with display configured on rear portion thereof for controlling the actions of apparatus.

Procedure

The apparatus having a housing comprising:

- A head unit with swing assembly mounted on upper portion of the housing.
- An oil container configured at lower portion of the housing, the oil container supplying oil to the head unit through a pipe by means of pump.
- A flow controller configured above the oil container for controlling the flow of oil to the head unit.
- an adjustable head rest with soft cushion configured in front portion of the housing such that when patient put his head on the adjustable head rest, the head unit with swing assembly lies above his head.
- An adjustable head rest with soft cushion configured in front portion of the housing such that when patient put his head on the adjustable head rest, the head unit with swing assembly lies above his head.
- A collection tray positioned below the adjustable head rest for collecting the oil therein during the Shirodhara procedure, wherein the collection tray is connected to a drain valve for draining the fluid out of the housing.
- A digital programmable controller with display configured on rear portion there for controlling the actions of apparatus.
- The apparatus wherein the adjustable head rest with tray is adjusted up and down by a geared motor operated from the digital programmable controller.

Product Benchmarking

Products (Images or name)	Specifications	Cost	Advantage	Limitations	Availability
1) Electrically operated automatic Shirodhara machine 	▪ Electrically operated ▪ Digital temperature controller ▪ Steady/ oscillating dhara system ▪ Dhara flow control by Valve ▪ Digital / manually timing controller ▪ Water/oil recalculating system ▪ Easy movable with wheel	48,000	▪ Steady / oscillating dhara system ▪ Water/oil recalculating system ▪ Dhara flow control by valve	▪ Not Adjustable to all beds ▪ No usage of hydraulic for height adjustable ▪ NO moving Angle	E-commerce Continuously available
2) Stainless steel Shirodhara machine 	▪ Usage/Application Ayurvedic Therapy ▪ Material Stainless Steel ▪ Brand AJE ▪ Voltage 110 / 230 V Temperature Control Range + /- 2 Deg C ▪ Moving Angle 360 degree	35,100	▪ Material Stainless Steel ▪ Temperature Control Range + /- 2 Deg C ▪ Moving angle 360 degree	▪ Not Adjustable to all beds ▪ No usage of hydraulic for height adjustable ▪ storage capacity is less then 2litres	E-commerce Continuously available
3) Automatic adjustable Shirodhara machine 	▪ Hydraulic adjustable height ▪ Dhara flow control by valve ▪ Digital/manually timing controller ▪ Water/Oil recalculating system ▪ Smoothly Working ▪ Steady/Oscillating Dhara System	38,000	▪ Hydraulic adjustable height ▪ Steady/Oscillating Dhara system ▪ Digital/ manually timing controller ▪ Easy movable with wheel ▪ Smoothly working	▪ storage capacity is less then 2litres ▪ Does not send any signal after the completion of the process ▪ Not Portable	E-commerce Continuously available

4) Portable automatic shirodhara machine 	▪ Electrically operated ▪ Digital temperature controller ▪ Steady/Oscillating dhara system ▪ Dhara flow control by valve ▪ Digital/ manually timing controller ▪ Water/oil recalculating system ▪ Easy movable with wheel	38000	▪ Dhar flow control by valve ▪ Digital/manually timing controller ▪ Water/oil recalculating system ▪ Easy movable with wheel	▪ Storage capacity is less then 2litres ▪ Does not send any signals after the completion of the process	E-commerce continuously available
5) Automatic Shirodhara machine 	▪ Usage/application Treatment centers ▪ Material wood, Medical graded tubes and pure copper ▪ Model Name/Number shirojeeva – v1 ▪ Medicine Type Ayurvedic ▪ Capacity 1litre-1.5litre ▪ Function Automatic	29,999	▪ Material Wood, Medical graded tubes and pure copper ▪ Function Automatic	▪ Not Adjustable to all beds ▪ No usage of hydraulic for height adjustable ▪ No moving Angle ▪ Storage capacity is less than 2 litres ▪ Does not send any signals after the completion of the process	E-commerce Continuously available

Patent Survey

Patent Name	Information
GRAVITY BASED AUTOMATIC SHIRODHARA YANTRA WITH RETURN PIPE FLOW TECHNOLOGY Application Date: 03/01/2017 Application Number: 201721000177	This is India's first "GRAVITY BASED AUTOMATIC SHIRODHARA YANTRA WITH RETURN PIPE FLOW TECHNOLOGY". Instruments available nowadays in the market are actually work on principle same as water heater which used to pumping dhara dravya (fluid which used for Shirodhara), whatever hot fluids/ oil pours with the help of motor pump on the forehead of the patient. Drawback of the available methods/ machines in market is the flow of patient's forehead is of varied speed, whereas in traditional / ancient actual Shirodhara, the flow (GRAVITY METHOD) falls very gently on the fore head of patient. This available pumping Shirodhara methods hampers the principle of ancient Shirodhara by avoiding/ neglecting gravity-based flow.
A PORTABLE SHIRODHARA APPARATUS Application Date: 23/06/2017 Application Number: 201711022198	Disclosed is a device for carrying out Shirodhara therapy. The device includes a baseplate adapted to receive thereon a head of the patient. The baseplate includes a hollow housing having a plurality of enclosures configured therein, a cover plate adapted to cover the hollow housing, a reservoir configured with the hollow housing for storing therein a therapy liquid, the reservoir being covered by a transparent cover, and a fluid pump in fluid communication with the reservoir and adapted to receive the therapy liquid from the reservoir and pump the same out of the reservoir. The device also includes a flexible conduit extending outwardly from the base plate, the flexible conduit being capable of reciprocating motion in a transverse direction to user.

SHIRODHARA APPARATUS Application Date: 08/09/2020 Application Number: 202021038777	Electronic and transportable Shirodhara apparatus in which there is a continuous flow of liquid over the forehead of a person. The apparatus has a liquid circulation module comprising of a silent motor and a silent pump designed to accommodate different types of Shirodhara treatments, using different types of liquids, providing ease of operation and functionality without any professional intervention. The apparatus also has an ergonomic headrest base, an adjustable moveable liquid pouring arm with multiple functionalities and characterized by circumferential oscillations, a heater, and a touch interface to control temperature, regulate flow and control duration. The apparatus also has a USB interface to provide ambient music and environment for a conducive therapeutic session.
AUTOMATED SHIRODHARA DEVICE Application Date: 02/04/2021 Application Number: 202141015735	sent invention relates to an automated shirodhara device comprising a tubular clamp , a dispensing arm attached to a proximal end of the tubular clamp ,a central main unit attached to distal end of the tubular clamp , the central main unit including a main reservoir, an aperture formed in at least a portion of the tubular clamp , the aperture is configured to provide a fluid connection of rippled liquid into the main reservoir, an actuator mounted on at least a portion of the dispensing arm , and a head rest member attached to at least a portion of the central main unit .Further the automated Shirodhara device is a portable, economical and can be operated with the help of minimal manpower.

Literature Survey

Patent Name/ Number/ Date	Information
OT Based Shirodhara Patent No.: 10.3233/APC210153 Date: November 2021	The contemporary pandemic scenario of COVID-19 has brought to surface the efficacy of old health care wisdom in inhibition and care of diseases where contemporary medicine deceptively wants a real cure. Undeniably, viral diseases for the fascinating vitality of their causal organisms, top this wish list. Ultimately the world seems to be enthusiastic to pay attention about old health care approaches to control viral pandemics if these are found well-intentioned in handling such situations. One such demand is to energetically or intelligently use the therapeutic devices especially the Shirodhara device, at the convenience, anytime, anywhere in a teleconsultation mode. The Shirodhara device design is to be in a manageable form without trailing the legitimacy and principals of Ayurveda. The main elements used in the device comprises of a sensor for perceiving the temperature, a pump for salvaging the medicine, programming device to control the temperature, and regulate the heater and a wavering pipe for free flow of the medicine. The device is premeditated in such a way to evade the faults and snags produced while doing the procedure Shirodhara. Hence, this device is built which is portable, cost effective; it provides a technologically enhanced Shirodhara instrument curtailing the practice of medicine and man power for the procedure. LINK: https://www.researchgate.net/publication/356081596_IoT_Based_Shirodhara
Development of a portable, cost effective and effective Shirodhara instrument with diverse technologies. Patent number: 10.1016/j.jaim.2018.02.095 Date: April 2018	The traditional Shirodhara technique requires cumbersome equipment's like heavy, expensive metallic pots, and long stands. Shirodhara is a procedure which requires large amount of medicine and high labour force. To fix the issues regarding the Shirodhara technique, there is a necessity of developing a mechanical device for the easy and effective administration of the procedure. Statement of Problem: The market available Shirodhara instruments are huge in size, non-economical, with partial technologically perfections, and not user friendly. Recognizing the crucial role of a good instrument and the drawbacks mentioned above made a thought of developing a portable and cost effective Shirodhara device which will also preserve the efficacy of the procedure. Methods: Necessary inputs were collected from the experts in the field of Ayurveda and technology. The device was designed in an accessible form without losing the authenticity and principals of Ayurveda. The main components used in the device includes sensor for sensing the temperature, a pump for recycling the medicine, programming device to regulate the temperature, and control the heater and an oscillating pipe for free flow of the medicine. The device is designed in such a way to avoid the errors and difficulties produced while doing the

	procedure Shirodhara. Out comes: This portable and cost-effective device probably provides a technologically improved Shirodhara instrument minimizing the usage of medicine and man power for the procedure. LINK: https://www.researchgate.net/publication/326514134_182_Development_of_a_portable_cost_effective_and_efficient_shirodhara_instrument_with_diverse_technologies
Automatic thermostatic control system for heater and evaporative cooler Patent No.: 10.1016/j.jaim.2018.10.006 Date August 2019	An automatic control system is described for an evaporative cooler and an electrically-controlled heater. The cooler includes an electrically driven water pump, and an electrically driven blower having a highspeed winding and a lower speed winding. The control system comprises first, second, third, and fourth relays. Each has a winding, and each of the relays has a common terminal and normally open contacts. The second of the relays has normally closed contacts. The normally open contacts of the first relay are connected to common terminal of the second relay and the normally open and normally closed contacts of the second relay are connected respectively to the high speed and low speed winding of the blower. The normally open contacts of the third relay is connected to the water pump; and thermostatic control means connected to the windings of the four relays for causing the first and third relays to close their normally open contacts when ambient temperature reaches a pre-set threshold. It causes the second relay to open its normally closed contacts and close normally open contacts when ambient temperature exceeds the pre-set threshold by a predetermined amount. It automatically causes the fourth relay to close normally open contacts and activates the heater when ambient temperature falls below a pre-set threshold. LINK: https://www.researchgate.net/publication/238610670_Automatic_thermostatic_control_system_for_heater_and_evaporative_cooler

Design Specifications

Portable, Minimal sound, Oscillating, Non-toxic material, Laminar flow, Temperature control, Display status, Standard procedure display, kill switch, alarm, Filter oil, Adjustable, Spill proof, IOT control, Water proof, Shock proof, Cost effective, User friendly, Low maintenance, Drip size(3-5mm), compact, less power consumption, Water/oil recalculation, temperature 38-42 degree Celsius, time limit set.

Keywords	Objectives	Functions	Means	Constraints
Portable	✓			
Minimal sound		✓		
Oscillating				✓
Non-toxic material				✓
Laminar flow				✓
Temperature control				✓
Display status		✓		
Standard procedure display		✓		
kill switch				✓
alarm		✓		
Filter oil	✓			
Adjustable	✓			
Spill proof	✓			
IOT control		✓		
Water proof	✓			
Shock proof	✓			
Cost effective				✓
User friendly	✓			
Low maintenance	✓			
Drip size(3-5mm)				✓
compact	✓			
less power consumption				✓
Water/oil recalculation		✓		
Temperature 38-42 degree Celsius				✓
Time limit set		✓		

Objectives

Portable	Shock proof
Filter oil	Water proof
Adjustable	User friendly
Spill proof	Low maintenance
compact	

Function

Minimal sound	Water/oil recalculation
alarm	time limit set
IOT control	Display status
Standard procedure display	

Constraints

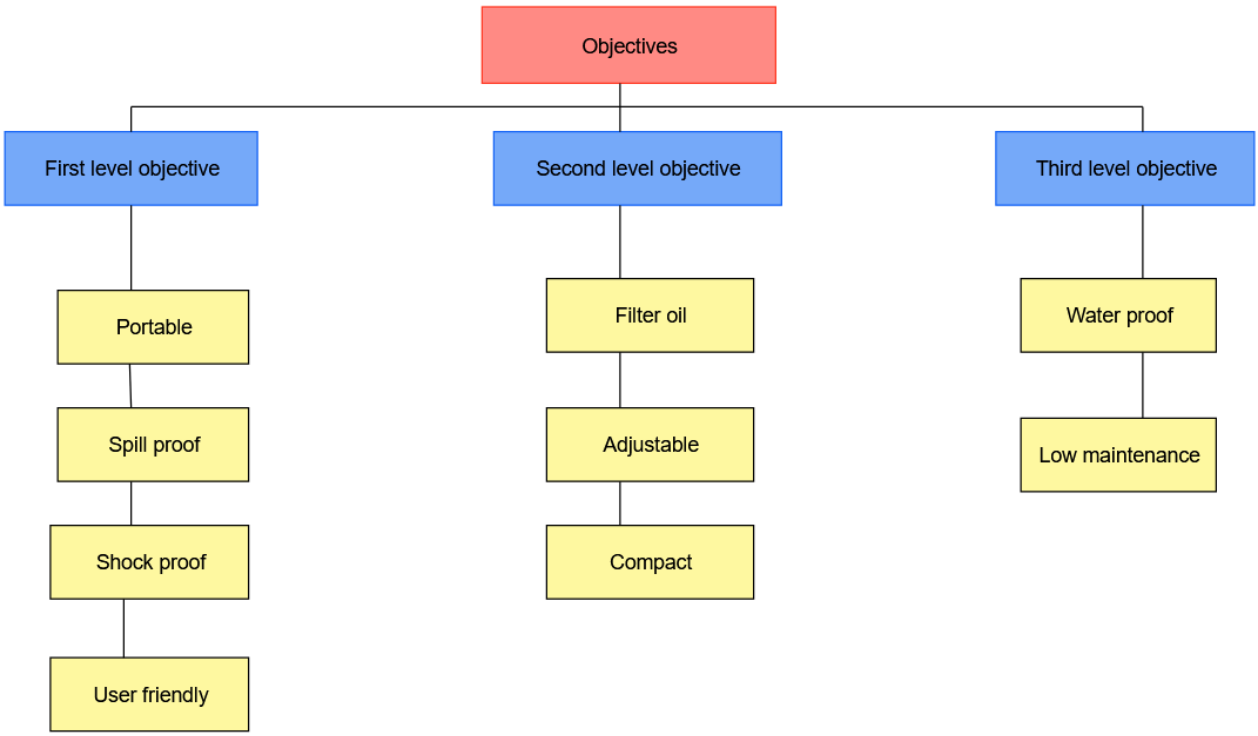
Oscillating	Non-toxic material
kill switch	Temperature control
Cost effective	less power consumption
Drip size(3-5mm)	Laminar flow
temperature 38-42 degree Celsius	

Objective tree (affinity diagram)

*SL	Objectives	First level objectives	Second level objectives	Third level objectives
1.	Portable	✓		
2.	Filter oil		✓	
3.	Adjustable		✓	
4.	Spill proof	✓		
5.	compact		✓	

6.	Shock proof	✓		
7.	Water proof			✓
8.	User friendly	✓		
9.	Low maintenance			✓

Objectives Tree



Design Specifications

Sl.no	Engineering Specifications	Units
1	Drip nozzle	3 to 5mm
2	Amount of oil	2 litres
3	Temperature of oil	38 ˚c to 42 ˚c
4	Height of nozzle	5 inches
5	Voltage	110/230 V , 50 Hz
6	Flow type	Laminar

7	Range of sound	<60 dB
8	Weight	20kg

Competitive Benchmarking

Sl.no	Metric	Units	Competitive Products		
			Product 1 Electrical operated automatic Shirodhara machine	Product 2 Stainless steel Shirodhara machine	Product 3 Automatic Shirodhara machine
1	Drip nozzle	mm	3-5 mm	3-5 mm	3-5 mm
2	Amount of oil	litres	2ltrs	2ltrs	2ltrs
3	Temperature of oil	˚c	Adjustable	Adjustable	Adjustable
4	Height of nozzle	inches	Adjustable	Adjustable	Not Adjustable
5	Voltage	V	220	220	220
6	Cost	Rs	48,000	35,100	29,999

Concept Generation

Defining Functions

Sl. No	Functions	Sub Functions (optional)
1	Minimal sound	-
2	alarm	-
3	IOT control	-
4	Standard procedure display	-
5	Water/oil recalculation	-
6	time limit set	-
7	Display status	-
8	Oscillating	-
9	Laminar flow	-

10	Filter oil	-
11	Temperature control	-

Morphological Chart

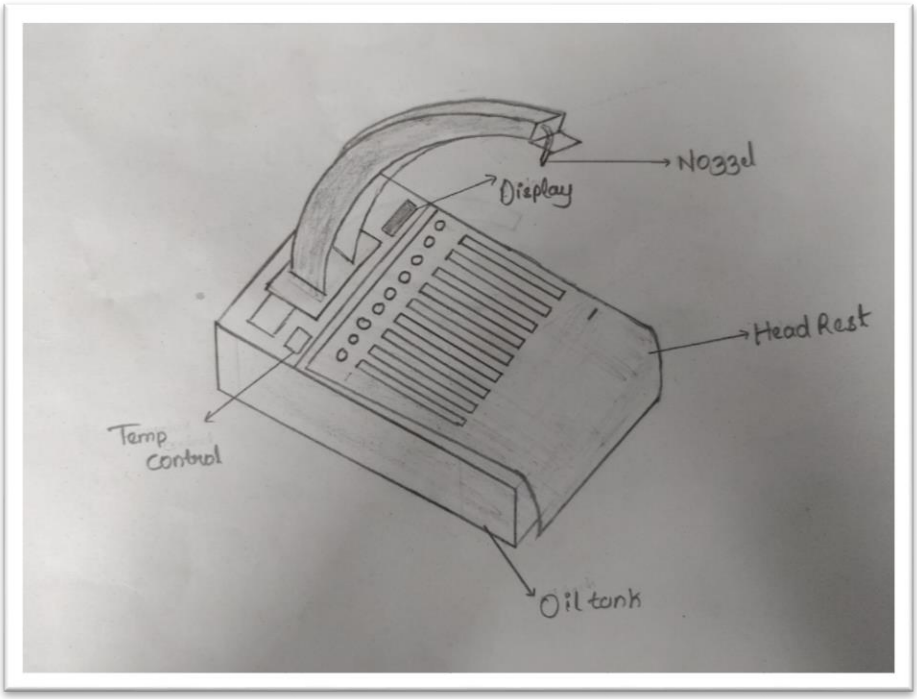
Functions ▼ / Means ▶	**Means 1**	**Means 2**	**Means 3**	**Means 4**	**Means 5**
Minimal sound	throttle the pressure side valves	trim the impeller	reduce pump speed / brushless pump	add a flow recirculation line	install a variable frequency drive and remove control valves
alarm	buzzer	LED blink			
control	Knob	switch	touch pad		
Standard procedure display	chart	video display	instruction manual		
Water/oil recalculation	oil content meter	Fuel level indicator	Displacement sensor		
time limit set	stop watch				
Display status	led screen	app			
Oscillating	Rack and pinion	worm & wheel gear	Pendulum oscillation	Swing arm mechanism	Cam and follower mechanism
Laminar flow	Reducing fluid pressure	Straight nozzles			
Filter oil	Sedimentation	Stainer			
Temperature control	DTC	thermostat			

Generating design alternatives

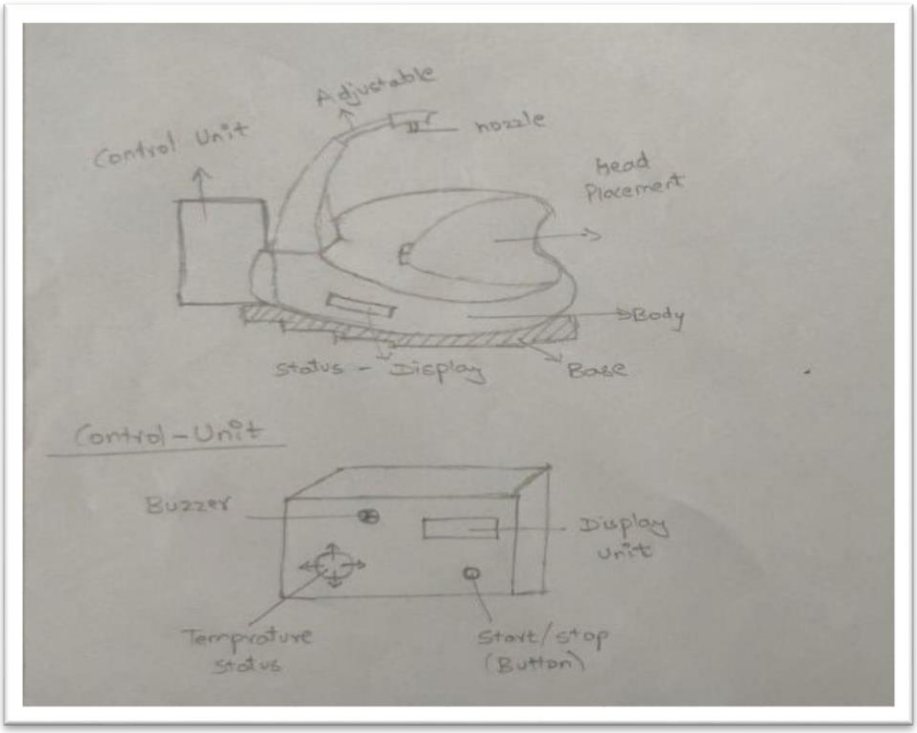
Sl. No	Design Alternatives
1	Portable Shirodhara Machine
2	Adjustable Shirodhara Machine
3	Hydraulic Automatic Shirodhara Machine
4	Clamped Shirodhara Machine

5	Shirodhara Machine-1
6	Shirodhara Machine-2
7	Shirahseka

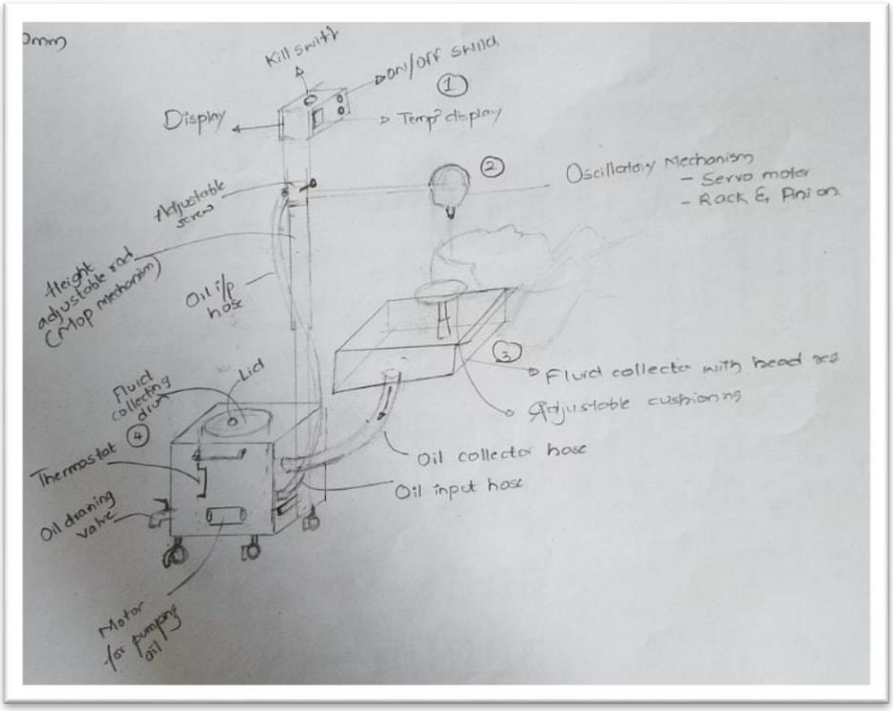
Design Alternatives

Design Alternative 1


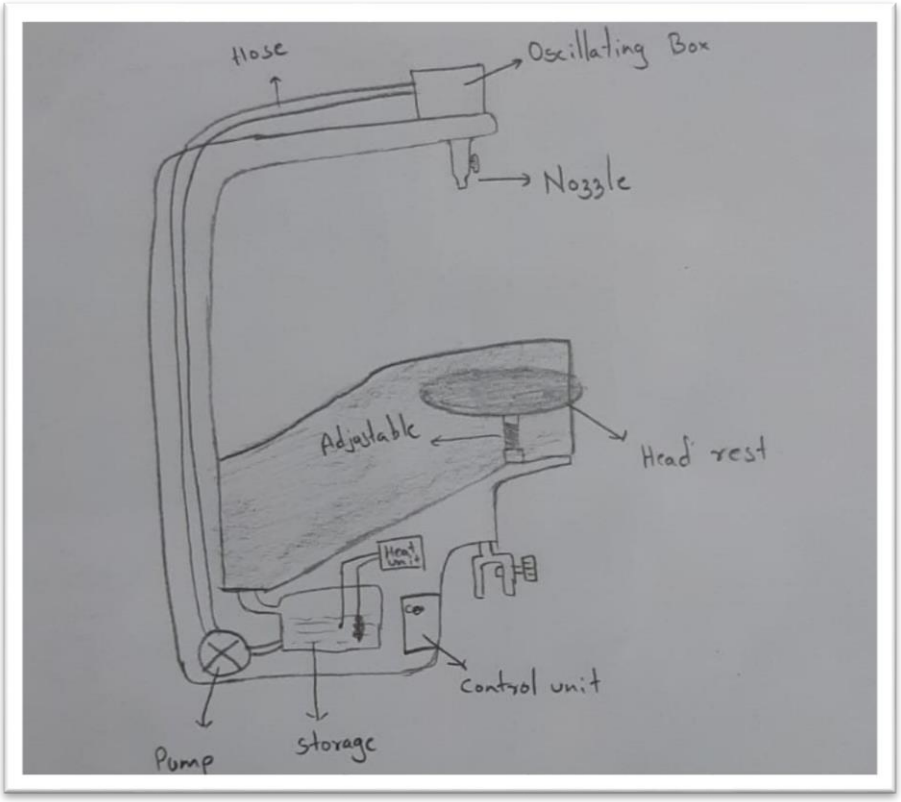
Design Alternative 2



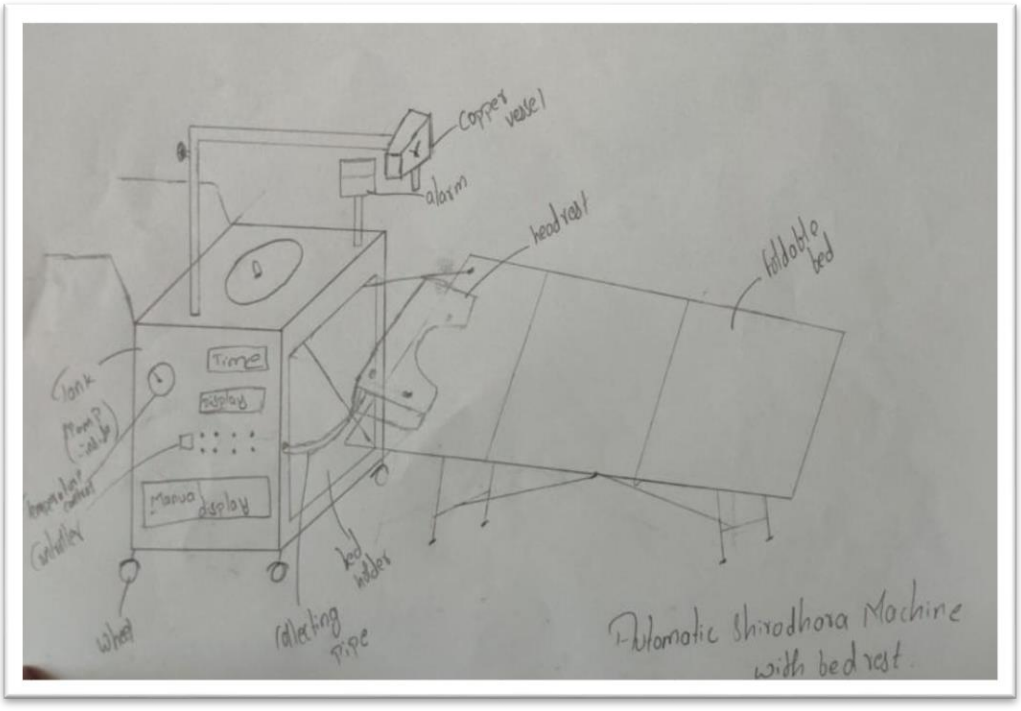
Design alternative 3



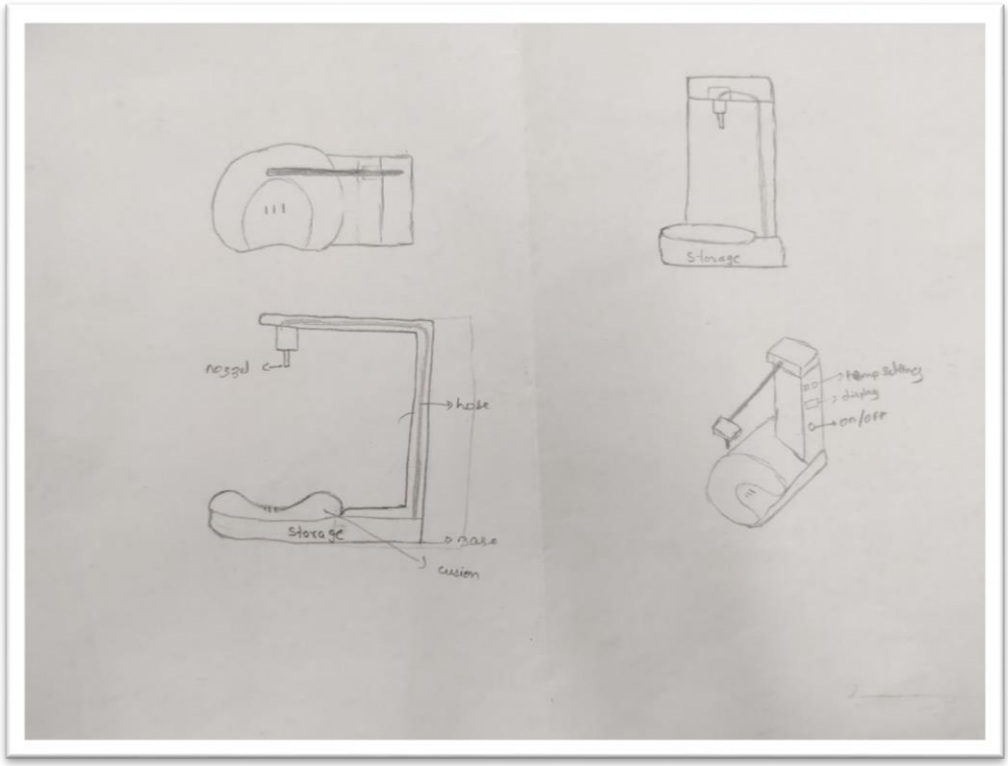
Design alternative 4



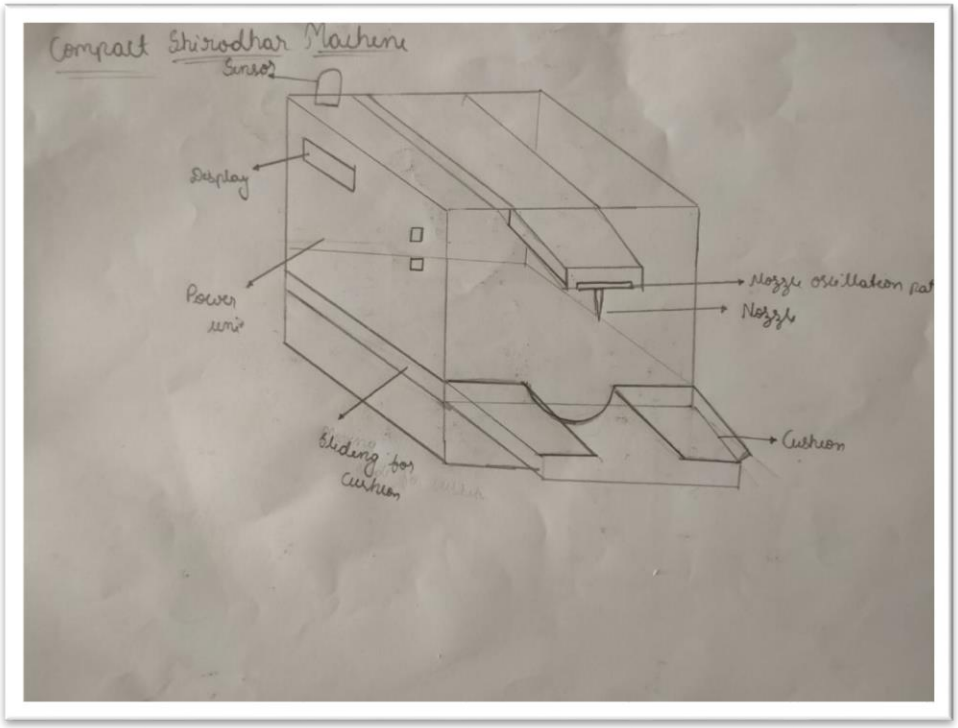
Design alternative 5



Design alternative 8



Design alternative 7

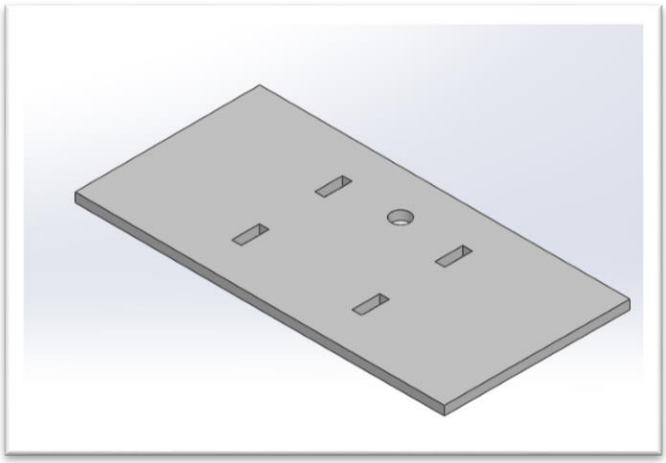

Compact Shirodhar Machine
Sensor
Display
Power unit
Nozzle oscillation rod
Nozzle
Cushion
Sliding for cushion

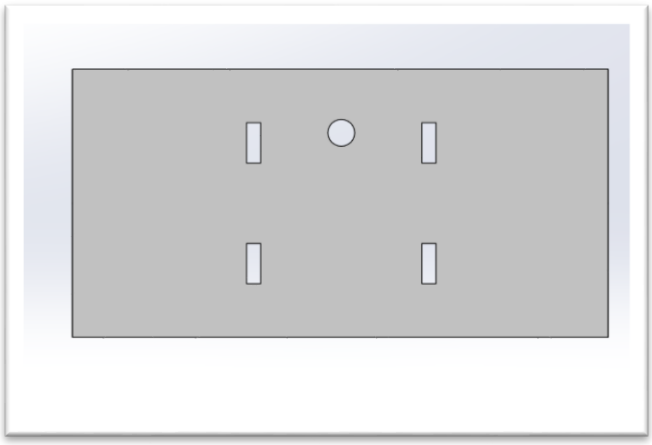
Selecting Design Alternative (Using Pugh Chart)

Requirements	Weight	Design 1	Design 2	Design 3	Design 4	Design 5	Design 6	Design 7	Reference
Portable	7	+	-	-	+	_	+	-	0
User-Friendly	7	+	-	-	+	-	+	+	0
Spill proof	8	+	+	-	+	+	+	+	0
Low maintenance	5	+	-	-	-	-	+	-	0`
Cost	5	-	-	+	+	+	-	-	0
Non-toxic material	9	-	+	+	+	+	-	+	0
Design complexity	5	+	-	+	-	+	-	-	0
Less power consumption	7	+	+	-	+	-	+	-	0
Safety	10	+	-	+	+	+	+	-	0
Marketable	7	+	-	+	+	-	+	-	0
Near to customer needs	10	+	-	+	-	+	-	+	0
Pluses		9	3	6	8	6	7	4	
Same									
Minuses		2	8	5	3	5	4	7	
Overall Total		52	-32	12	40	14	22	-12	
Weighted Total									

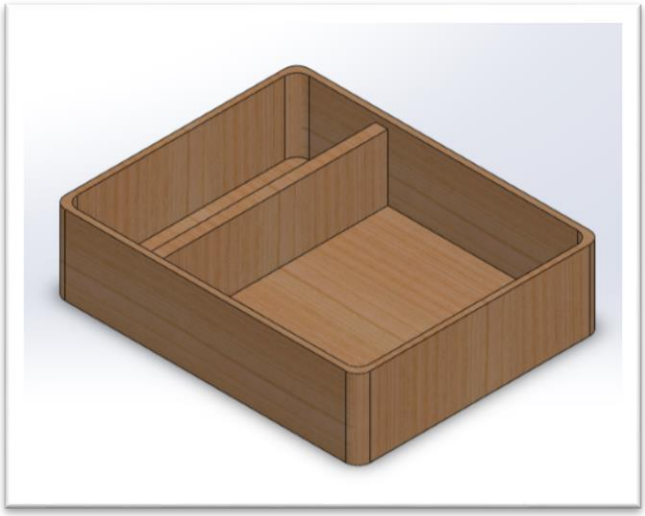
3D PART MODELING

Part Model of Structure Base

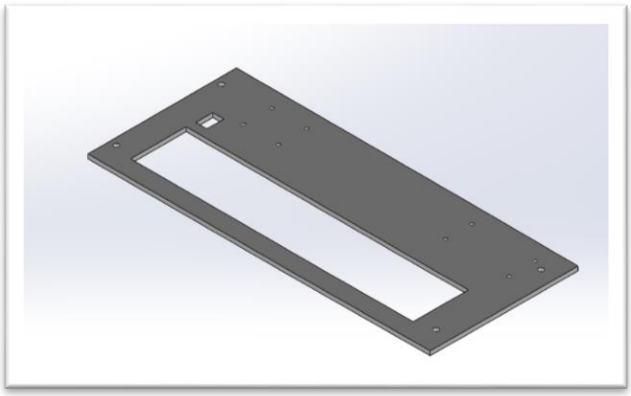




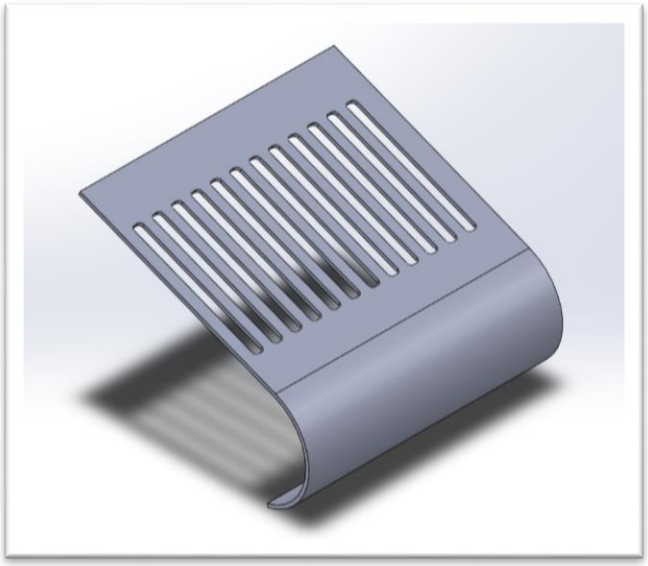
Part Model of Base Structure

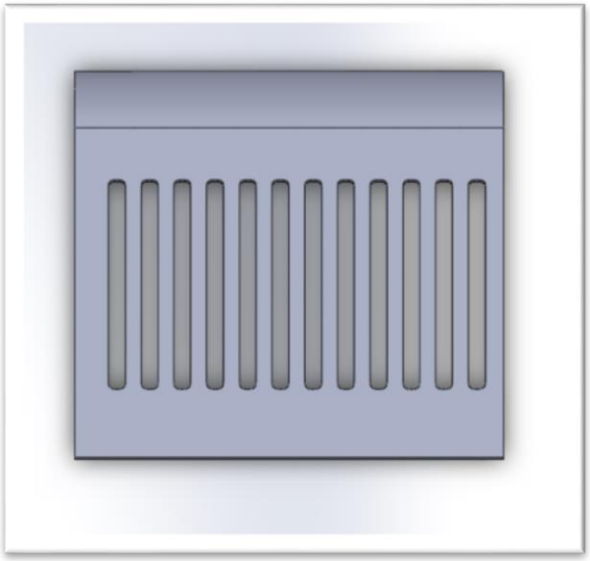


Part Model of Support Member

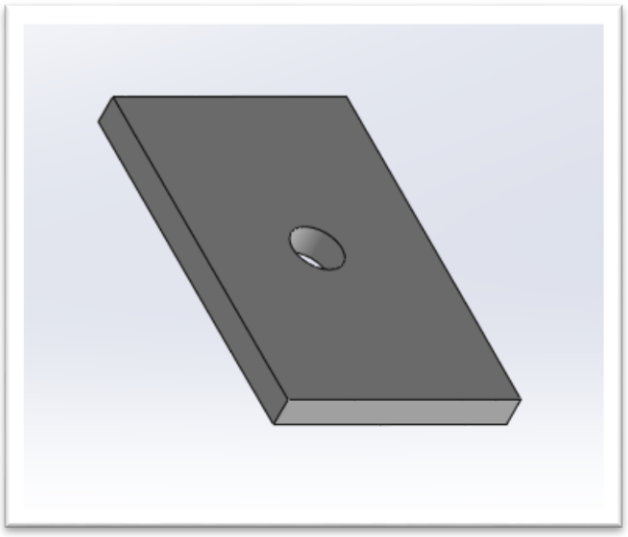


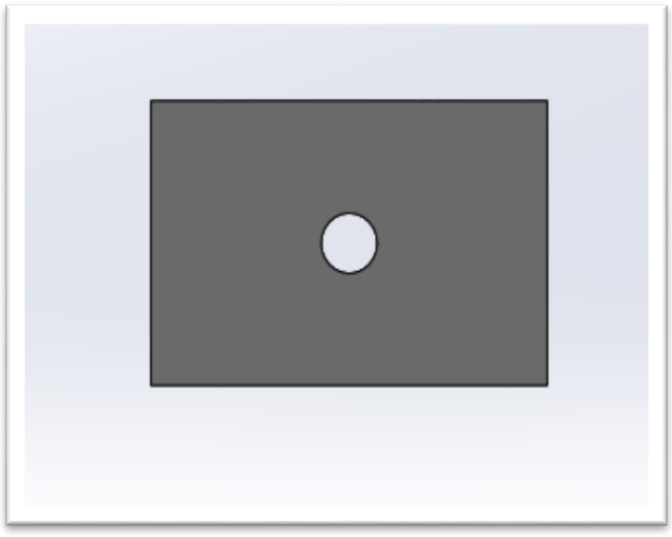
Part Model of Head Restraint



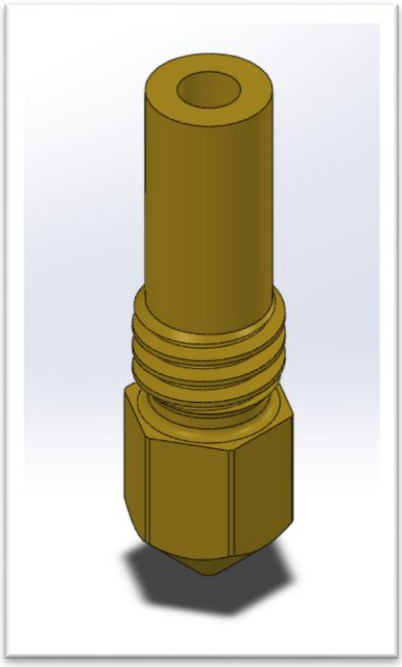


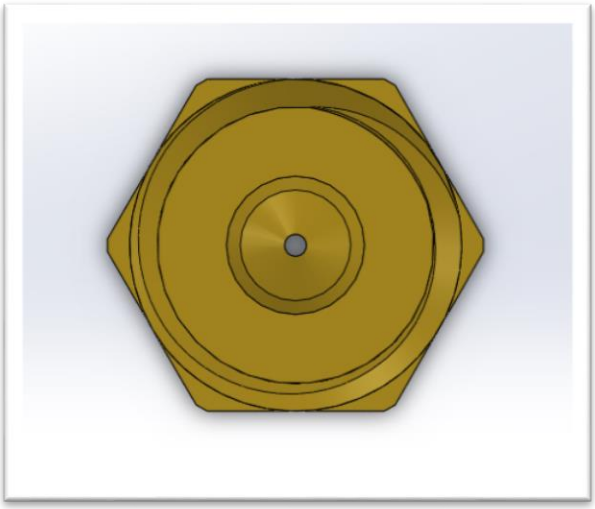
Part Model of Support Member



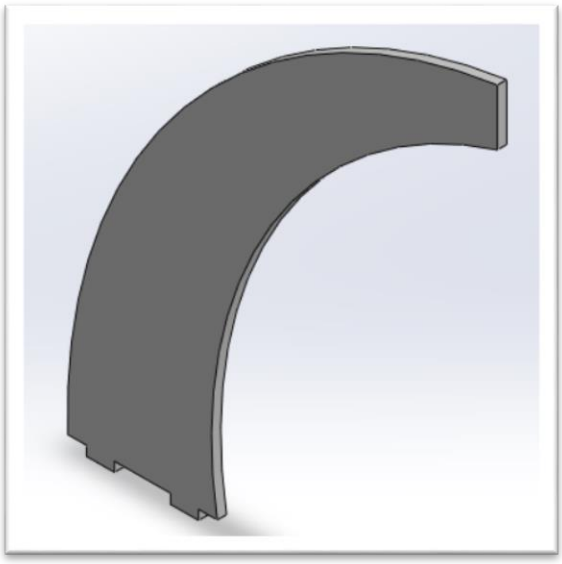


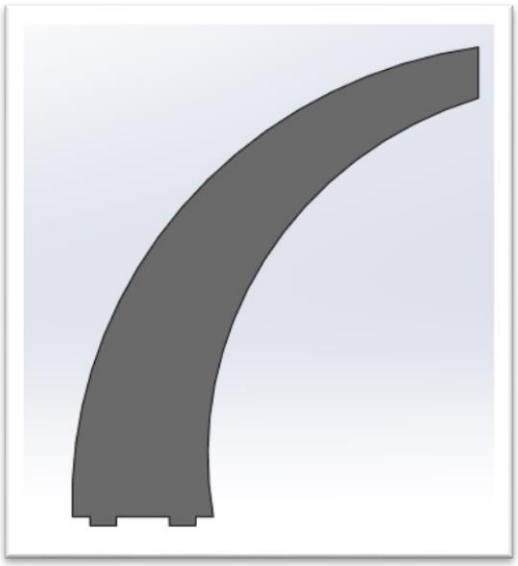
Part Model of Nozzle



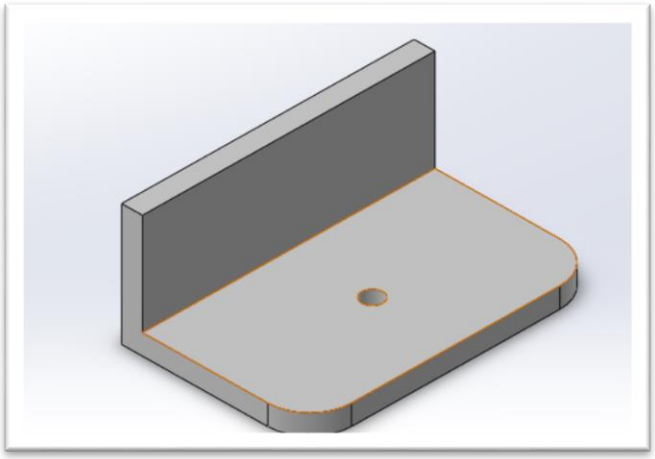


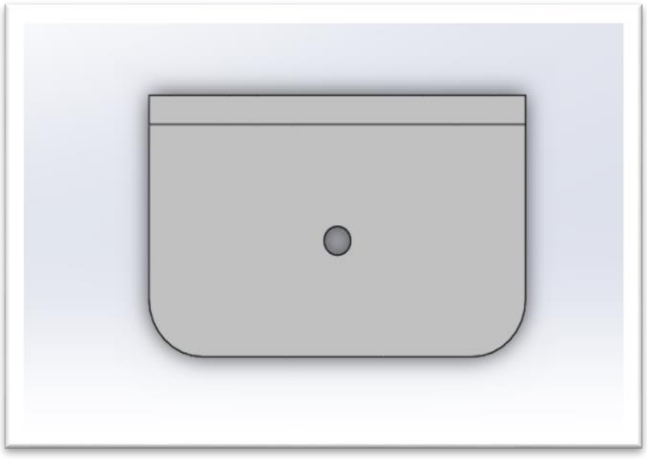
Part Model of Side Member





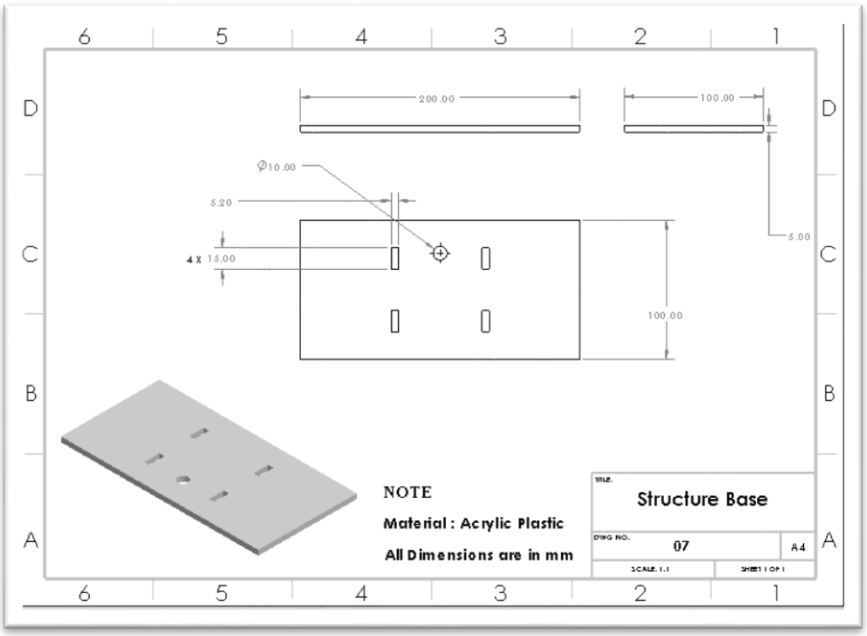
Part Model of Drip Support



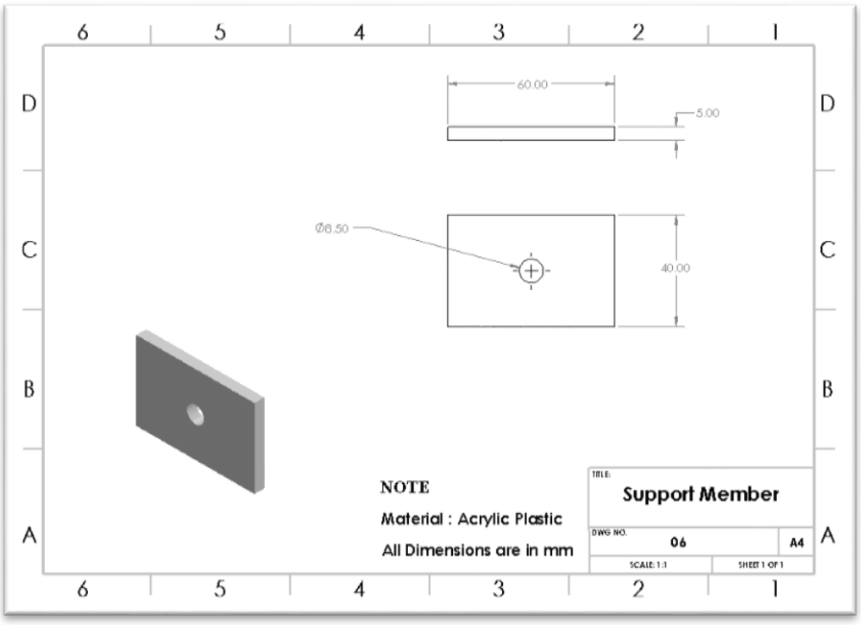


2D Drafts

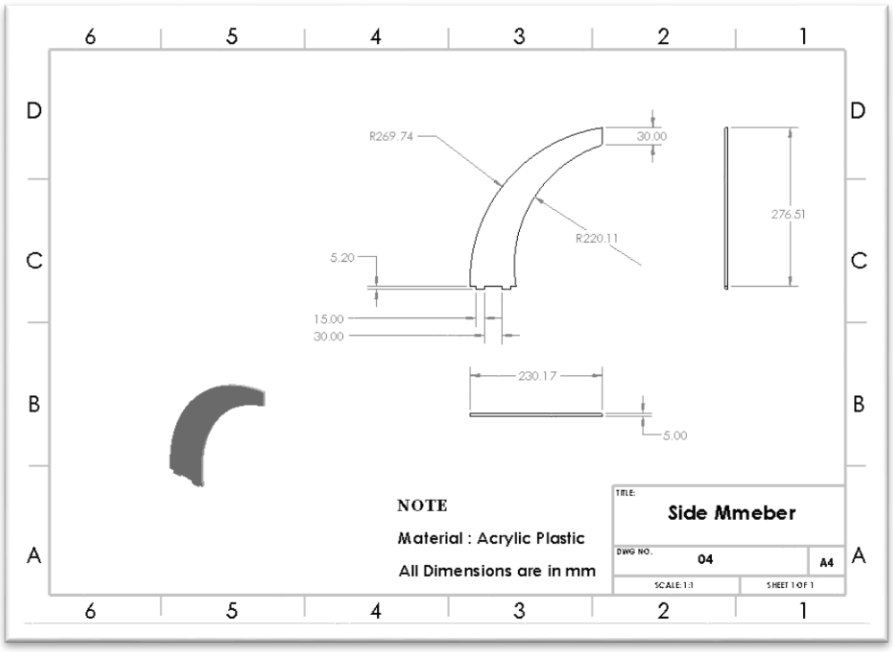
2D Draft of Structure Base



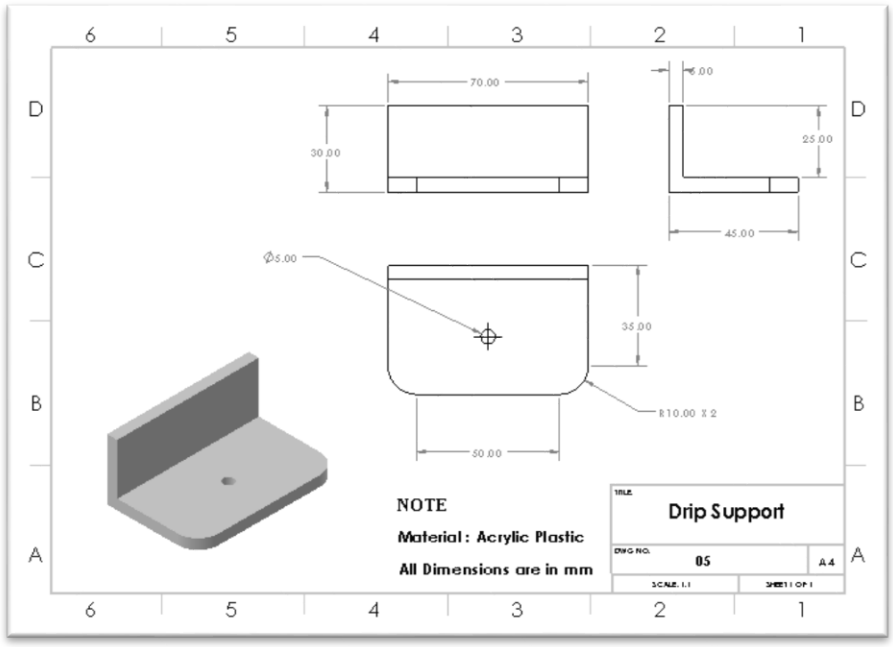
2D Draft of Support Member



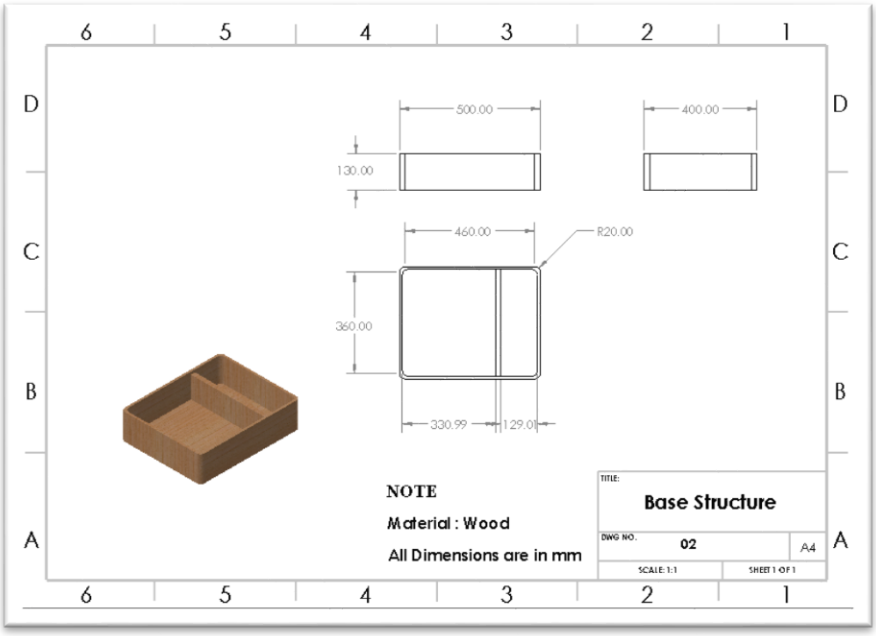
2D Draft of Side Member



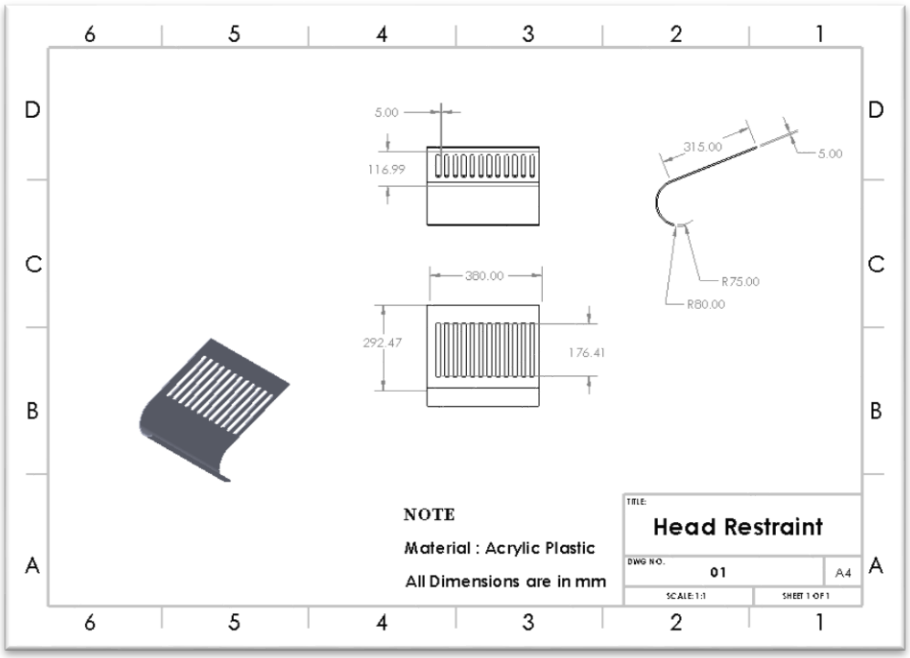
2D Draft of Drip Support



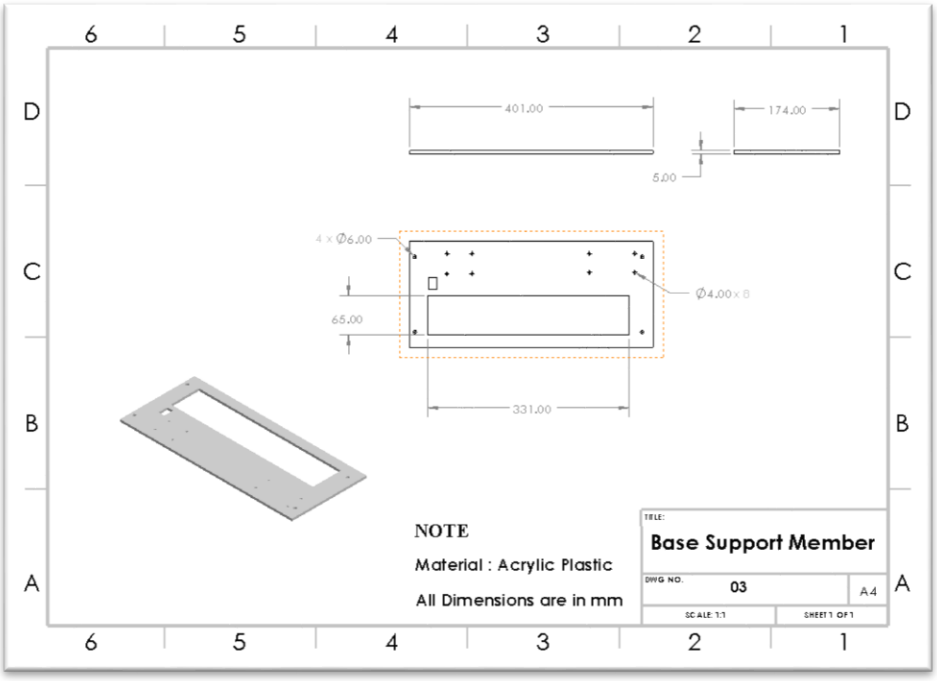
2D Draft of Base Structure



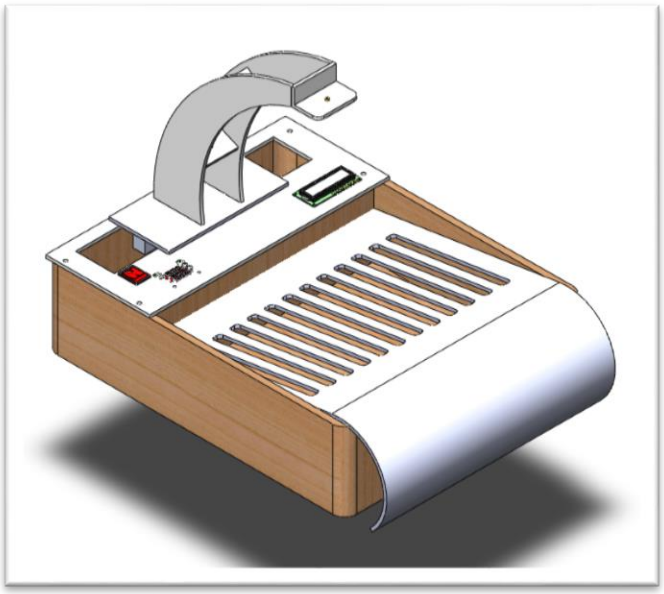
2D Draft of Head Restraint

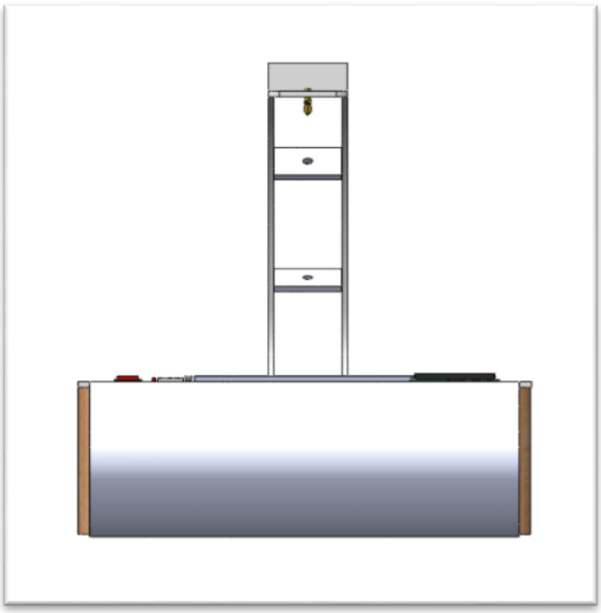


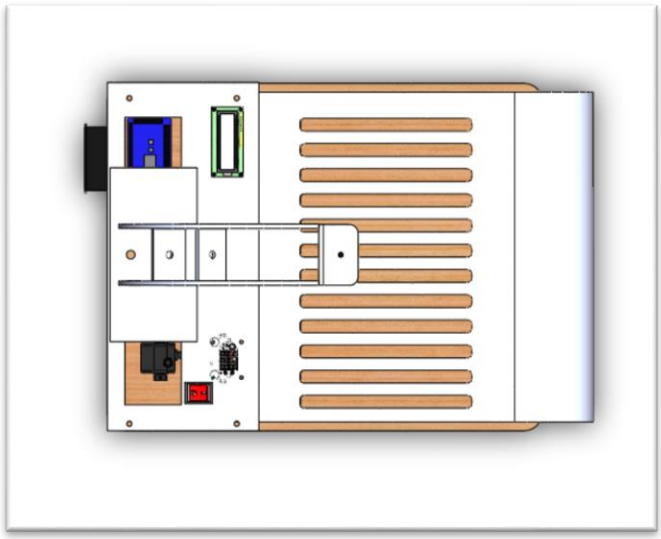
2D Draft of Base Support Member

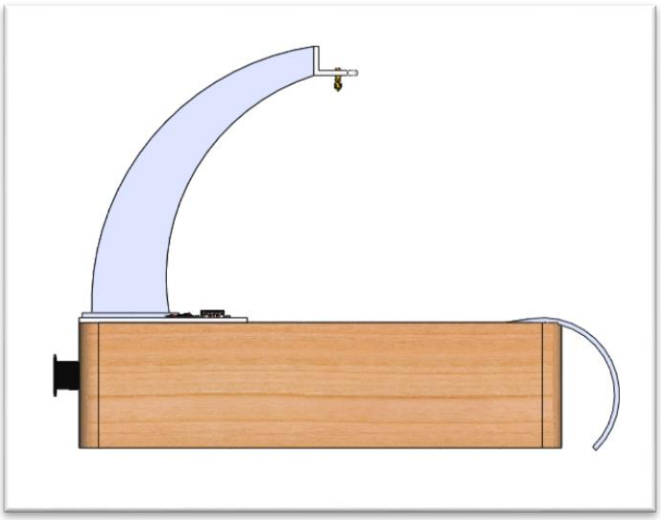


Final Assembly

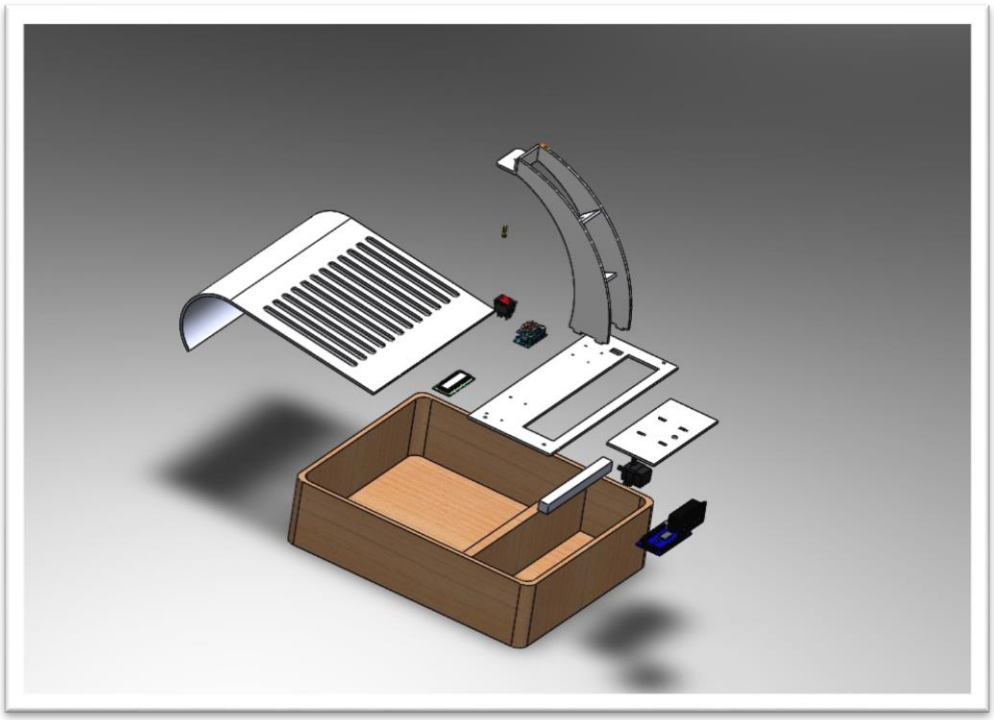


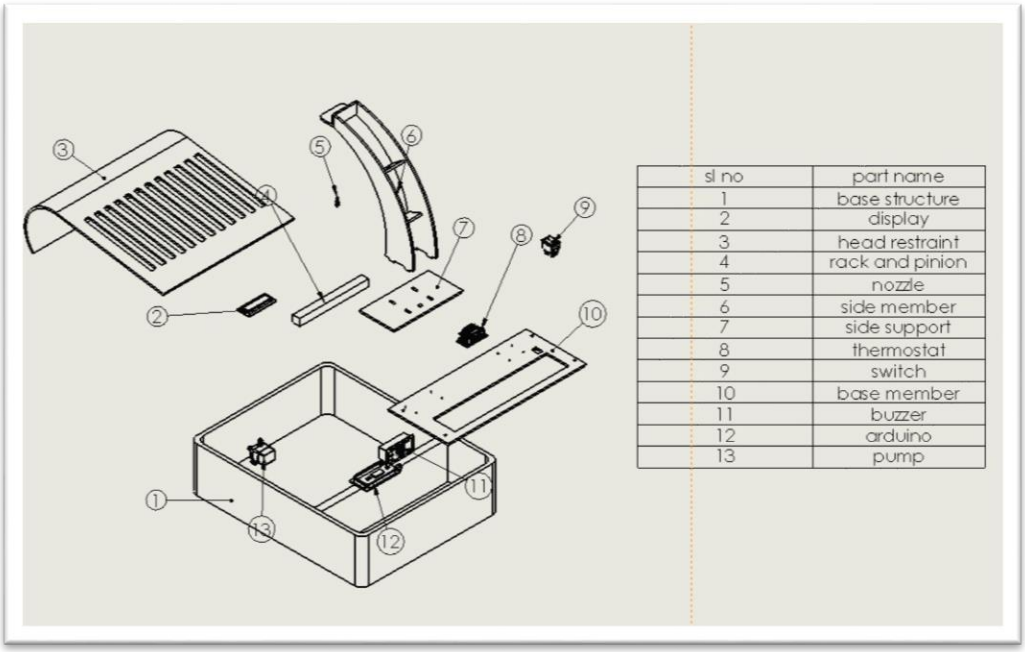






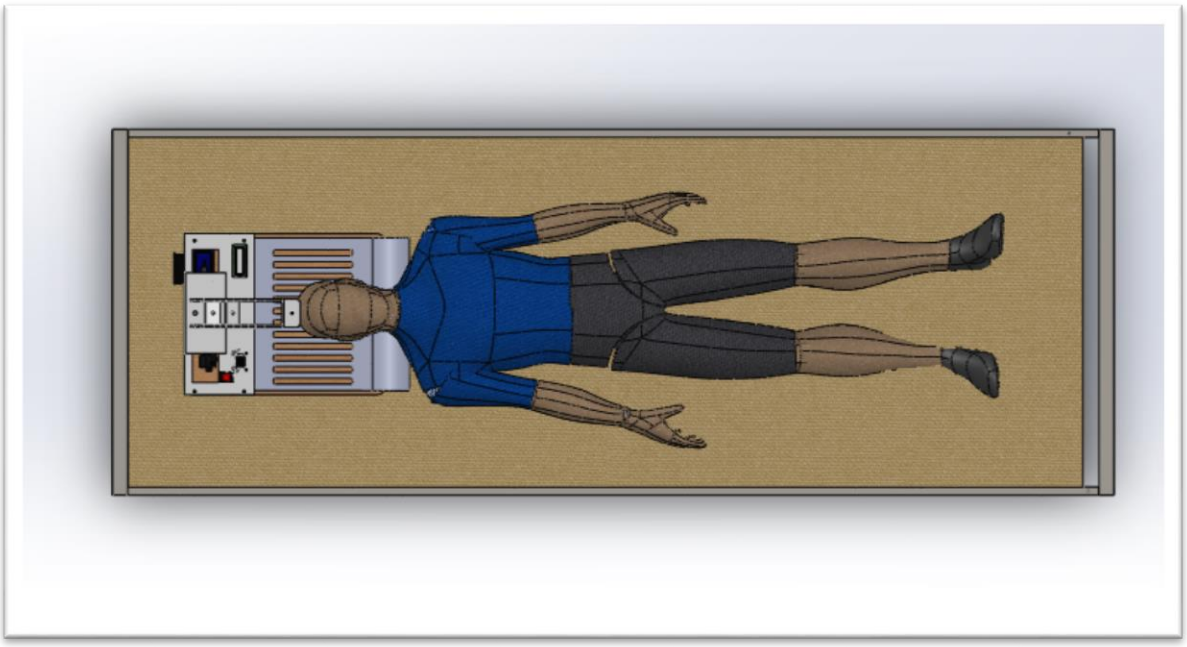
Exploded View





sl no	part name
1	base structure
2	display
3	head restraint
4	rack and pinion
5	nozzle
6	side member
7	side support
8	thermostat
9	switch
10	base member
11	buzzer
12	arduino
13	pump

Rendered View



Bought out and manufactured parts

Sr No	Brought out Parts	Manufactured Parts
1	Arduino Mega 2560	Head Restraint
2	LCD 16X2 Display	Base Structure
3	Bread Board	Base Support Member
4	30 RPM Motor	Side Member
5	L298N Motor drive	Drip Support
6	12V DC Pump	Support Member
7	Temperature controller	Structure Base
8	Heater	-
9	Jumper wire	-
10	Single strand wire	-
11	Multi strand wire	-
12	Aluminum Foil	-
13	Fevicol Marine	-
14	Hose pipe (6 mm)	-
15	Adapter 12 V	-
16	Switch	-

Motor Calculations

R=0.3 cm
m=1.5kg
g=9.81 m/s^2
T=F*r
=m*g*r
=15*9.8*0.3
=4.41 N-cm
At 12V
Rated Torque
The rate rpm = 30rpm

Flow rate calculations

Impact velocity = sqrt (2gh)
= sqrt (2*9.81*0.1)
=1.4 m/s
d=0.006m
A= pi/4 (d^2)
A=0.000028m^2

Flow rate Q= V*A = 1.4 * 0.000028 = 0.000039 m^3/s
Flow rate for 30rpm motor
Q= 30×0.000039
Q=0.00117 m^3/s

Velocity of fluid from container to the pump		Velocity of fluid from pump to the Forehead	
$Q_1=A_1*V_1$		$Q_2=A_2*V_2$	
Q_1=2 litre/min	A_1=6mm	Q_2=2 litre/min	A_2=4mm
Q_1=0.0333 litre/sec	A_1=0.006m	Q_2=0.0333 litre/sec	A_2=0.004m
$V_1=Q_1/A_1$		$V_2=Q_2/A_2$	
V_1=0.0333/0.006		V_2=0.0333/0.004	
V_1=5.55 m/s		V_2=8.325 m/s	

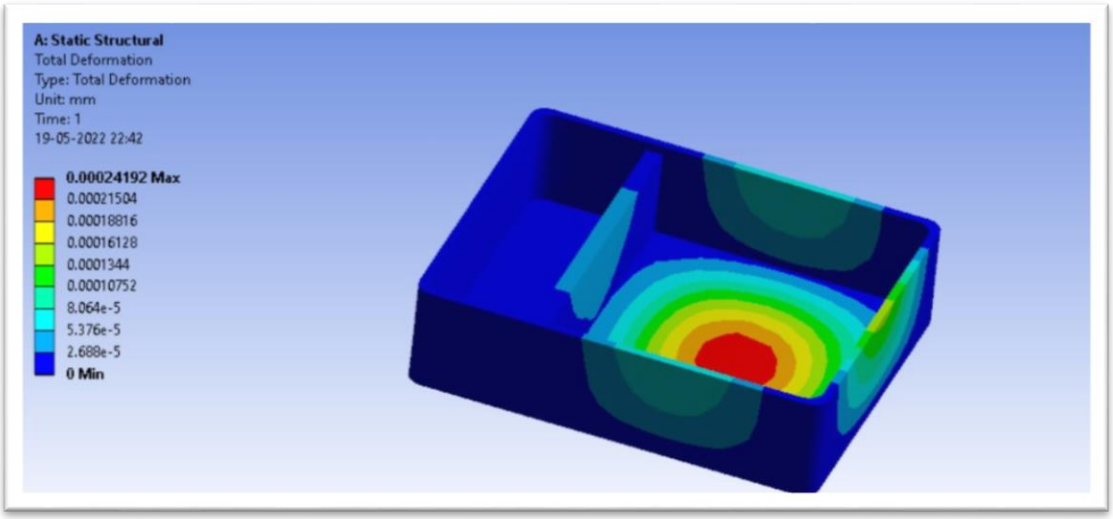
Bill of Materials

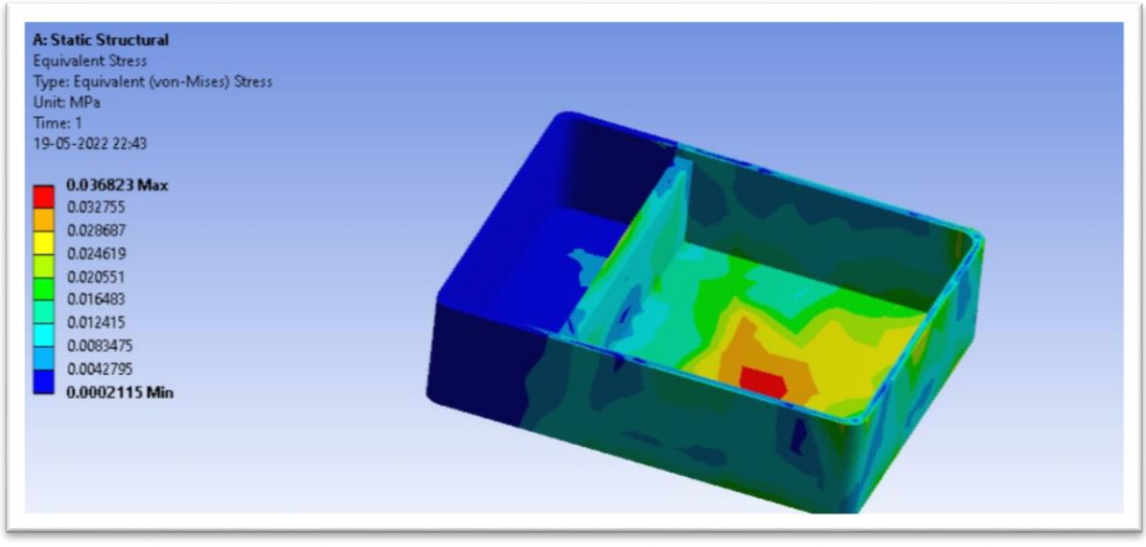
S.no.	Component name	Quantity
1	Arduino Mega 2560	2
2	LCD 16X2 Display	1
3	Bread Board	1
4	30 RPM Motor	1
5	L298N Motor drive	1
6	12V DC Pump	1
7	Temperature controller	1
8	Heater	1
9	Jumper wire	20
10	Single strand wire	2 meters
11	Multi strand wire	1 meter
12	Aluminum Foil	1
13	Fevicol Marine	1
14	Hose pipe (6 mm)	2 meters
15	Switch	2
16	Adapter 12 V	2

Analysis and Mechanism

FEA Analysis of structure Base

Static structural analysis was carried out on the outer structure of base. A force of 50N was applied on the base and a mesh of 2mm was given and results were obtained. The structure was found to be safe under static loading.

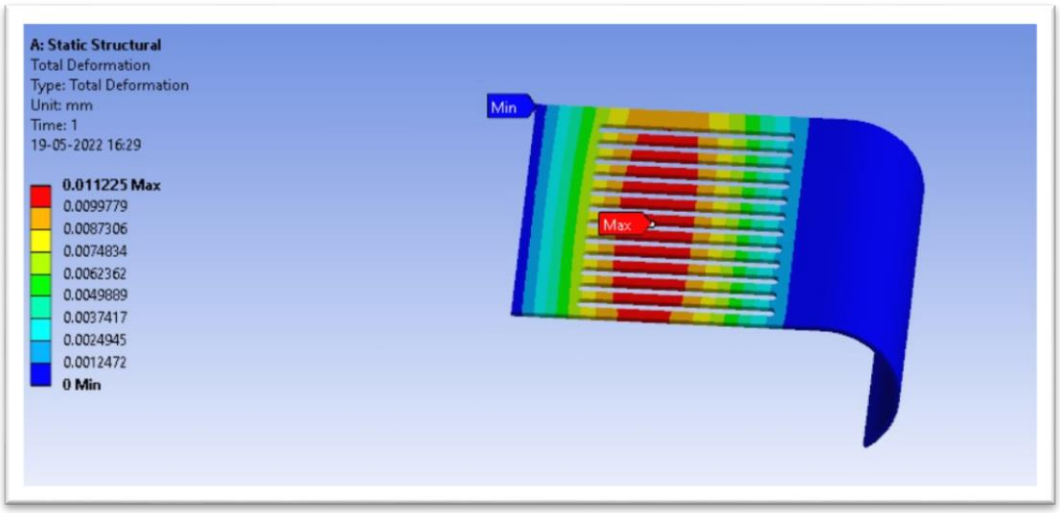


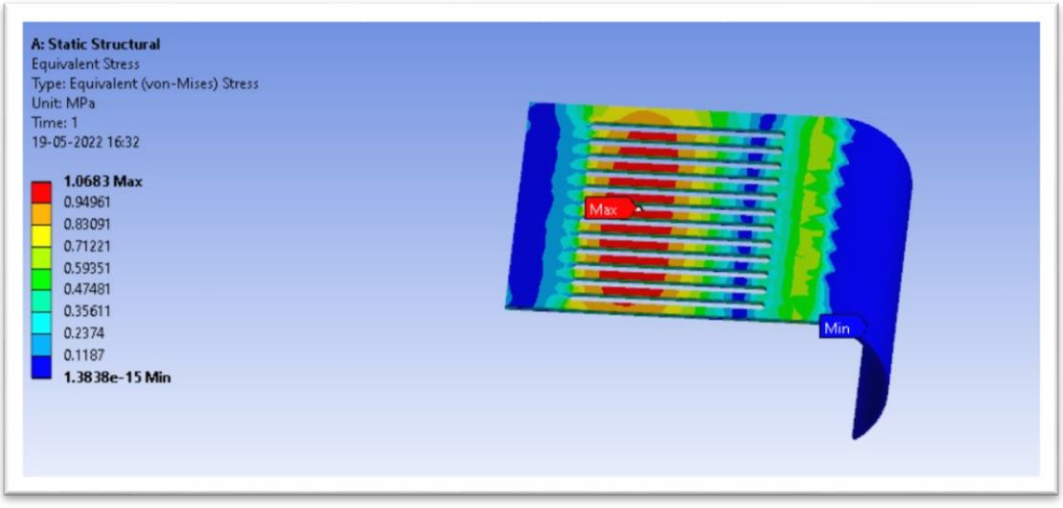


Particulars	Maximum	Minimum
Stress (MPa)	0.0002419	0 .0002115
Deformation (mm)	0.03682	0

FEA Analysis of Head Restraint

Static structural analysis was carried out on the outer structure of head rest . A force of 50N was applied on the head rest and a mesh of 2mm was given and results were obtained . The structure was found to be safe under static loading.





Particulars	Maximum	Minimum
Stress (MPa)	1.0683	1.3838e-15
Deformation (mm)	0.011225	0

Electrical

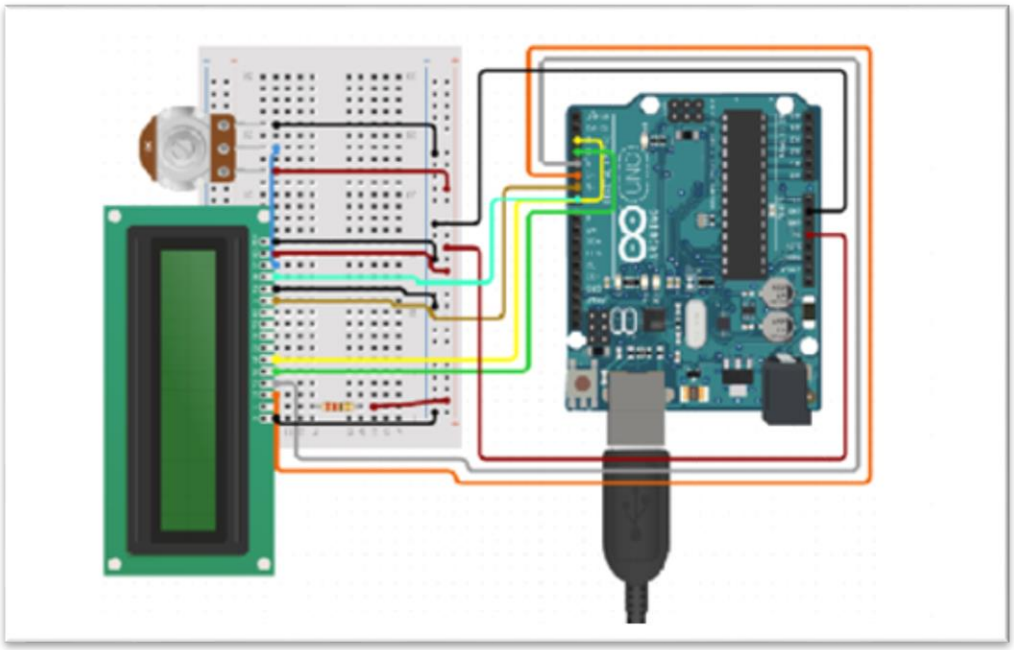
Circuit for timer display

For timer display components used are,

- 16X2 LCD display
- Arduino

Working

The Display is used to show the duration of the process done and after the process i.e., after 1 hour the buzzer rings calling the instructor for manual shut down.



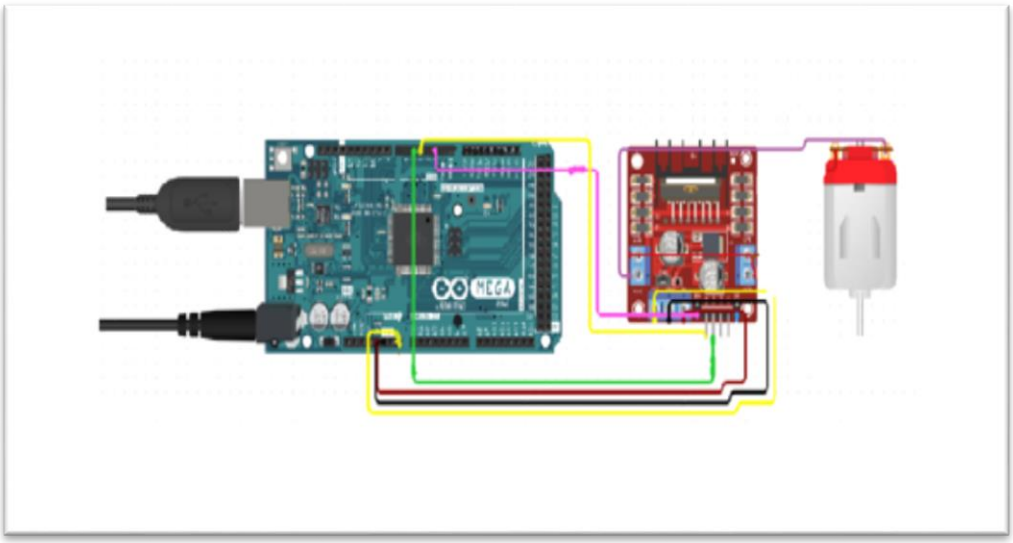
Circuit for oscillation

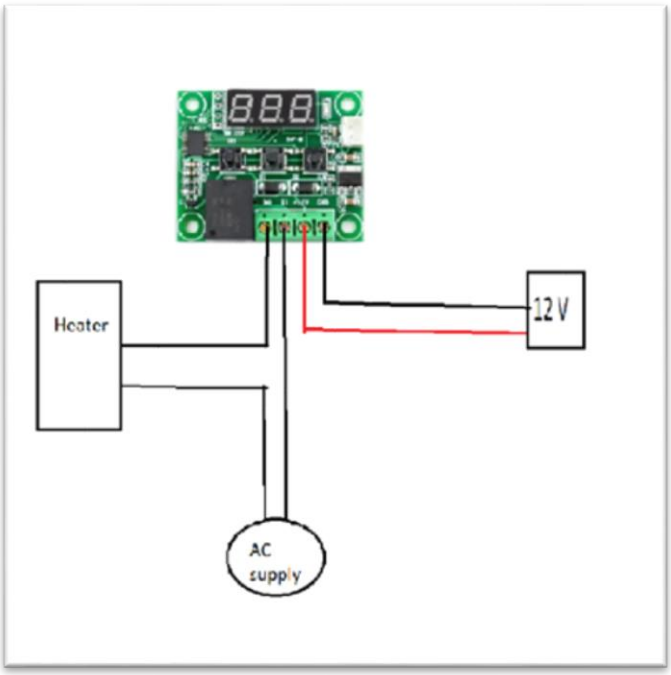
For oscillation components used are,

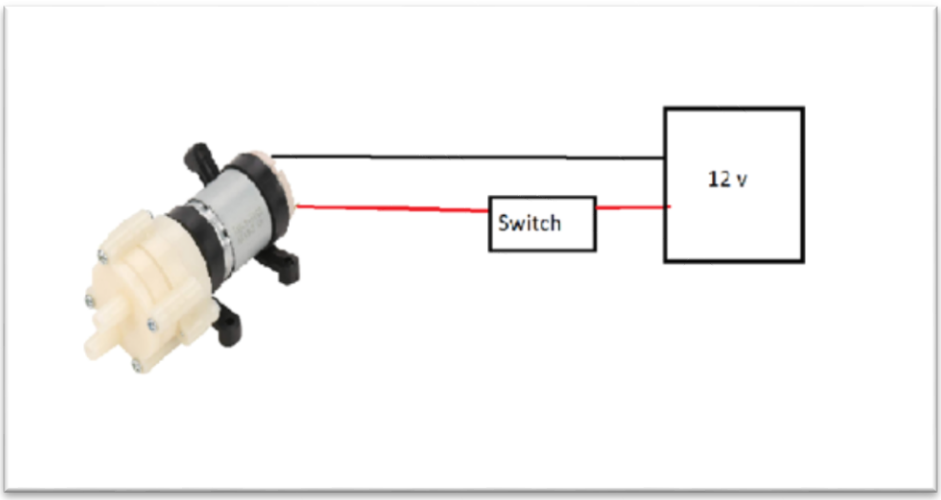
- 12 v DC motor
- L298N motor driver
- Arduino mega 2560

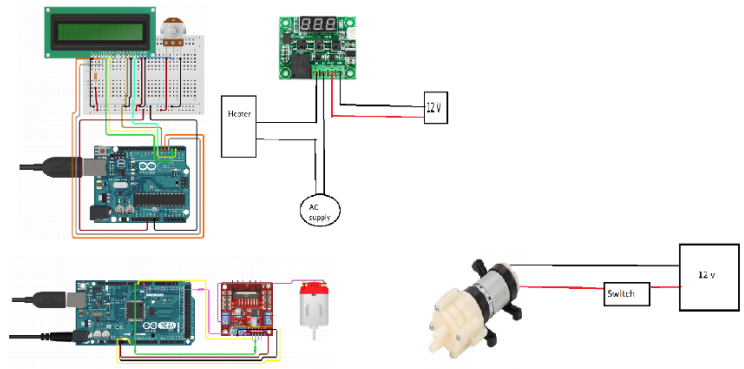
Working

The motor is driven by L298N motor driver by oscillating it for 10 mins and stopping for 10 mins. The motor turns clockwise and anticlockwise at equal duration further driving the rack by pinion attached over the drive shaft of motor.

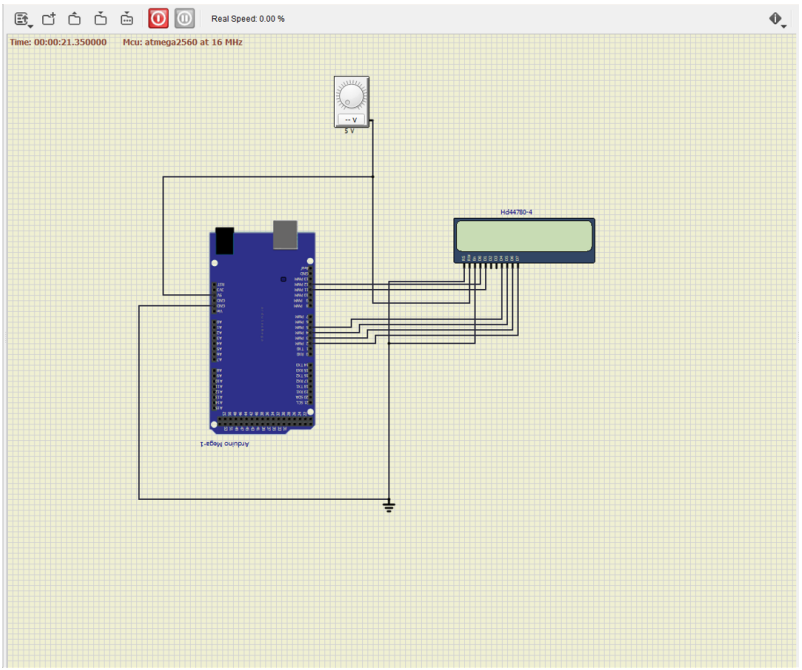


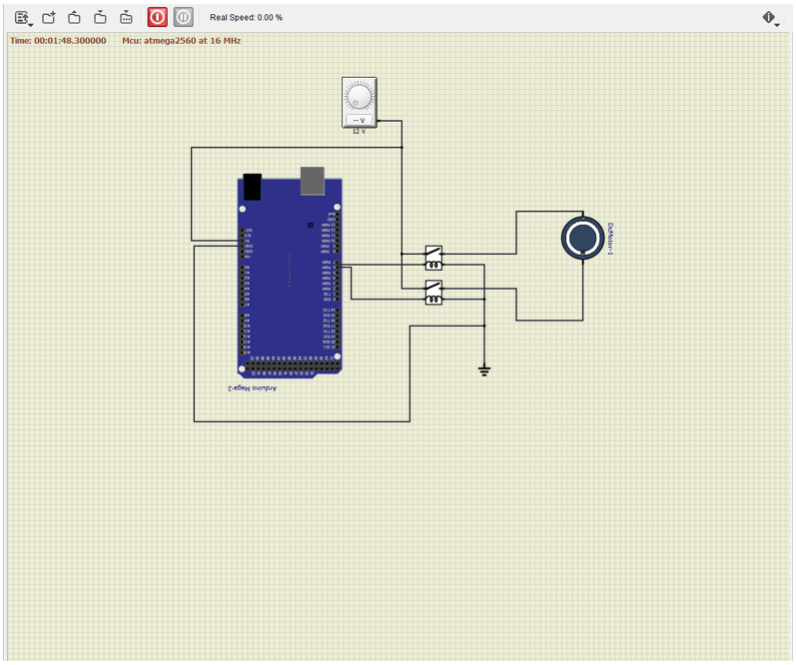

Heater
12 V
AC
supply


12 v
Switch


Heater
12V
AC supply
12 v
Switch

SIMULATIONS





Conclusion

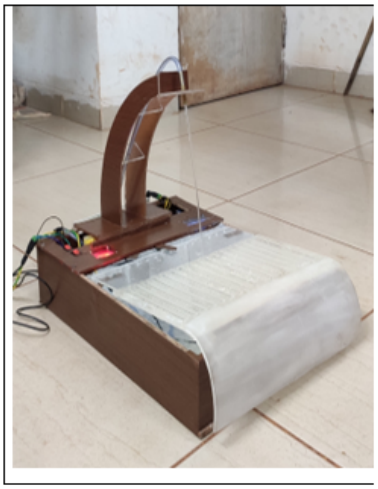
Automatic machine was a successful project as we have tried our level best to satisfy all the objectives and desired functions. We have designed it as per customer need which provides portable and automatic machine with minimal human intervention. We have designed it by keeping aesthetics and ergonomics in our mind. Shirodhara is a form of Ayurvedic therapy that involves pouring warm liquids gently over the forehead .

The team begin the literature survey over the product available in the market and identifying various parts and their function. The function was studied, which made us familiar with various kinds of machines available in the market. 3D models were designed using SOLIDWORKS 2020. The concepts of geometric dimensioning and tolerance, were used by the team in creating drawings of the parts, with the help of drafting tool of the software. The project enabled us to practically apply the previously learnt knowledge of ‘Fluid Mechanics’ ‘Measurement & Metrology’, ‘Design of Machine Elements’, ‘Computer aided engineering’, ‘FEM analysis’, to arrive at various necessary design calculations. The initial bill of materials was made, which contained the identified material which could withstand the required load to perform the function. Main parts such as base , headrest was analyzed using ANSYS 18.2 Workbench which enabled us the capabilities of our components by stating stress induced and deformation. The assembly of the model was challenging as it included the internal assemblies. The rendering tool, enlightened us on how a modelled and genuine design could be more presentable and marketable, in terms of aesthetics.

Thorough documentation of the project was carried out by the team, at each level, for reference and for evaluation by the project mentors, making it a successful project for the team.

CATALOG

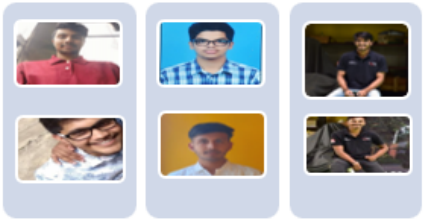
Product in use:



Operating Instructions:

- Fill the tank with water/oil then cover it with head restraint.
- Place the head on the head restraint.
- Turn on the power supply Water/oil gets heated.
- Then turn on the pump, water/oil gets circulated.
- After Completion of the process turn off the power supply.

Team Members:

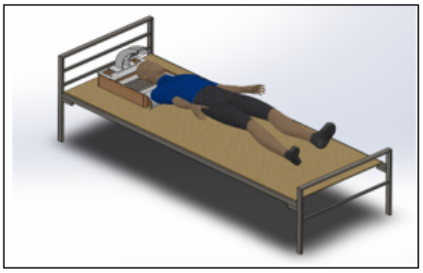


Karthik Kulkarni
Vishalram Patil
Rahul Nayak
Abhinandhan S
Vasant Kulkarni
Puneet Savalgi

Mentors:
Prof: Shivaprasada M
Prof: Mahesh G

Contact:
Karthik Kulkarni
Ph no. 8762799266
For more Demo, Videos and info scan the QR code:

SHIRAHSEKA



School of Mechanical Engineering

Minor Project Team #12

Introduction:

Shirodhara is a form of Ayurveda therapy that involves gently pouring liquids over the forehead and can be one of the steps involved in Panchakarma. The name comes from the Sanskrit words shiro (head) and Dhara (flow). The liquids used in Shirodhara depend on what is being treated, but can include oil, milk, buttermilk, Kashaya or Khadha (medicated decoction), or even plain water.

Background/Introduction

Shirodhara has been used to treat a variety of conditions including eye diseases, tinnitus, vertigo, Autism, Peripheral or vascular Headache, migraine, chronic fatigue syndrome, stress management, depression, neurological conditions, exam phobia, depression, physiological problems, stress induce disorders, allergic rhinitis, greying of hair, neurological disorders, memory loss, insomnia, hearing impairment, tinnitus, vertigo, Meniere's disease and certain types of skin diseases like psoriasis. It is also used non-medicinally at spas for its relaxing properties. This technique, known as Shirodhara in Indian Ayurvedic medicine has, until now, been practiced by pouring oil from a pierced pot suspended above the head of the patient This pot must be frequently refilled. It is difficult to ensure that the oil remains at a constant temperature. In addition to its cost, the oil also has the disadvantage that it runs everywhere (over the head, hair, table, equipment, etc.), making it difficult to maintain hygiene. This technique requires a practitioner present at all times, in order to refill the pot and sweep the patient's forehead with the jet of oil.

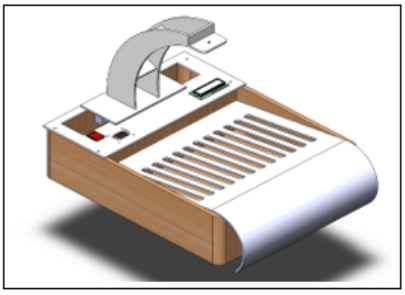
Features:

- ✓ *Temperature Display.*
- ✓ *Oscillatory Mechanism.*
- ✓ *Fluid Collector with Head Rest.*
- ✓ *Electronic Control Unit.*
- ✓ *Enhanced Safety.*
- ✓ *Buzzer.*

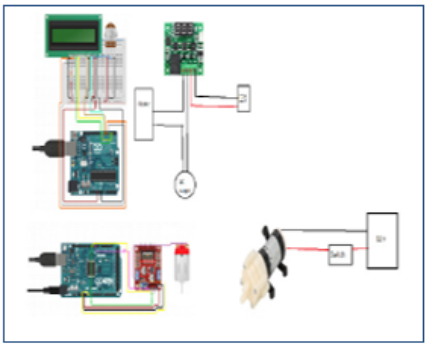
Product Specifications:

- ✓ *Pump Discharge – 3LPM*
- ✓ *Rpm of Motor -30rpm*
- ✓ *Nozzle dia:4mm*
- ✓ *Hose dia: 6mm*
- ✓ *Tank Volume – 5Litres*
- ✓ *Operating Voltage - DC 12V*
- ✓ *Process time -60 minutes*

3D Model:



CIRCUIT DIAGRAM:



Mechanism Information

A rack and pinion is a type of linear actuator that comprises a circular gear (the pinion) engaging a linear gear (the rack), which operate to translate rotational motion into linear motion. Driving the pinion into rotation causes the rack to be driven linearly.
Pinion is placed on motor and rack is attached to side member.

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A Minor Project Report on

"Portable Smoke Purifier"

Bachelor of Engineering in

Mechanical Engineering

Submitted by

Samee Khan Bhagewadi	**01FE19BME135**
Malatesh Kesari	**01FE19BME156**
Shivanand Guraddi	**01FE19BME138**
Ritish Mirje	**01FE19BME142**
Prajwal Kadagi	**01FE19BME145**
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Under the Guidance of

Prof. Gururaj F

Prof. Girish C

2021-2022

School of Mechanical Engineering

K.L.E Technological University, Vidyanagar,

Hubballi 580031

CERTIFICATE

This is to certify that Minor Project entitled "**Portable Smoke Purifier**" submitted by **Team 3** to the **KLE Technological University, Hubli-580031,** towards partial fulfillment for the award of the degree of Bachelor of Engineering is a bona-fide record of work carried out by him/her under our supervision. The contents of project report, in full or in parts, have not been submitted to any other institute or university for award of any degree or diploma.

Guide	**Head of department**
Prof. Gururaj F	Dr. B. B. Kottursheettar
Prof. Girish C	

ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without mentioning the people who made it possible and whose guidance and encouragement has made our efforts successful.

At the outset, we would like to express our deep sense of gratitude for our guide **Prof. Gururaj F** for making this project report successful through their invaluable guidance at every stage of the project report.

We also thank **Dr. B. B. Kottursheṭtar** for his encouragement in undertaking the task of this project. We express our sincere regard and gratitude to our project co-ordinators **Prof. Gururaj F and Prof. Girish C** School of Mechanical Engineering, KLE Tech,Hubli.

We also thankful to all faculty members of the Mechanical Engineering Department of KLE Technological University, for helping us directly or indirectly in different stages of our project work.

Student signatures (Team 03)

Phase wise Contents:

Phase 1

1 **Refined problem statement**

1.1 Identifying end users (Customers)

- Pan Shop , General Stores , Bar & Restaurant , Bus Stops , Cinema Halls.

1.2 Identify customer needs

- Problems faced by passive smokers afftected by active smoker.

1.3Analyzing the needs

Customer:	Interviewer(s):	Date:
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical user Shopkeeper who sells cigarette products**.**	→People walking nearby shop are affected by the smoke. →People buying some other products may get affected through smoke.	Create a smoking area/zone.
Passive smoker at public places (bus stops).	He doesn't feel comfortable when a person smokes in front of him.	The smoker should have some decency that he should maintain some distance from non smokers.
Bar & Restaurant (Workers & Customers)	No space/zone for smoking in bar & restaurant.	They need a device to purify the air (smoke) and maintain a pleasant environment.

1.4 Requirements List

Customer	Requirements
1] Shopkeeper who sells cigarette products. **2]** Passive smoker at public places (bus stops). 3] Bar & Restaurant (Workers & Customers)	➔ We need a device which can purify smoke
	➔ The device should be portable.
	➔ It should be chargeable.
	➔ It should be cost efficient.
	➔ It should be light in weight , so that it should be easy to carry.
	→ It can be easily maintained.

Phase 2

2. Product Benchmarking

2.1 Studying and exploring competitive products

Products (Images or name)	Specifications	Cost	Advantage	Limitations	Availability
1] Coway Airmega 200M True HEPA Air Purifier 	Captures and reduces up to 99.97% of 0.3-micron particles in the air	$197	Filter replacement indicator checks both Pre-filter and HEPA filter respectively.	Power Consumption: 77 W	WALMART(USA)
2] Germ Guardian Air Purifier 4-in-1 with HEPA Filter 	Optional UV-C light technology works with Titanium Dioxide to reduce airborne bacteria.	$98	Product Dimensions (L x W x H) 8.50 x 8.50x 22.50 Inches.	This product can expose you to chemicals including lead or lead compounds.	WALMART(USA)
3] Philips AC1215/20 Air Purifier 	Vitashield Intelligent purification automatically senses air quality and removes 99.97% airborne pollutants as small as 0.003 microns.	Rs10,214	4-color air quality indicator gives real time air quality feedback Removes 99.9% airborne viruses.	Power Source:- Corded Electric	AMAZON INDIA

4]Nectar HexaOne Air Purifier 	HIRD, a proprietary patented technology used in our Portable Air Purifier	6,999 Rs	360° Rotation: A full rotation of 360 degree to adjust different air flow direction.	Needs regular cleaning of the filter	AMAZON INDIA

2.2 Patent search

Patent Name/ Number/ Date	Information
Patent Name – Personal Rechargeable portable ionic air purifier **Patent No- US 20150352564A1** **Date - Dec. 10, 2015**	A portable rechargeable personal ionic air purifier energizing a personal airspace and cleaning particulate pollutants there in a manner that poses little or no personal shock risk that maximize battery life. Ionization actuation means cooperative to provide ion bursts at regular intervals to energize and to clean particulates from the personal airspace. The ion emitter may be removably mounted to a portable housing and/or to a facemask or other objects in the personal airspace via an elongated flexible cable.
Patent Name – Filter device to reduce cigarette smoke **Patent No- USOO.5908479A** **Date - Jun. 1, 1999**	A filter device for use when Smoking cigarettes, which safely carries a lit cigarette therein, allows the Smoker to inhale Smoke from the cigarette and then either to exhale the Smoke into the air or back into the device, which captures the Smoke and prevents it from escape into the air.
Patent Name – Personal Smoke Filter or Smoke TrapPatent **No- US20100206319A1** **Date- Feb. 16, 2009.**	A personal smoke filter or smoke trap includes a hollow tube having an input opening to receive the Smoke exhaled by a user, and an exit opening. The tube contains a paper filter, a first fiber filter; a carbon filter; and a second fiber filter. The fiber may be polyester.

2.3 Literature survey

Literature details	Gathered Information
Self-Sustainable Air Purifier with Air Cooling System https://www.ijert.org/research/self-sustainable-air-purifier-with-air-cooling-system-IJERTCONV7IS10062.pdf	- Air pollution is a major health hazard affecting the developing and developed countries alike. The effect of air pollution on health is complex and their individual impact varies from one to another. - The apparatus is cost effective for regular use owing to its minimal power consumption and eco-friendly since it uses mud pots for cooling instead of compressors.
PORTABLE AIR CLEANER SELECTION, CARE AND MAINTENANCE.	Air-purifying devices, such as a portable air cleaner, can be an effective supplement to building ventilation and can help improve indoor air quality, especially when eliminating the source of air pollution is not feasible and/or increasing outdoor air ventilation is impractical or ineffective.
Effectiveness of particle air purifier in improving air quality in classrooms. http://nrs.harvard.edu/urn-3:HUL.InstRepos:37945127	This project is mainly designed to purify air quality in classrooms/ schools. Indoor air pollution contributes to respiratory illness in children and such is a serious public health and environmental health issue. At the same time fine particles emitted outdoors contribute to indoor concentrations due to infiltration by various pathways.

Origin of Air Purifiers

- The very first air-purifying apparatus was developed by Lewis P. Haslett and received its patent in 1848. In the 1850s, John Stenhouse used charcoal filters as an air purifier. Also. this led to the development of gas masks which were used in the London industries as a personal filter to protect workers from toxic gases.
- In 1940, the US Atomic Energy Commission invented the HEPA filter to clean air contaminated with radioactive particles. After World War II, the HEPA filter was released to the public and is now majorly being used by air purifier companies as a heavy-duty filtration device.

Current purifier technologies

One can group the current air purifier technologies into two categories:

Air Purifiers with Filters (Pre-filters, HEPA Filters, Activated Carbon Filters, Permanent/Washable Filters)

- Filter-less Air Purifiers (Air Ionizers, Electrostatic Precipitator, Ozone Generators, Thermodynamic Sterilization, Ultraviolet Germicidal Irradiation, Ultraviolet Germicidal Irradiation, Photocatalytic Oxidation Cleaners)
- Currently, HEPA purifiers rule the air purifier market. They may contribute to market growth during the forecast period as well. Activated carbon and ozone-based purifiers are expected to experience growth.
- Furthermore, photocatalytic oxidation (PCO) is one of the emerging technologies.
- PCO cleaners also use UV light to react with a catalyst – TiO2. The reaction oxidizes bacteria, viruses, fungi, odors, and volatile organic compounds and breaks the pollutants down into harmless carbon dioxide and water molecules in order to make the air cleaner.
- **Major Players in Air Purification / Purifier Market**
- Panasonic
- Daikin Industries
- Gree Electric Appliances
- LG Electronics
- Samsung Electronics
- Sharp

PHOTOS:-

Phase 3

1.Design Specifications

3.1 Brainstorming

Keywords	
Portable Durable Inexpensive Easy To Use Low Service Cost Light in weight User Friendly Safe To Use Easily Powered Easy To Carry	Less Sound Easy to repair Different fragrances Long Filter Duration Easy To Change Filters Easily Washable Long Battery Backup Rechargeable Battery

3.2 OFMC Chart

Keywords	Objectives	Functions	Means	Constraints
Portable	✓			
Durable	✓			
Inexpensive				✓
Easy To Use		✓		✓
Low Service Cost				✓
Light in weight	✓			✓
User Friendly			✓	
Safe To Use	✓			
Easily Powered	✓			
Easy To Carry				✓
Less Sound				✓
Easy to repair			✓	
Different fragrances		✓		
Long Filter Duration	✓			
Easy To Change Filters			✓	
Easily Washable				✓
Long Battery Backup	✓		✓	
Rechargeable Battery		✓		

Smaller In Size	✓			
Buttons Smooth to Use			✓	

3.3 Objectives

Objectives	
Portable	Long Filter Duration
Durable	Smaller In Size
Light in weight	Long Battery Backup
Easily Powered	Safe To Use

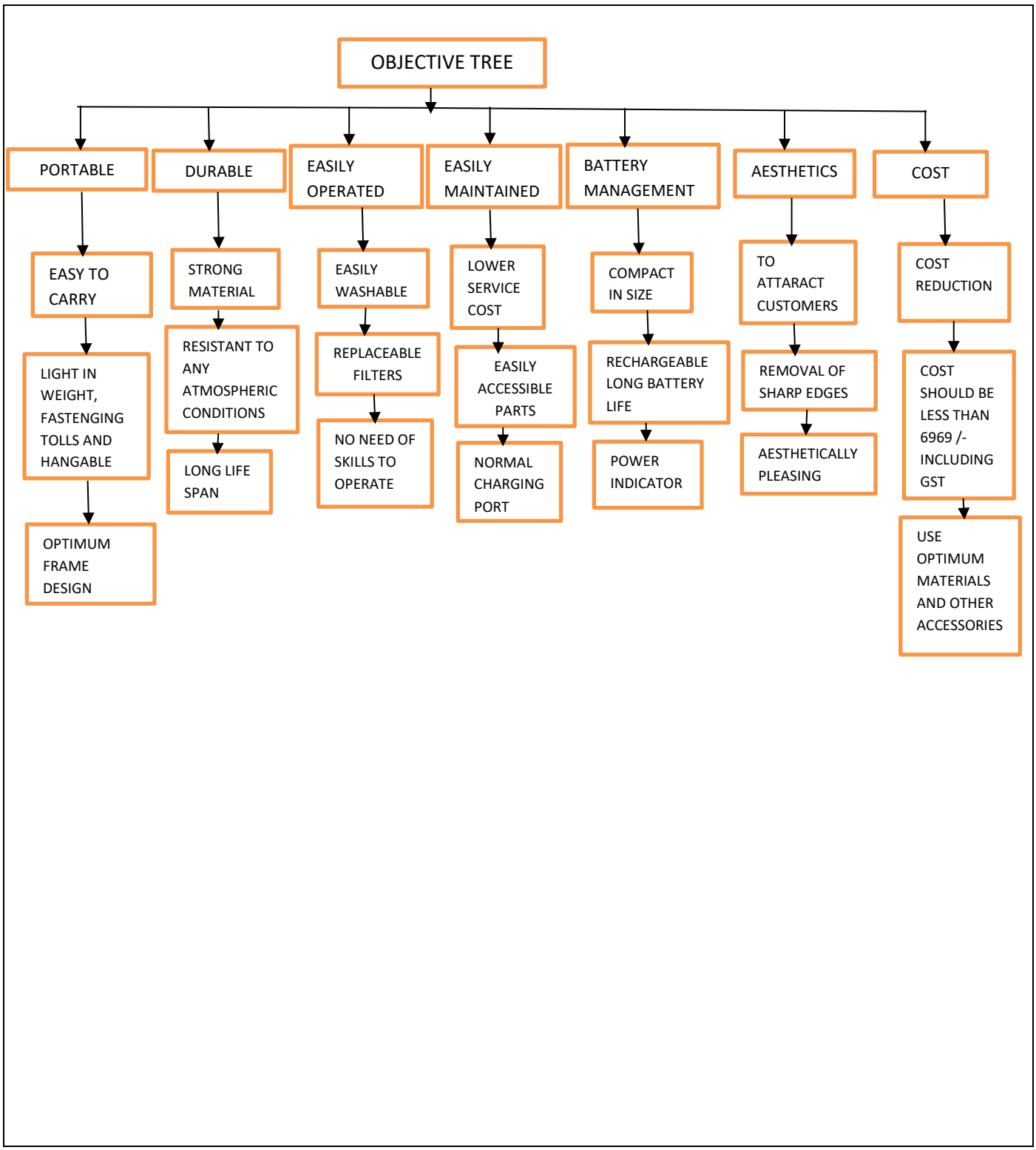
3.4 Constraints

Constraints	
Inexpensive	Easy To Carry
Easy To Use	Less Sound
Low Service Cost	Easily Washable
Light in weight	

3.5 Objective tree (affinity diagram)

O#	Objectives	First level objectives	Second level objectives	Third level objectives
1	Portable	**Ease to carry**	**Light in Weight** **Fastening tools** **Hangable**	**Optimum Frame Design**
2	Durable	**Strong Material**	**Resistant to any atmospheric conditions**	**Long Life Span**
3	Easily Operated	**Easily Washable**	**Replaceable Filters**	**No need of skills to operate.**
4	Easily Maintained	**Low Service Cost**	**Easily accessible parts.**	NormaL Charging Port.
5	Cost	**Cost Reduction**	**Cost should be less than 6969/-** **INCLUDING gst**	**Use of optimum materials and other accessories.**
6	Smaller In Size			
7	Battery Management	**Compact in Size**	**Rechargeable** **Long Battery Life**	**Power Indicator**
8	Safe To Use			
9	Aesthetics	**To attract customers**	**Removal of sharp edges**	**Aesthetically pleasing**

Objective tree: (draw your affinity diagram here)



3.6 Design Specifications:

Si.	Engineering Specifications	Units
1	Length	15 cm
2	Breadth	10 cm
3	Height	15 cm
4	Weight	2.5 Kg
5	Charging time	2 Hours
6	Charging Duration	4 Hours
7	Fan Speed	200 rpm

3.7 Competitive Benchmarking:

Metric #	Metric	Units	Competitive Products		
			Product 1 Phillips Ac 1215/20 Air purifier	Product 2 Nectar Hexaone purifier	Product 3 Germ guardian air purifier
1	Virus and bacteria removal	Percentage	99.97	99.99	99.97
2	Noise level	dB	56	53	40
3	Price	Ruppes	10214	6999	8183
4	Filters	-	HEPA	Electrostatic	HEPA
5	Coverage Range	Sq/ft	677	250	189
6	Degree of suction	Degree	360	360	360
7	Power consumption	Watt	50	69	1200
8	Dimensions	Cm	2.11*325*541	15.5*9.3*14.5	27.9*17.1*69.2
9	Weight	Kg	7.04	1.8	5.1
10	Filter capacity	Months	12-18	28-36	6-8

Phase 4

4.1 Concept Generation

Defining Functions

Si.	Functions	Sub Functions (optional)
1	**Suction of air**	
2	**Power Source**	**Power Indication**
3	**Suction Speed Control**	
4	**Filtering Of Air**	
5	**Fragrance**	
6	**Smoke Detection**	

4.2 Morphological Chart

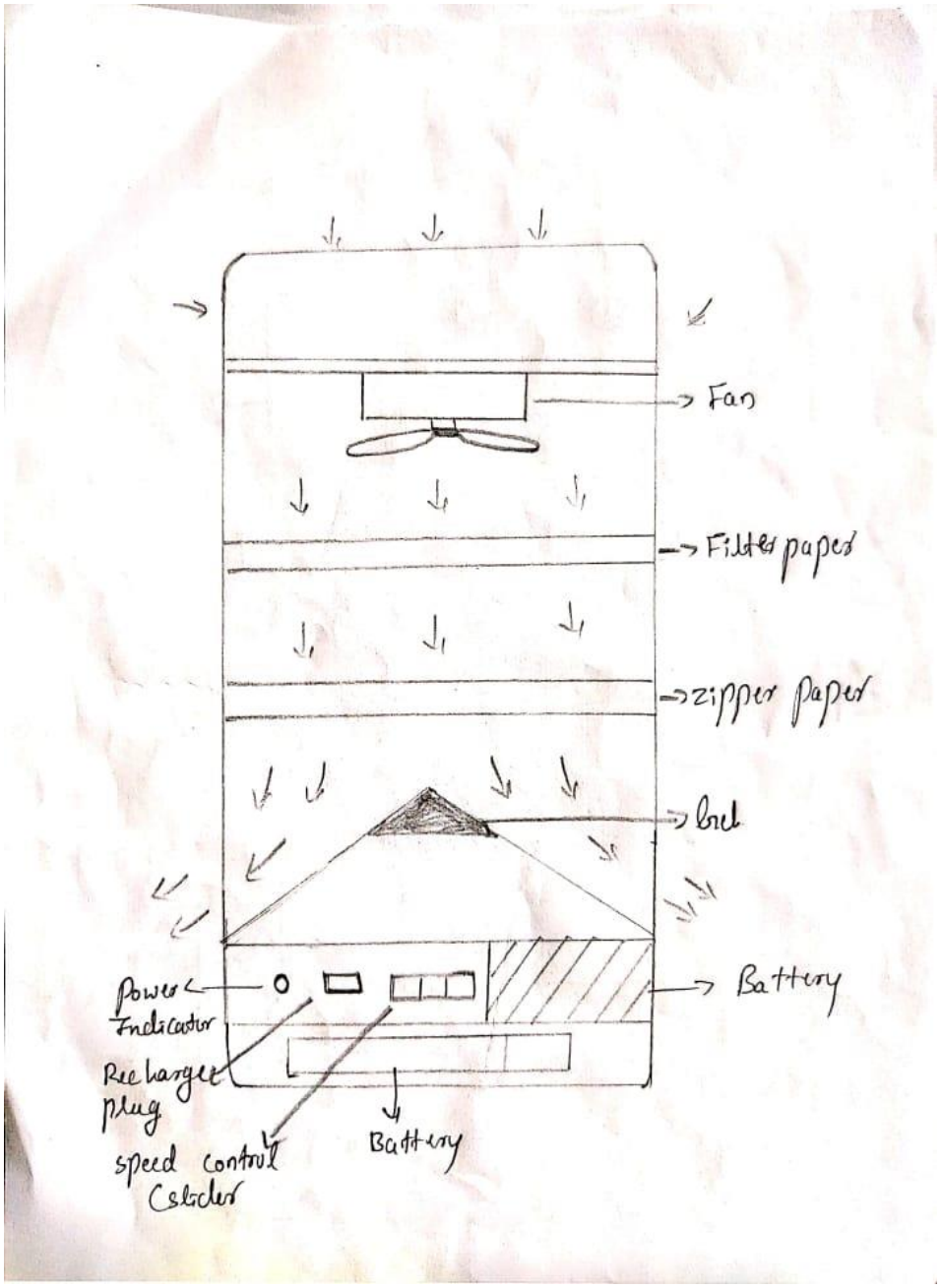
Functions ▼ / Means ▶	**Means 1**	**Means 2**	**Means 3**	**Means 4**	**Means 5**
Suction Of Air	*Stepper motor*	Vacuum Suction	DC Motor	BLDC Motor	
Power Source	Alkaline Battery	USB Port	Nickel Cadmium Battery	Lithium Ion Battery	Lead Acid Battery
Suction Speed Control	Regulator	Buttons	Touch Screen	Slide Mechanism	
Fitering Of Air	True HEPA Filter	Carbon Filter	Charcoal Filter	Odour Remover	
Fragrance	Fragrance Powder	Fragrance Spray	Gel	Zipper Papers	

4.3 Generating design alternatives

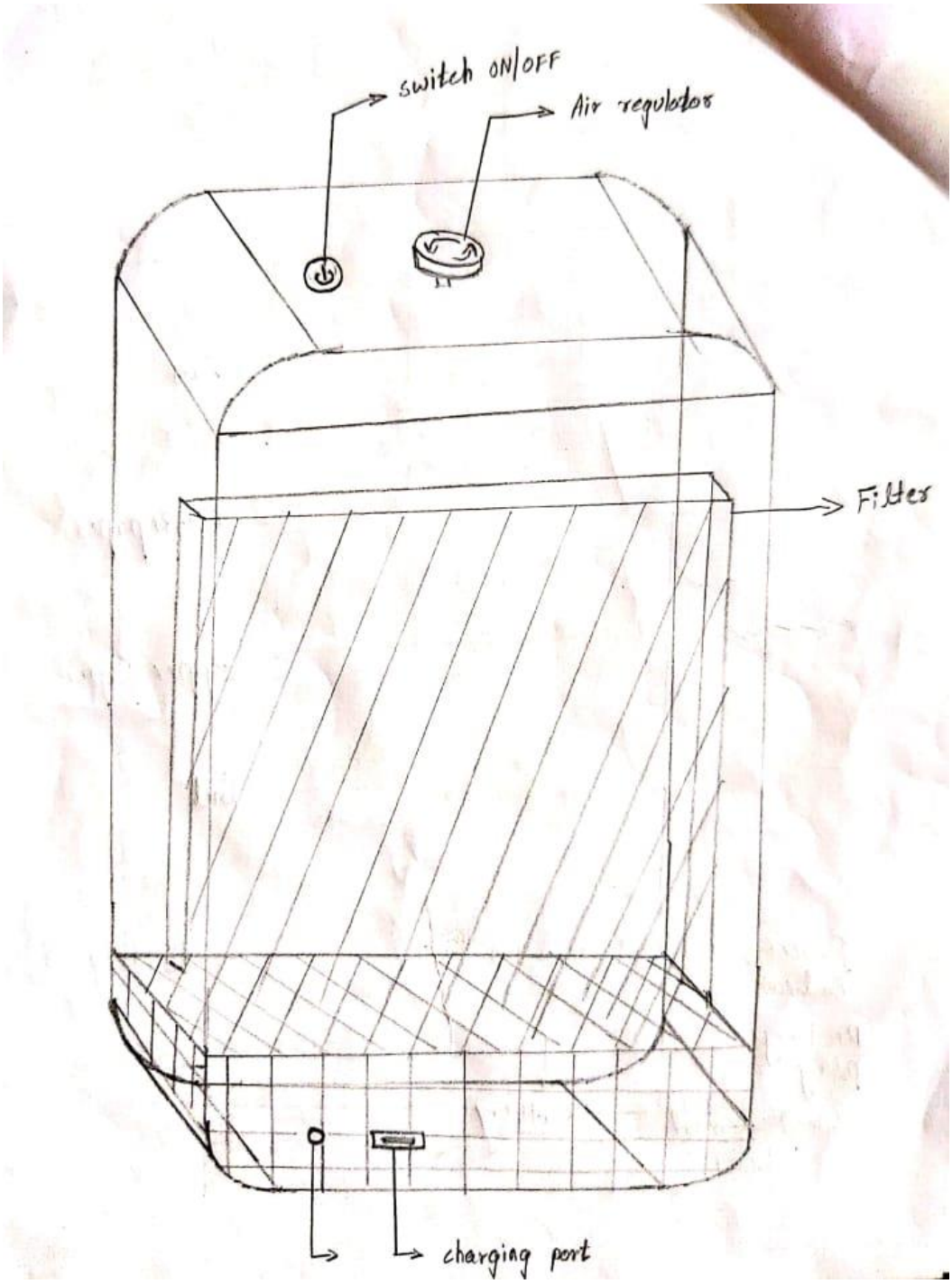
Identified Design Alternatives:

Si.	Design Alternatives
1	**360 Degrees Of Air Suction**
2	**Suction Of Air Horizontally**
3	**Discharge Of Air Through 1 Duct**
4	**Suction Through An Exhaust Fan**

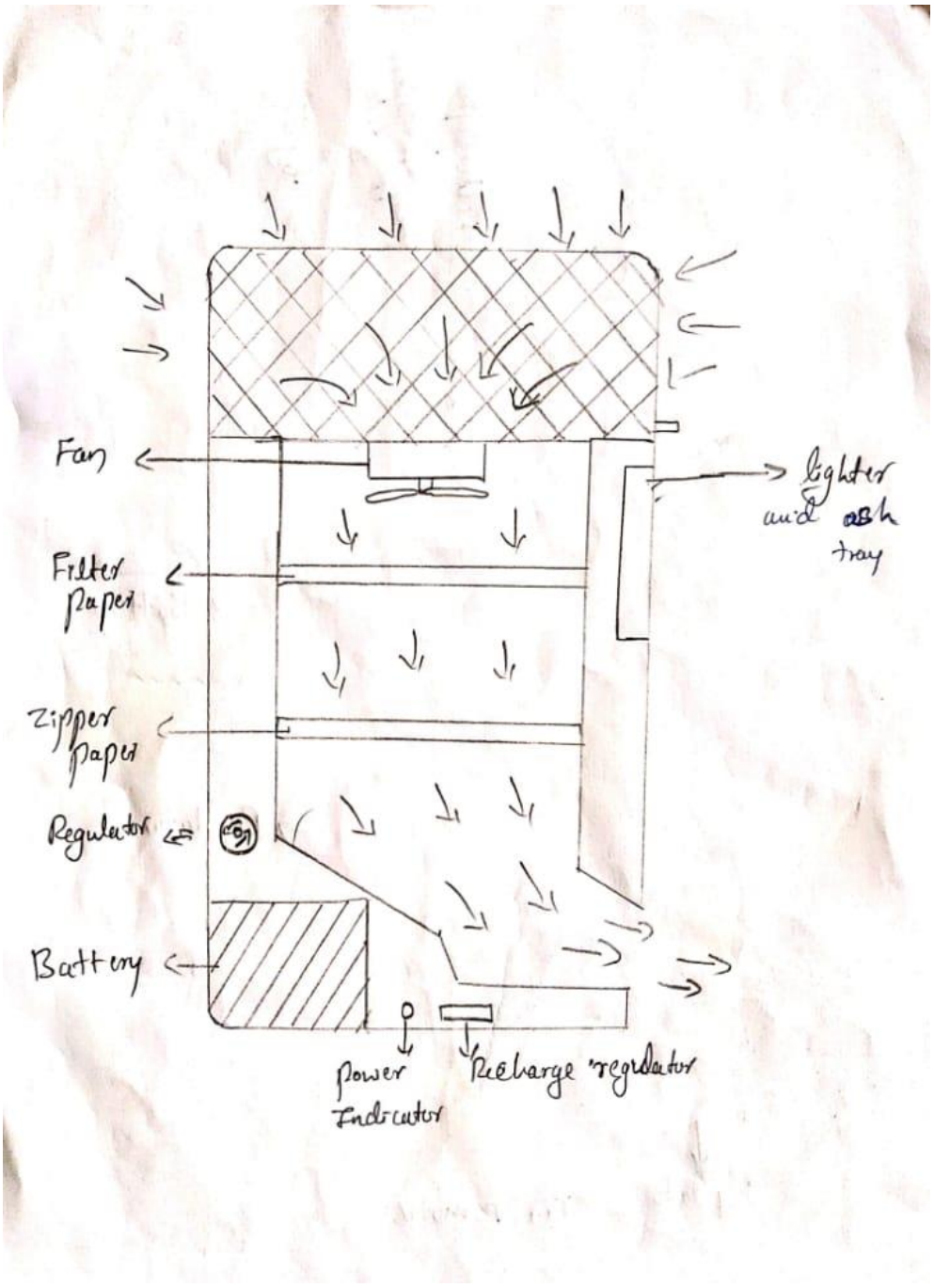
Sketch of generated design concepts/ alternatives:

Design Alternative 1


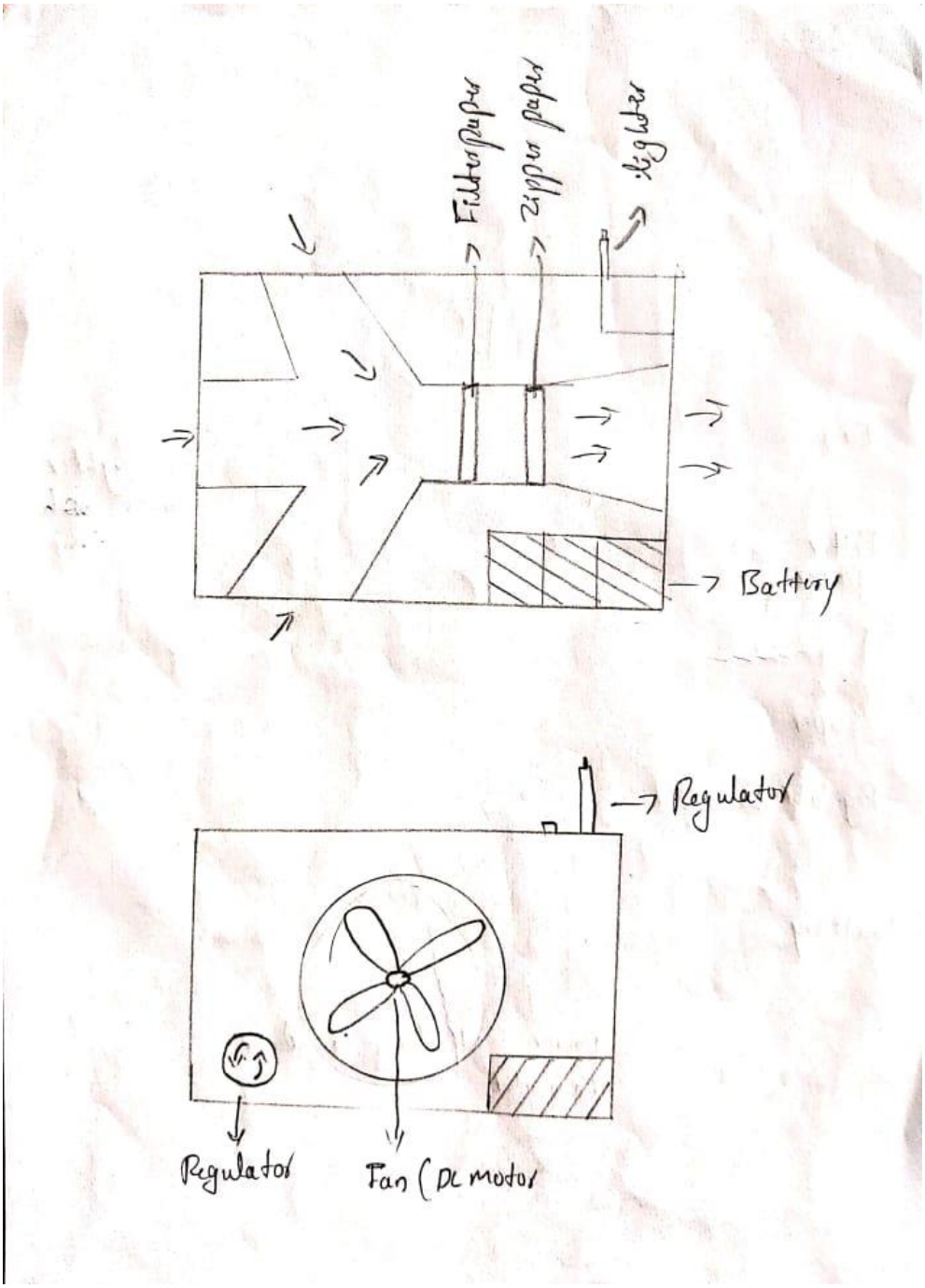
Design Alternative 2



Design Alternative 3



Design Alternative 4



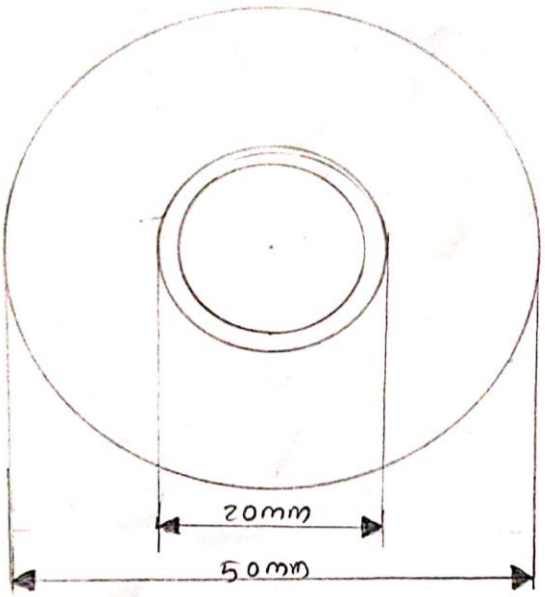
4.4 Selecting Design Alternative (Using Phugh Chart)

Requirements	Weight	Design1	Design2	Design3	Design4	Reference
Purify Smoke	10	+	-	0	+	0
Portable	9	0	0	+	0	0
Durable	10	+	+	-	-	0
Rechargeable	9	+	+	0	-	0
Fragrance	7	+	+	+	-	0
Easy To Maintain	7	+	-	-	0	0
Light in Weight	7	-	-	+	+	0
Cost Efficient	6	+	+	+	0	0
Sensing	8	-	-	+	+	0
Pluses		6	4	5	3	
Sames		1	2	2	3	
Minuses		2	4	2	4	
Overall Total		3	-1	1	-4	
Weighted Total		34	0	20	-1	
Yes / No		YES	NO	YES	NO	

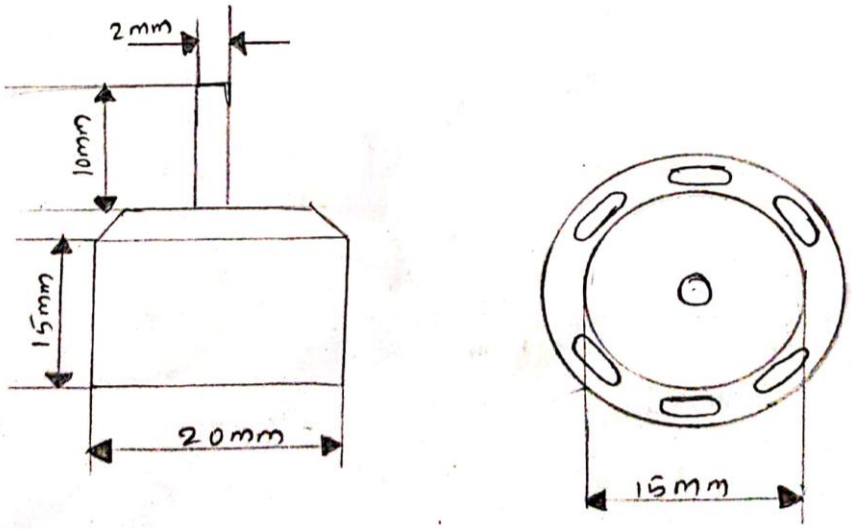
Selected Design Alternative: Design 1 is selected over design 3, As it is More Beneficial.

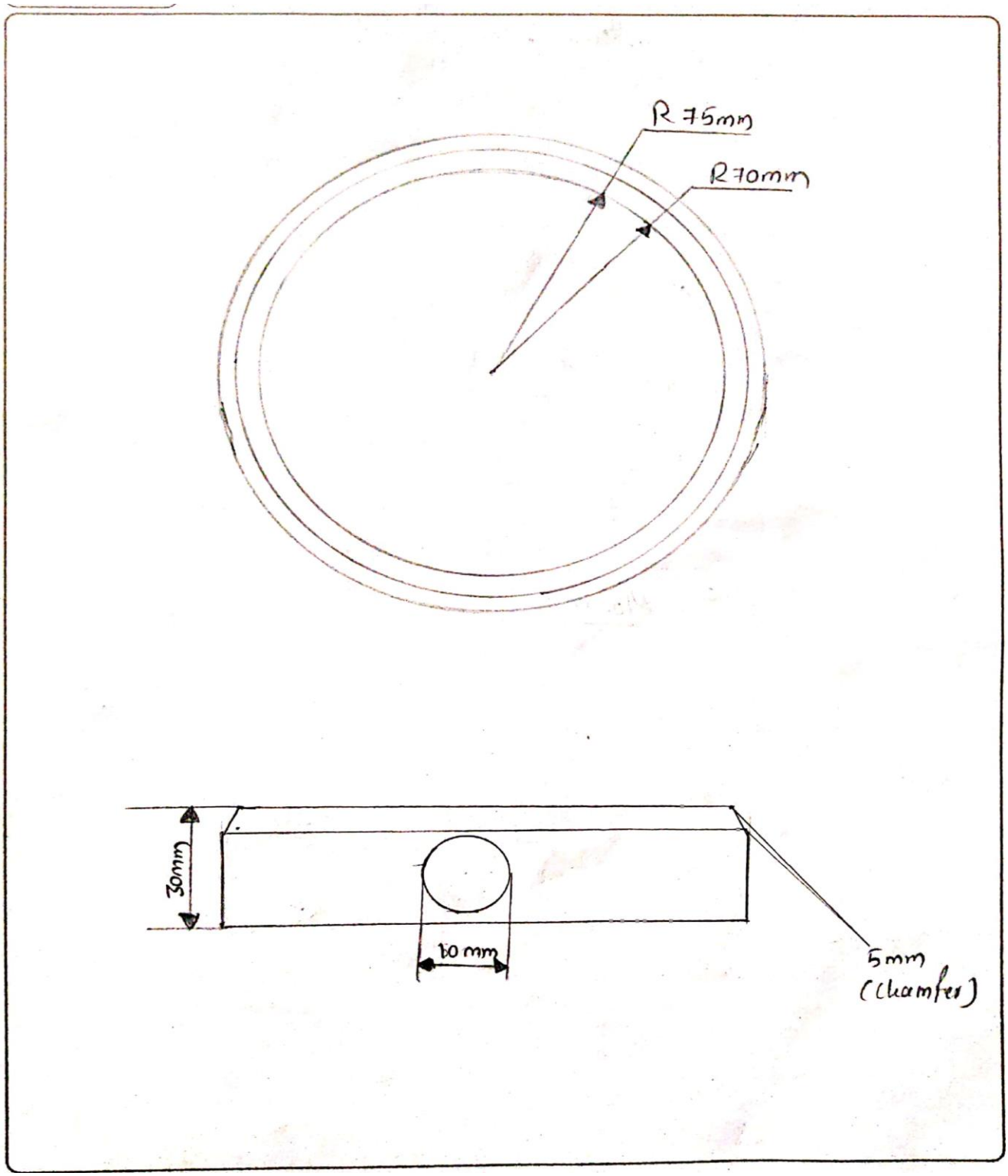
2D SKETCHES

Suction Fan

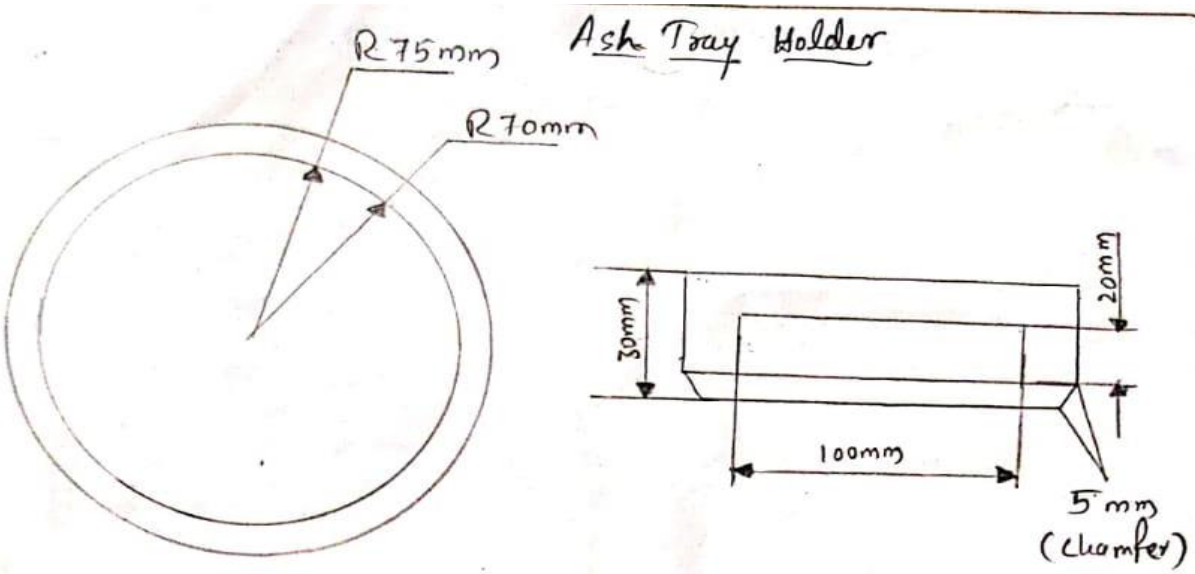


Motor

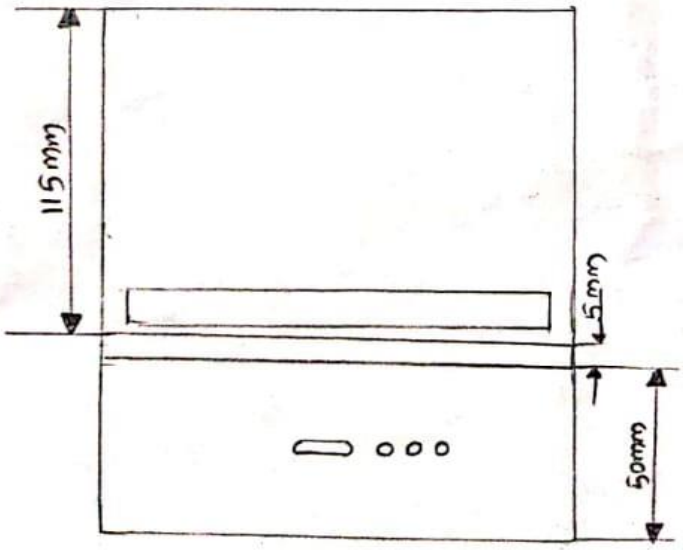


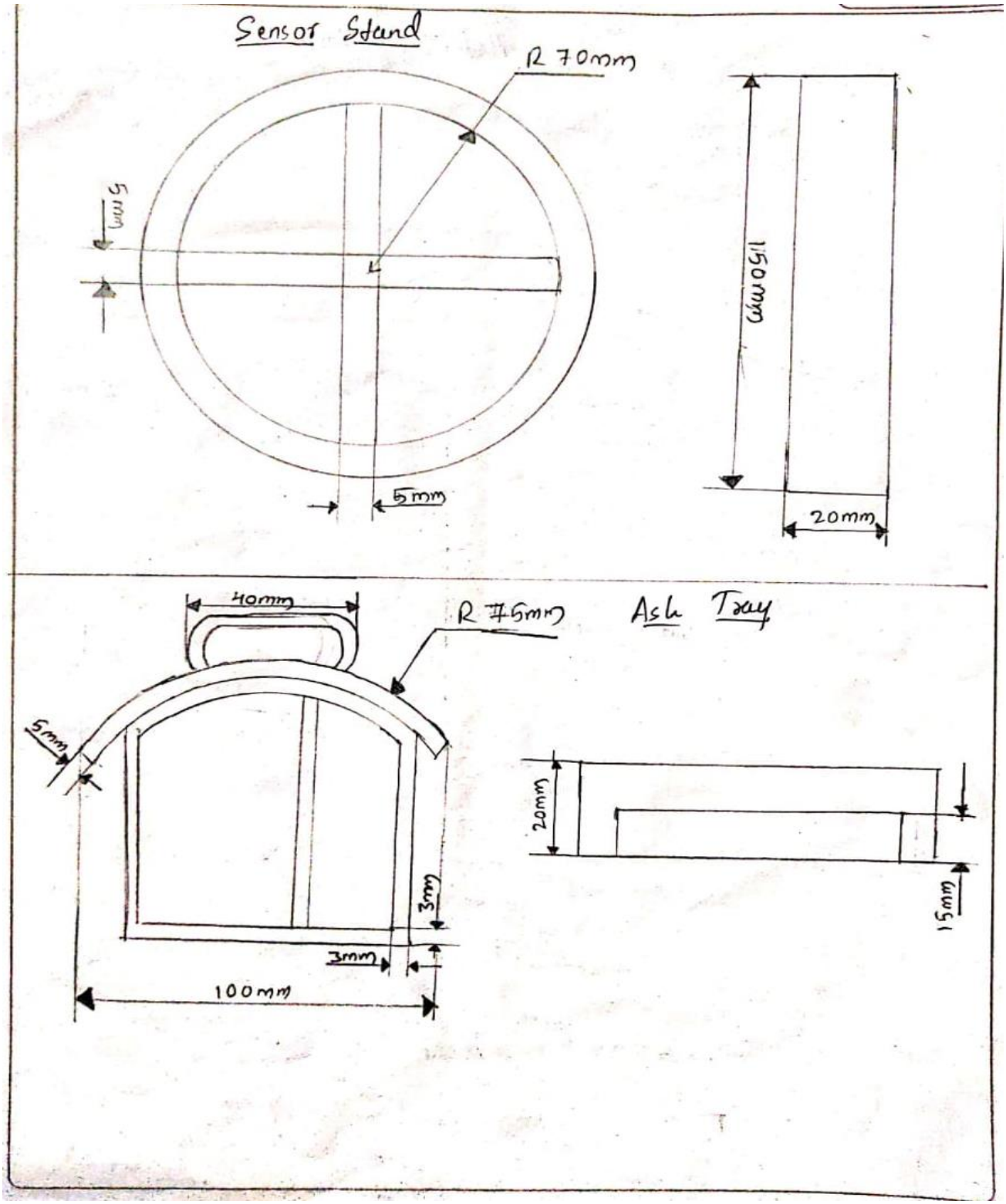

R 75mm
R 70mm
30mm
10 mm
5mm
(chamfer)

Ash Tray Holder

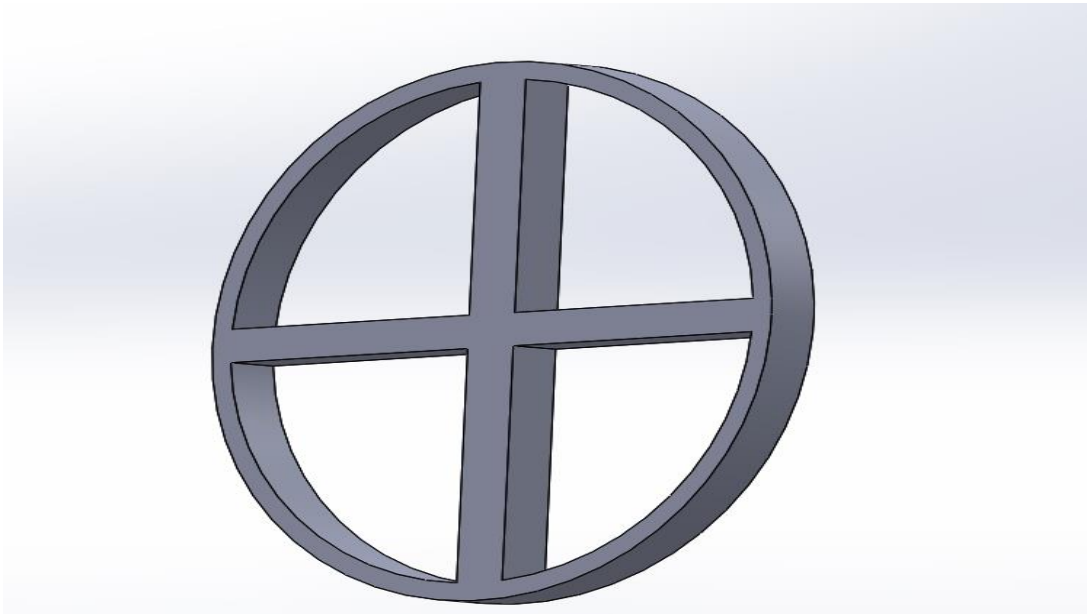
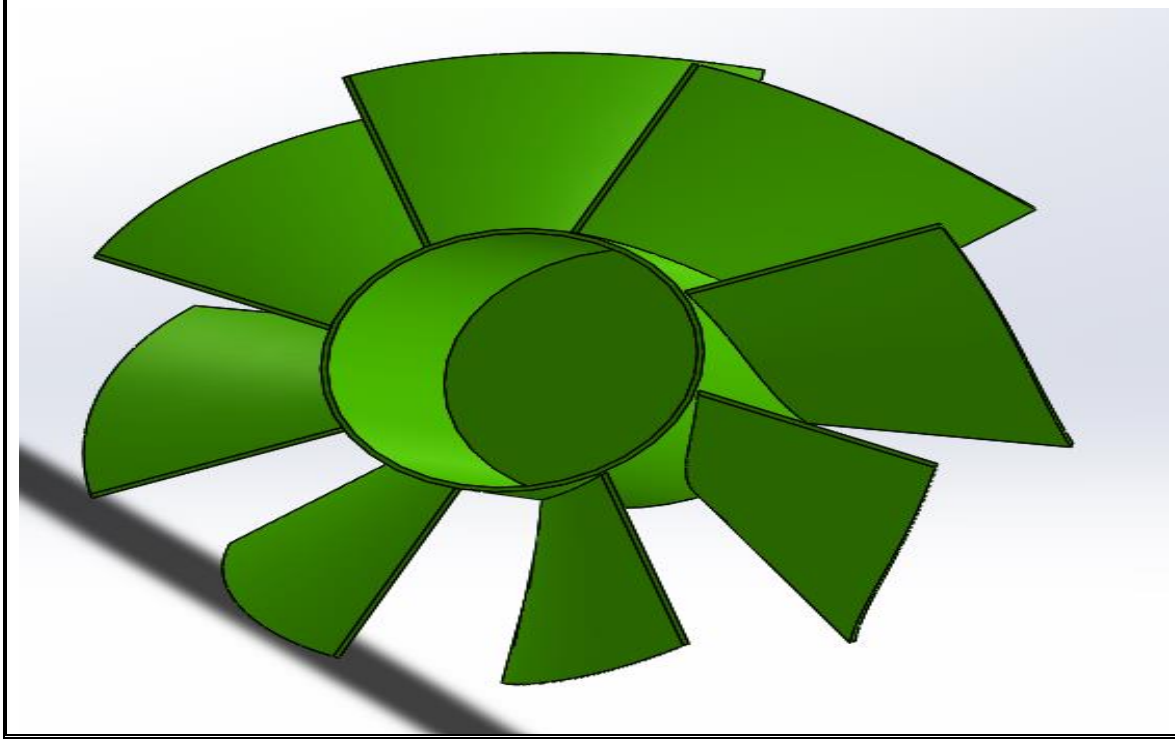


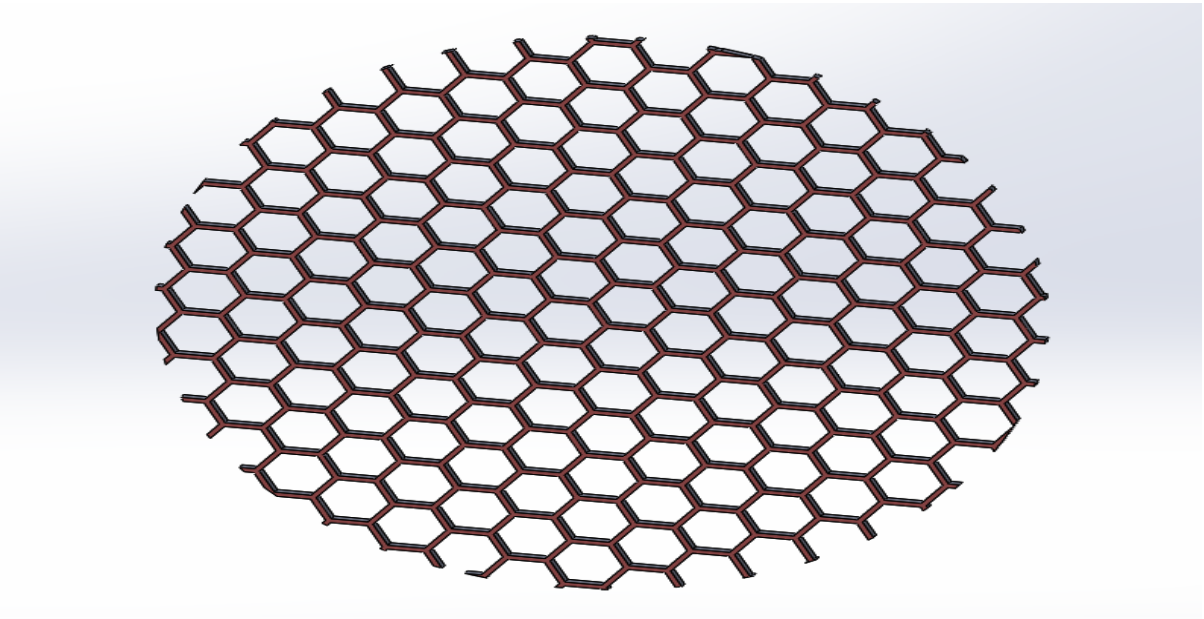
Outer Shell

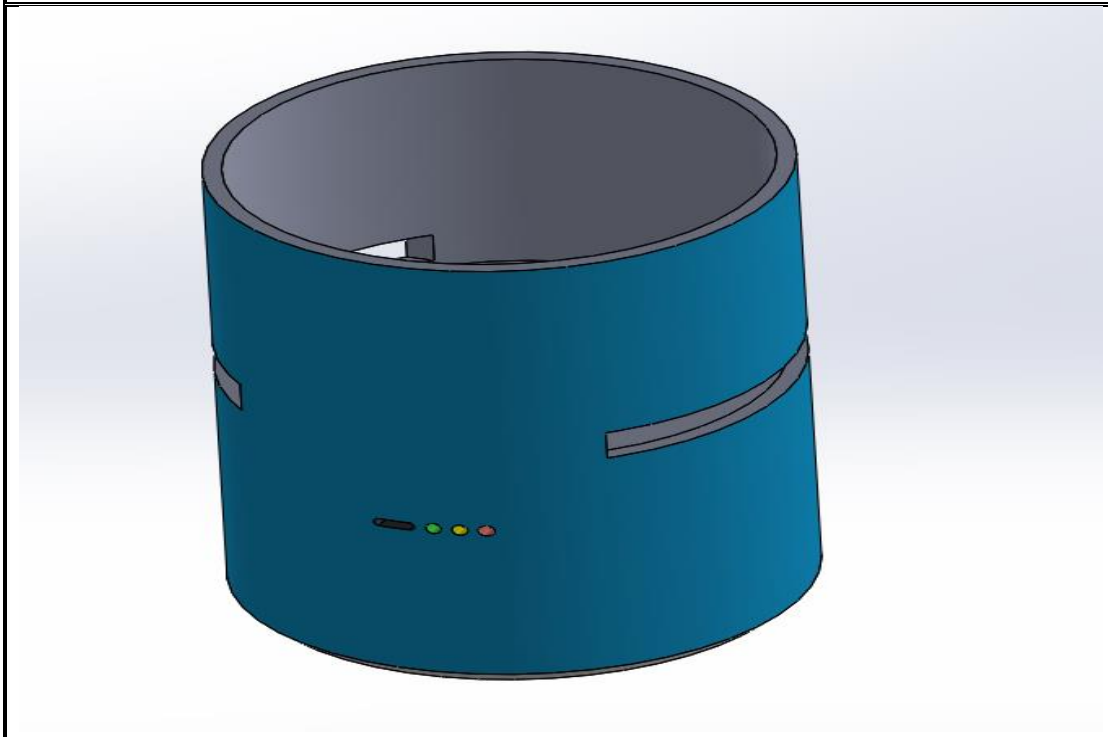
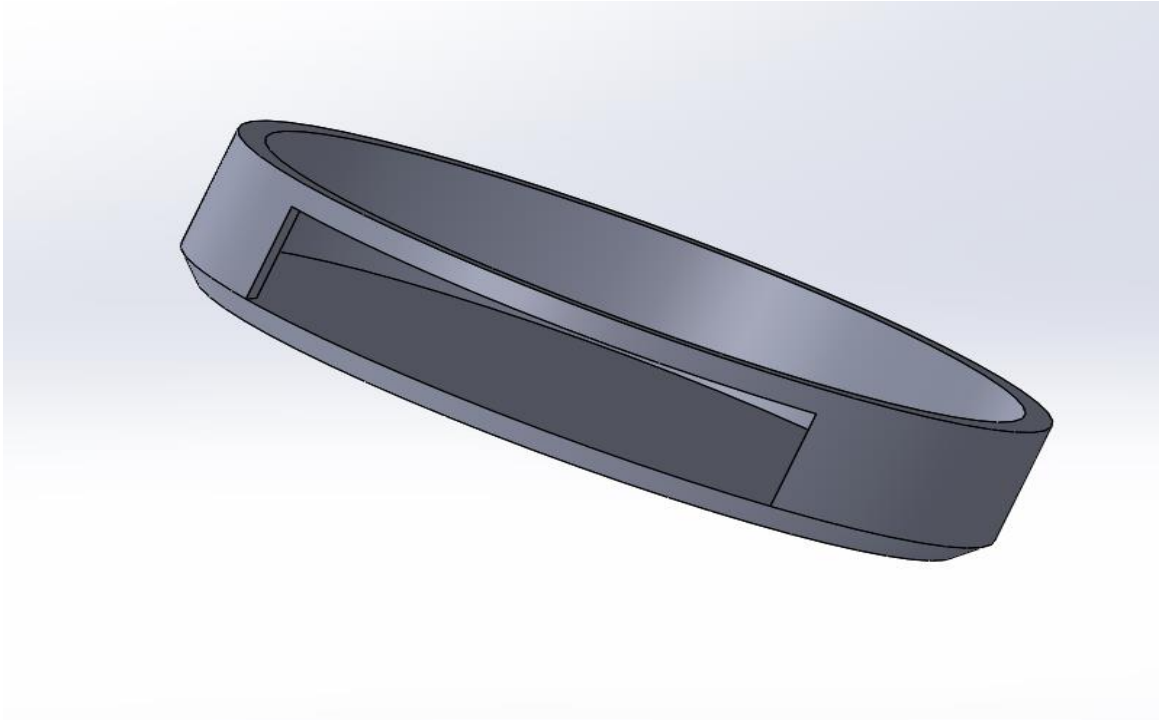



Sensor Stand
R 70mm
5mm
5mm
150mm
20mm
40mm
R 45mm
Ash Tray
5mm
3mm
3mm
100mm
20mm
15mm

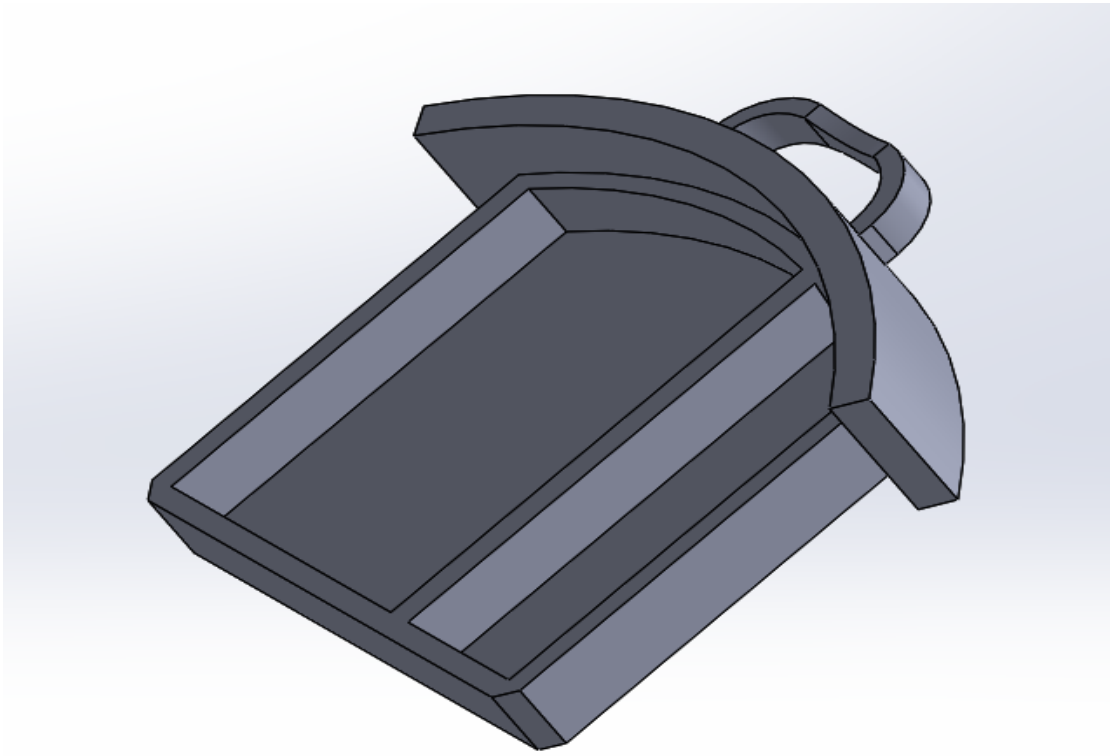
5.1 3D Model

Sensor stand

Suction Fan


Mesh Structure

Motor

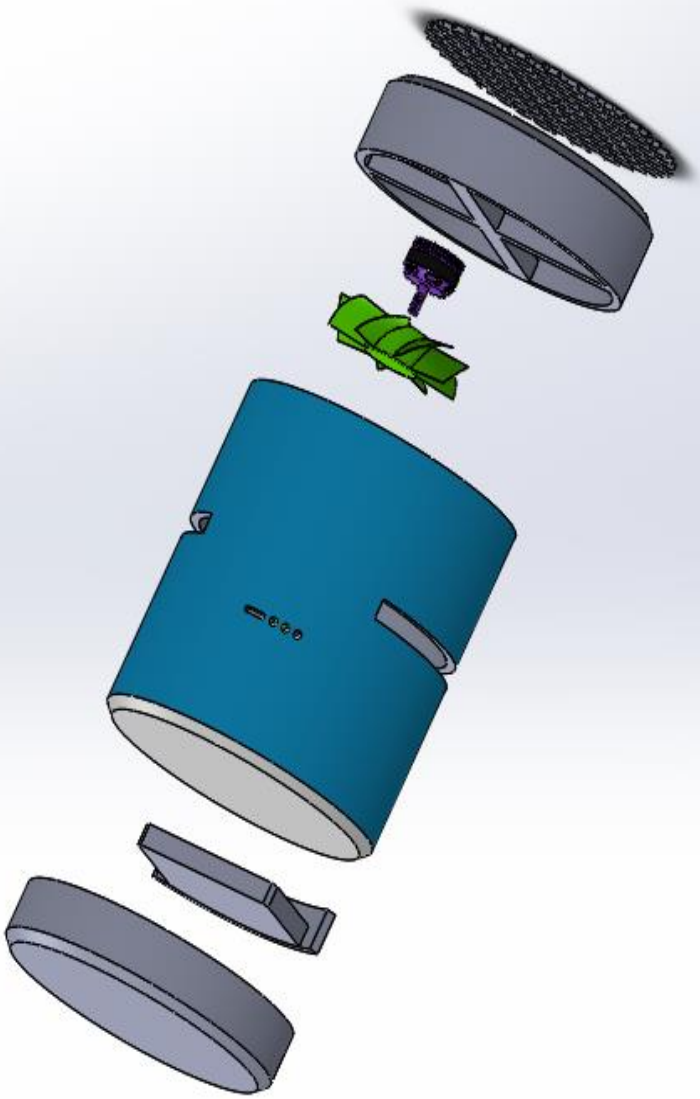

Outer Shell

Ash Tray Holder


Ash Tray



5.2 Assembly models

Assembly Model

EXPLODED VIEW

5.4 Design Calculations

Design Calculations

Design Calculation:

Torque Calculations:

Rpm of motor(n) = Frequency of the motor *60*2/No of poles

= 60*60*2/6

n = 1200rpm

For 1200rpm,

Power (P) = 0.37kW

Current = 1.7A

Noise = 60dB

The nominal torque of the motor Tn, is the torque developed by the motor at rated speed n, while delivering the rated power P.

Tn = 9550*[P/n]

= 9550*[0.37/1200]

= 2.94 N.m

Range of MQ 135 sensors

gases detected -> Ammonia, Benzene, smoke, and co_2+

other harmful operating temp gases. 0-55 C

Range --10 to 1000 PPM

Battery sizing

Type -> lithium ion

B = 100 x Ixt 100 - Q

where I, is current in Amp
't', is duration in hours
'Q', requiind remaining
charge in %.

I = P/Vdc

P in power in watts

Vdc voltage in volts

where.

(250+120)/(32+5+15)

I = 4.11 A

B = 27 Ah

In volt= 11.65 v **Approx = 12v**

SPECIFICATIONS OF CARBON ACTIVATED FILTER PAPER

A. Specifications Of Activated Carbon To Be Used In Manufacturing of Sheets

1. Base Material	- Coconut Shell Charcoal
2. Color	- Black
3. Mesh Size	- 8+16 BSS mesh
4. Iodine No	- More than 1000 mg/gm
5. CC14 Value	- More than 60-64 %
6. Bulk Density	--500+/- 50 Kg/m3 -2.0% Max
7. Ash Content	- 2.0% Max
8. Moisture Content	-Less than 5%

B. Air Sampling Sheet Properties

1. Basis Weight	- 180-190 GSM
2. Base Material	- Glass fibres and activated carbon
3. Ash Content	- 45-50%
4. Moisture Content	-Less than 5%
5. CCL4 activity	-30-32%
6. Packing	-25/50 Nos per small carton
7. Filter Dimensions	-8" x 10" each sheet

Sheet Metal Development

Sheet Metal is used to manufacture of products, components and parts made of metal. In addition to welding, cutting , bending , the processes of sheet metal also include punching ,forming ,rolling and joining.

	Tensile Strength(PSI)	Yield Strength(PSI)
Sheet Grade 50	65000	50000

Advantages of Sheet Metal

Strength and Durability. Sheet metal is strong and durable, and sheet metal parts are often able to withstand greater pressure and heat than those made with plastic.

Malleability. In addition to being durable, sheet metal is also malleable

Replaceability

Sustainability

Cost-Effectiveness

SPECIFICATIONS OF HEPA FILTER

Specifications:

1.) Filter Grade :EU-13/ H-13

2.) Media : Glass Fibre

3.) Frame MOC : AL/GI/SS

4.) CFM : 1000

5.) IPD : < 25 MM WG

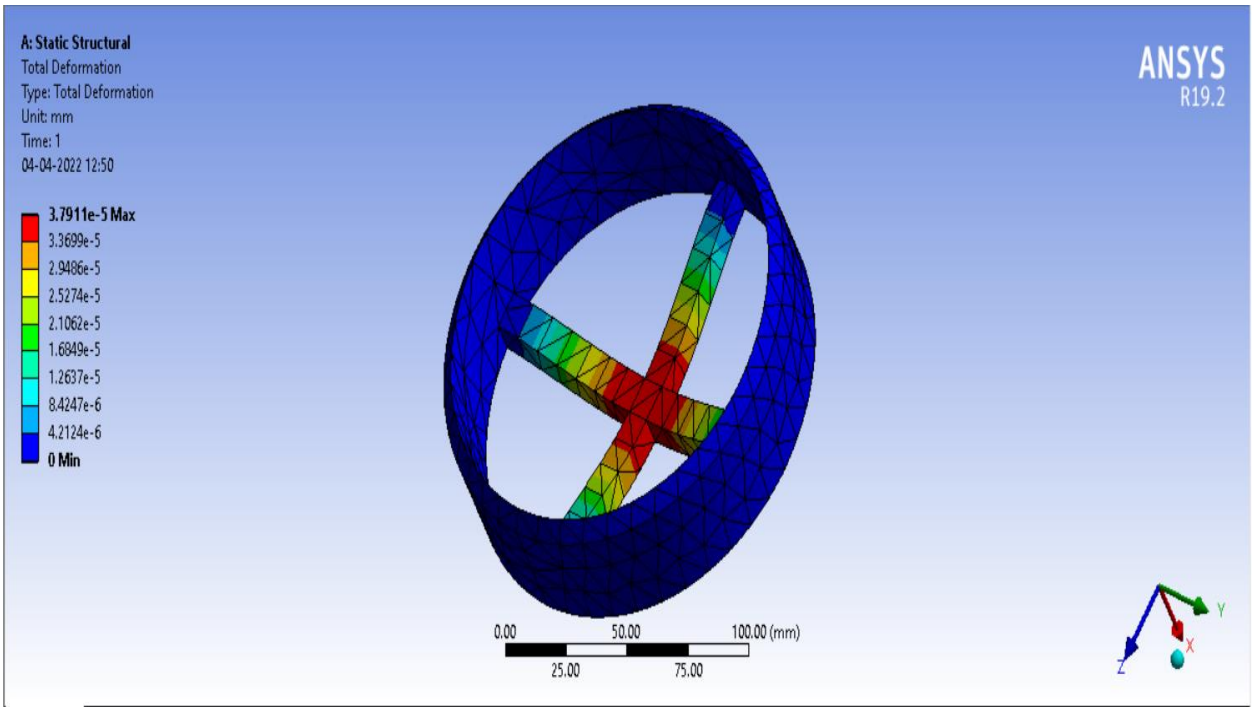
6.) Effeciency : 99.97% @ 0.3 Micron

PHASE 6

6.1 FEM Analysis of Critical Parts

Motor Holder

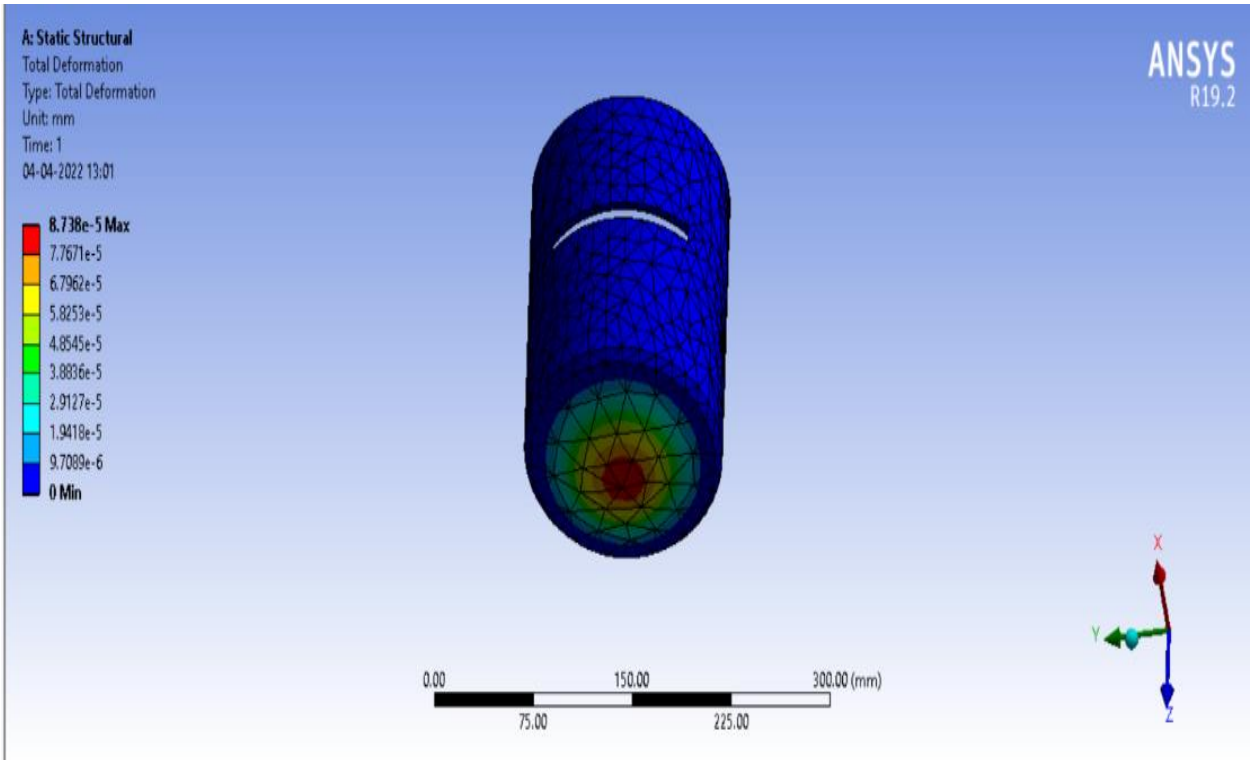
Static structural analysis was carried out on the motor holding part. A 2N force was applied on below and meshing was done. In the result, structure found to be safe



CONCLUSIONS :- The maximum deformation is 0.0255 mm

OUTER SHELL

Static structural analysis was carried out on the Outer shell part. A 20N force was applied on below and meshing was done. In the result, structure found to be safe



Conclusions: The maximum deformation is 0.0588 mm

6.2 Raw materials required for Prototyping:

#	Material	Properties /Reason for selecting the material	Part Name and Number
1	SHEET METAL	- Light in weight - High Strength - Easily foldable	- Senor stand - Mesh Structure - Outer shell - Ash tray holder - Ash tray
2	Ms metal rod	- High Strength	- Fan holder - Assembly holder

6.3 Bill of Materials

Si No	Part Number	Part Name	Quantity	Material Specification
1	1	BLDC motor	1	12V 1200rpm
2	2	Fan	1	2m suction
3	3	Battery	1	Li-ion , 12V
4	4	Filter	2	Hepa , Carbon Filter
5	5	Regulator	1	Polycarbonate 240V 50hz
6	6	Indication light	3	LED light
7	7	Charging port	1	C-type 12V adapter
8	8	Mesh Structure	1	Stainless steel
9	9	Fan holder	1	32cm Sheet metal
10	10	Ash tray	1	Sheet metal
11	11	Outer shell	1	Sheet metal
12	12	Ash tray holder	1	Sheet metal
13	13	Filter holder	2	Sheet metal
14	14	Arduino uno	1	PCB board
15	15	Screws	10	4mm

6.4 Joining techniques/ methods:

#	Joining Method	Material to be joined	Resources required and specification
1	Welding joints	Sheet Metals (Main Body, Suction Head, Ash Tray)	Spot Welding machine (No pre- processing required)
2	Soldering	Metal Rod and Fan Holder	Soldering Iron

6.5 Flow Chart:

Prepare tentative flow chart of series of operation to be followed for prototyping:

-Material used is Sheet Metal. Joining techniques for sheet metal are Taping & Folding, Soldering. Metallic net is fixed to sheet metal with screws. DC Motor & Fan are joined by Interlocking system. The whole outer bodv is done bv sheet metal.

↓

-Taping and Folding is done. Solder wire connected to Solder Gun and soldering is done for sheet metal. For fixing of screws drilling machine is used(Temporary Joint). Sheet Cutting Machine is used for cutting sheet metal.

↓

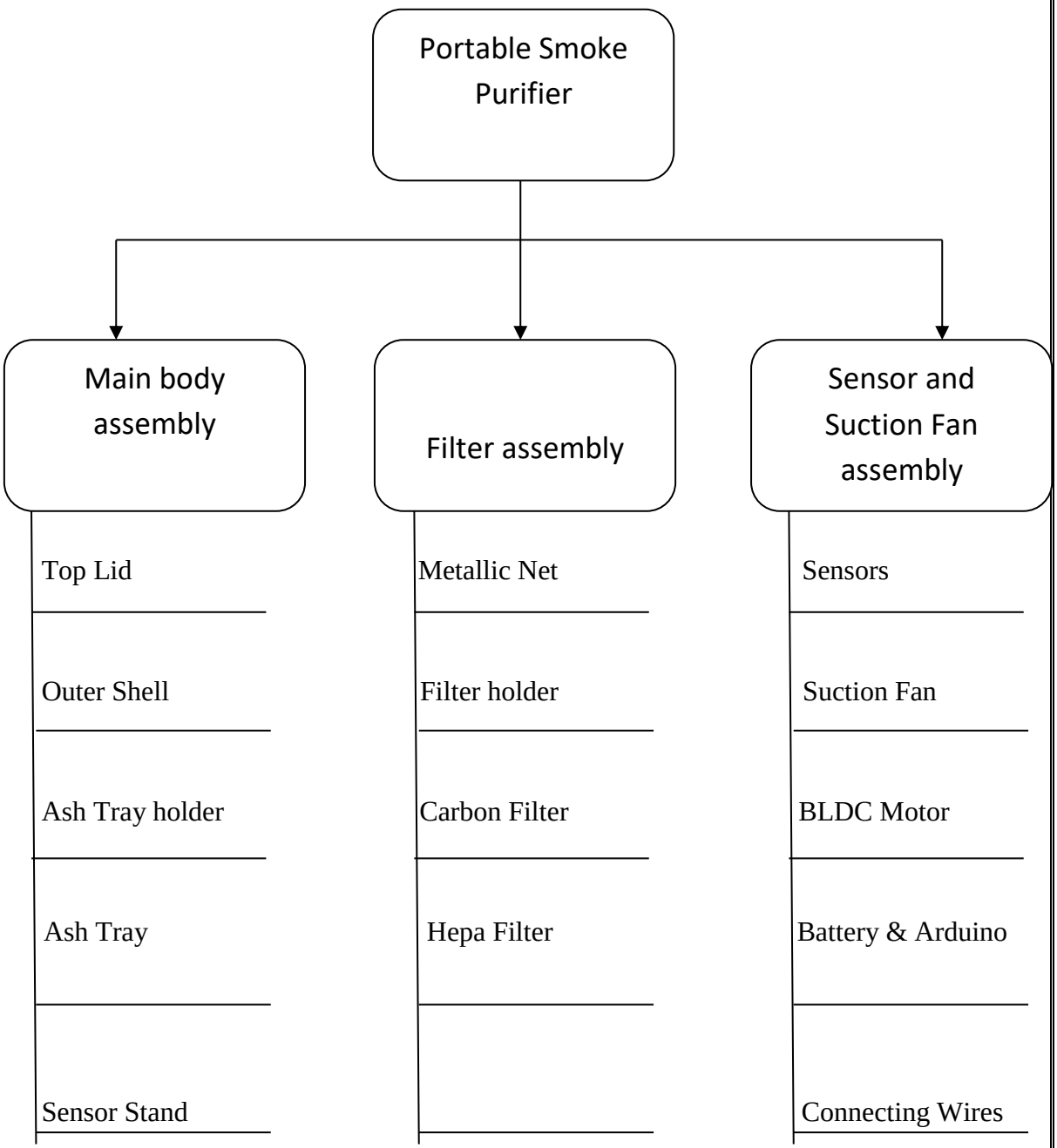
-Outer body is done by sheet metal. In inner body the metallic net is fixed. Below the net fan is placed. Fan is connected to BLDC Motor. Motor is connected to sensors. Sensors are connected to Arduino. Arduino is conneted to Battery. For Filter process (Hepa filter→Carbon

↓

Smoke is detected by the sensor → Suction of smoke→ Filtering of smoke→ Pure Air is left out. Any default found inside the prototype, modification can be done.

6.6 Sub-Assembly Planning:

Plan to fabricate the Prototype in sub assemblies:

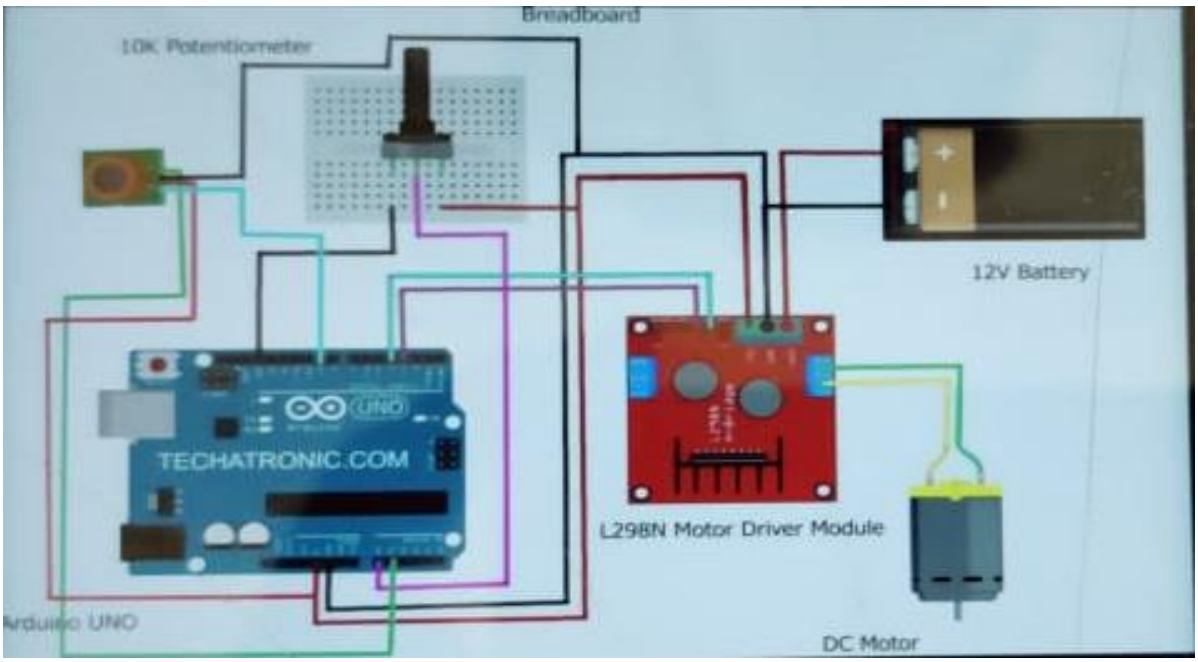


Individual SA Part Names

Sub Assembly #	**Brought out Parts**	**Manufactured Parts**
SA 1 – Main Body		Top Lid
		Outer Shell
		Ash Tray holder
		Ash Tray
		Sensor Stand
SA 2 – Filter Assembly		Metallic Net
		Filter holder
	Carbon Filter	
	Hepa Filter	
SA 3 – Sensor and suction fan	Connecting Wires	
	Battery & Arduino	
	BLDC Motor	
		Suction Fan
	Sensors	

7. Electronic Circuit and IoT details

7.1 Circuit Diagram



Phase 8

8.1Conclusions

A portable device (prototype) which can automatically detect and purify the smoke coming from a smoker sitting nearby.

8.2 future scope

° We can still reduce the weight of the prototype by using carbon fiber or any other lighter materials.

° By using some advanced filters, we can remove organisms from air and reduce the risks of air borne diseases.

9. Catalogue

FE Analysis:

Operating Instructions:

- Switch ON the device.
- When the person smokes the sensor detects the smoke and suction of smoke is done.
- With the help of the regulator we can control the speed of the fan.
- The smoke passes through the filter area and fresh air comes out

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https://drive.google.com/drive/folders/1HPYjbJCAyqF8vxX8NQYgqje44fm_UAuw?usp=sharing
For emo, Videos and info scan the QR code:

Portable Smoke Purifier

Experience Engineering @
School of Mechanical EngineeringKLETECH
KLE Technological University
School of Mechanical Engineering

Minor Project Team #03

Introduction:

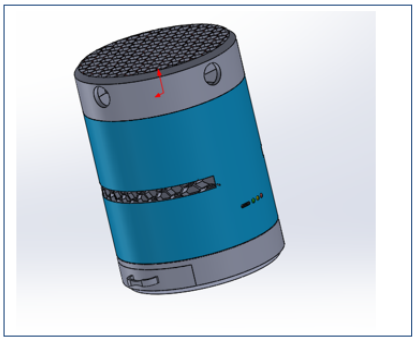
Smoking cigaratte is injurious to health and affects passive smokers(second hand smokers), so we have come up with a prototype which purifies the smoke and gives out fresh air. We can use this prototype in public places.

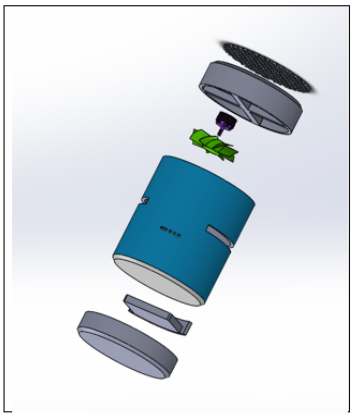
.

Features:

- ✓ *Maintainance is easy and hence make more effective.*
- ✓ *Construction of this design is simple*
- ✓ *Portable*
- ✓ *Has capability to detect the smoke.*
- ✓ *With Ash Tray and lighter holder.*

3D MODEL:





Background/Introduction

Nearly 7 million who die each year due to tobacco related causes 6 million die from direct tobacco use.

Another 890,000 are victims of second hand smoke(Passive Smokers). There is a need for a smoke purifier to give out a pure air. The "Air Purifier" has numerous drawbacks and is expensive too. So to overcome all this drawback, this new model of Portable Smoke Purifier is designed.

Product Specifications:

List your product specifications here:

- **Purify smoke and particles upto 0.3 microns.**
- **Has 2 filters (AOC and HEPA filters).**
- **Weighs around 1.8 kgs**

A Minor Project Report on

UPI SCANNER MONEY VENDING MACHINE

"PayMech"

Bachelor of Engineering in

Mechanical Engineering

Submitted by

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Under the Guidance of

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2021-2022

School of Mechanical Engineering
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CERTIFICATE

This is to certify that Capstone Project entitled **"PayMech"** submitted by **Team B-04 to** the **KLE Technological University**, Hubli-580031, towards partial fulfillment for the award of the degree of Bachelor of Engineering is a bona-fide record of work carried out by him/her under our supervision. The contents of project report, in full or in parts, have not been submitted to any other institute or university for award of any degree or diploma.

Prof. Gururaj fattepur
Prof. Girish

Guide

Dr. B. B. Kottureshettar

Head of department

ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without mentioning the people who made it possible and whose guidance and encouragement has made our efforts successful.

At the outset, we would like to express our deep sense of gratitude for our guide **Prof. Gururaj Fattepur & Prof. Girish** for making this project report successful through their invaluable guidance at every stage of the project report.

We also thank **Dr. B. B. Kottursheṭtar** for his encouragement in undertaking the task of this project.

We express our sincere regard and gratitude to our project coordinators **Prof Gururaj Fattepur** and course mentors **Prof. Shivaprasad, Prof. Nagaraj Ekbote, and Prof. Arun Patil** School of Mechanical Engineering, KLE Tech, Hubli

We also thankful to all faculty members of the Mechanical Engineering Department of KLE Technological University, for helping us directly or indirectly in different stages of our project work.

Student signatures

(Team B-04)

Table of Contents:

Phase 1

1 Refined problem statement

1.1 Identifying end users (Customers)

Small tiffin centers, Kirani stores, pan shops, vegetable sellers, fruit sellers, common people, transportation, etc...

1.2 Identify customer needs

Due to digitalization of transactions, even now we are facing problems in some areas where we require hard cash for buying the products or for transportation. So, to overcome these types of situations we need a machine which accepts money through UPI and dispense the cash.

1.3Analyzing the needs

Customer: shopkeepers Interviewer: Ramesh and Darshan Date:2-2-22		
User	Customer Statement	Interpreted Need
Small Shopkeeper, Tiffin Centre, Vegetable and fruit sellers	▪ Some customer takes only 10- or 20-rupees things and give 100 or 200 notes ▪ Some customer tells they don't have change ▪ Some say that they will give tomorrow/write loans ▪ Some of them bargain and give less amount because of change issue	After the interaction with all the sector people, we came to know that they want the customer to give at least change, they didn't want to give loan also and they didn't want to lose their customers

Customer: Common people **Interviewer: Ramesh and Darshan** **Date:2-2-22**		
User	Customer Statement	Interpreted Need
Common People/ Daily Customers	• The Shopkeepers didn't give the change because they want them to buy some more products • Some are forcing to take other things because of change issue otherwise they will refuse to give necessary products • Some give the change at emergency with taking more percent for given change • They also increase prices	After the interaction with all the customers we came to know that they want changes at emergencies and also they didn't want to buy unnecessary things

Suggested Improvements	**Customer**	**Shopkeeper**
	• They want shopkeeper to have same machine to solve this problem • Also, it should be digitalized	• They think that small amount like 50, 20, 10 rupees changes are more used. So, they want to install smart device in markets • They want it to be user-friendly

Customer: Shopkeeper Interviewer: Chandrashekar and Sharanbasappa		**Date:2-2-22**
User	Customer Statement	Interpreted Need
Shopkeeper	▪ The customer said about they may face some problem in giving change to his close friend's circle or known people, even if he is in need of it ▪ The customer said about, he has doubt on customers who are taking money from this machine can pay the commission or not ▪ The customer said about, he thought about investment and profit from it	• Instead of giving change from his shop's collection, he can place separate machine for it and he can earn from this machine • So, by this we got to know that commission amount should be minimal • So, by this we should keep the cost of the machine affordable to the buyers

Customer: Saloon shop	**Interviewer: Sathyam**	**Date:2-2-22**
User	Customer Statement	Interpreted Need
Saloon shop	▪ The customer said that they face some problem in giving change from early morning to night because he has many customers so he needs the machine to run for more hours.	So, by this we got to know that we should design the machine with long life battery.

Customer: Fruit seller	**Interviewer: Kedar**	**Date:2-2-22**
User	Customer Statement	Interpreted Need
Fruit seller	▪ The customer said that they face problem in giving change but has less space to install the machine	▪ So, by this we got to know that we should make the machine small and durable

1.4 Requirements List

Customer	Requirements
Small Shopkeeper, Tiffin Centre, Vegetable and fruit sellers	User wants only small amount like 50, 20, 10 rupees change.
	They want the machine to be user-friendly so that they can easily transact.
Common People/ Daily Customers	They want it to be portable to use in some places like outside bus stops, shops, etc...
	They want machine to show denomination to them to get required changes.
Shopkeeper	It should be affordable for buyers
	The people who have installed should get the profit from it
	The commission amount should be minimal
Saloon shop	The machine should have long battery life
Fruit seller	The machine should be small and durable

PHOTOS WITH CUSTOMERS

Interaction with General stores shopkeeper

Interaction with Barber

Interaction with fast food shop owner

Interaction with fruit seller

Interaction with snacks seller

Interaction with flower bouquet seller

Interaction with bakery owner

Phase 2

2. Product Benchmarking

2.1 Studying and exploring competitive products

Products (Images or name)	Specifications	Cost	Advantage	Limitations	Availability
1] Bank of India ATMs with QR code scanner	1]Its withdrawal limit is 10 to 20 thousand. 2]It has separate bank of India UPI App. 3]Transaction authentication by security mPIN.	2.5-5 Lakh	1]The design is simple as ATM, only they included QR cash option 2]The security is good for transaction where we use in mPIN	1]Cost is high Need to BOI APP, for that you need to have BOI account 2]Server Problem Misuse of mPIN	The product is announced in September 7,2019 so the availability is very rare
2] SBI ATM	1]They added new option "Yono cash" option in ATM machines Then there is a common ATM specification NO changes are made	2.5-5 Lakh	1]The process is very simple 2]"Yono Cash" option is also on the main screen you didn't have to search 3]The Design is Good	1]You must have the YONO SBI App Server Problem of bank may lead to failure of transaction 2]The amount options may start from 500 rupees	SBI ATMs are available everywhere easily
3] NCR Private ATMs	1]The machine did not have space for using the ATM card i.e it is completely software based 2]This ATM Required to install NCR ATM App and the machine screen only shows QR code you need to scan the QR code to begin the transaction	2.5-5 Lakh	1]It is well designed 2]The process is very simple 3]You can withdraw minimum 10$ 4]There is no space to swipe the ATM card so that the transaction is very Quick	1]You must have NCR ATM App 2]If anyone know mPIN they can easily misuse 3]It might have server problem	The machine is not available everywhere

2.2 Patent search

Patent Name/ Number/ Date	Information
Coin exchange device and method of vending machine/KR19980073066A/05-11-1998	**Here, the user inputs a coin through a coin inlet, the amount of input through the coin machine is sensed, and the user selects a coin to be exchanged through a coin exchange selector .**
Vending machine having direct data link to cash dispenser/US6957732B2/25-06-2007	**A system which will allow a bill acceptor and dispenser to be incorporated into a vending machine operating on a standardized vending machine protocol to allow the vending machine to dispense change in the form of currency according to the amount of change to be dispensed and the availability of specific denominations of currency. Inventor -Joshua Corrick, Raymond Heide Current assignee-JCM American Corp.**

2.3 Literature survey

Literature details	Gathered Information
1] Securing ATM Transactions Using QR Code based Secure PIN Authentication, Author: Sumanth C M, Assistant Professor Rajeev IT Hassan Karnataka	In this Journal Paper they tried to control ATM frauds and hacking. For that they made QR code system in ATM machine screen. After we scratch ATM card then we have to scan QR code further in mobile we have to enter security PIN. By this we can easily prevent security PIN hacking fraud etc.
2] QR Based 24*7 Smart ATM System Author: P. Vijayalakshmi, P. Monisha, G. Nagiya Bhanu, B. Niranjana Associative Professor Panimalar Engineering College, Chennai, Tamil Nādu	This is also a QR code Based ATM system, here they made a App in which they have details about customer and then the QR code will be generated in mobile app. By sharing the QR code to the camera of ATM machine. We can easily make transaction
3] ATM Custodian: A new type of authentication for ATMs Author: Abhishek G Menon, Arun V Mohanan, Ghilby Varghese Jaison, Assistant Professor, Mbccet, Peermade Idukki	It is simple module, here they are using the QR code instead of using ATM cards. They scan unique bar codes and then they can easily make transactions.
4] Digitized Banking Transactions using QR Scanner Author: Praveen K, Ponsharan V, Venkatesh Raghu K, Vimal Raj S, Dr. S. M. Uma Tamil Nādu, India	It is a simple device, here it is used to reduce time in banks. In this device we have to scan our bank passbook copy using bar codes then entering the information about debiting /crediting money then machine will generate the token

SBI ATM

NCR PRIVATE ATM

Phase 3

3.Design Specifications

3.1 Brainstorming

KEY WORDS

Clear unscratched QR code, Fast processing, Portable, Maximum withdrawal limit, Denominations to be Rs10, 20, 50 only, Transaction should be transparent, Machine structure should not be harmful, overall machine cost, Transaction limit, Instructions in both voice and written formats, Sudden response to the QR scanning, Strong material for the machine, Security, Easy cash feeding, Working hours of the machine, Machine capacity to hold cash, Machine should work on both battery and power supply, Less power consuming, QR scanner should support all types of UPIs, Heat resistant, Both button operated and touch screen, Less weight, Emergency alerts, Machine should be compact, Parts of the machine should not be visible, Machine should be insulated, Removable battery, Attractive design, Time limit to collect money, High efficient(reduced transaction failures), Strong and bright screen, Rechargeable battery, Parts should be easily replaceable, High Accuracy, Maximum number of notes in a cabin, Transaction receipt, HELP option for user queries, No server error, Tax for certain cash withdrawal, accurate cash counting, User friendly, No sharp edges, good aesthetics, Less maintenance.

3.2 OFMC Chart

Keywords	Objectives	Functions	Means	Constraints
Clear unscratched QR code	✓			
Fast processing`	✓	✓		
Portable	✓			
Maximum withdrawal limit				✓
Denominations to be Rs10, 20, 50 only	✓			✓
Transaction should be transparent		✓		
Machine structure should not be harmful				✓
overall machine cost				✓
Instructions in both voice and written formats		✓		
Sudden response to the QR scanning	✓	✓		
Strong material for the machine	✓		✓	
Security	✓			
Easy cash feeding	✓			
Working hours of the machine	✓	✓		

Machine capacity to hold cash		✓		
Machine should work on both battery and power supply	✓	✓		
Less power consuming	✓			✓
QR scanner should support all types of UPIs		✓		
Heat resistant	✓			
Both button and touch screen operated		✓		
Less weight				✓
Emergency alerts		✓	✓	
Machine should be compact	✓			
Parts of the machine should not be visible				✓
Machine should be insulated				✓
Removable battery	✓			
+Time limit to collect money		✓		
Highly efficient (reduced transaction failures)	✓			
Strong and bright screen			✓	
Rechargeable battery			✓	
Parts should be easily replaceable			✓	
High accuracy	✓			
Maximum number of notes in a cabin				✓
Transaction receipt		✓		
HELP option for user queries	✓			
No server error	✓			
Tax for certain cash withdrawal		✓		
accurate cash counting		✓		
User friendly	✓			
Good aesthetics	✓			
No sharp edges				✓
Less maintenance	✓			

3.3 Objectives

Objectives	
Clear unscratched QR code	Heat resistant
Portable	Removable battery
Security	Attractive design
Easy cash feeding	Highly efficient (reduced transaction failures)
High accuracy	No server error
User friendly	Good aesthetics
HELP option for user queries	Strong material for the machine
Machine should be compact	Less Maintenance
Less power consuming	Machine should work on both battery and power supply

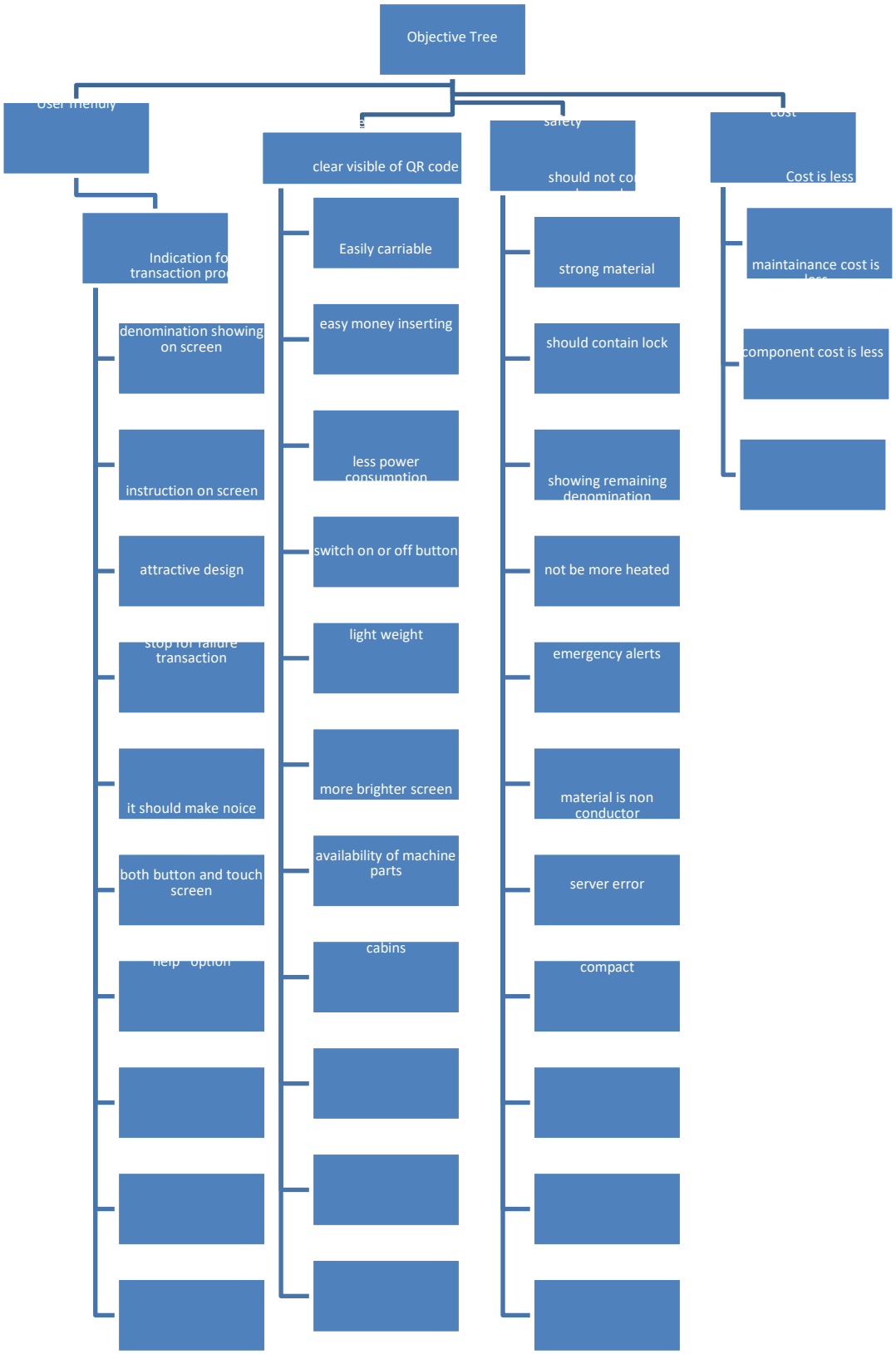
3.4 Constraints

Constraints	
Maximum withdrawal limit	No sharp edges
Denominations to be Rs10, 20, 50 only	Less power consuming
Machine structure should not be harmful	Less weight
overall machine cost	Maximum number of notes in a cabin
Parts of the machine should not be visible	Machine should be insulated

3.5 Objective tree (affinity diagram)

*SL	Objectives	First level objectives	Second level objectives	Third level objectives
1	Clear unscratched QR code	✓		
2	Portable			✓
3	Security	✓		
4	Easy cash feeding		✓	
5	High accuracy		✓	
6	User friendly	✓		
7	HELP option for user queries			✓
8	Heat resistant		✓	
9	Removable battery		✓	
10	Attractive design			✓
11	Highly efficient (reduced transaction failures)	✓		
12	No server error	✓		
13	Good aesthetics		✓	
14	Strong material for the machine	✓		
15	Machine should be compact		✓	
16	Less Maintenance	✓		

Objective tree:



3.6 Design Specifications:

SL.NO	SPECIFICATIONS	UNITS
1.	Cash Withdrawal	No's
2.	Weight	Kg
3.	Dimension	mm*mm*mm
4.	Control System	Automated
5.	Power Supply	Watts
6.	Motors	RPM
7.	Display	Pixels
8.	Roller and Belt	mm
9.	Cash storage capacity	No's

3.7 Competitive Benchmarking:

SL.NO	Metric	Units	Competitive Products		
			Product 1 BOI ATM with QR code	Product 2 SBI ATM	Product 3 NCR Private
1.	No of sharp edges	No's	<10	<10	<10
2.	Cash dispense at a time	No's	40	40	40
3.	Amount cash storage	INR	20 Lakhs (as per RBI)	20 Lakhs (as per RBI)	20 Lakhs (as per RBI)
4.	No of cassettes	No's	4	4	4
5.	Notes holding capacity	No's	8800	8800	8800
6.	Change dispensing according to denominations	INR	---	---	---
7.	Weight	Kg	450-700	450-700	450-700
8.	Height	cm	140-180	140-180	140-180

Phase 4

4.1 Concept Generation

Defining Functions

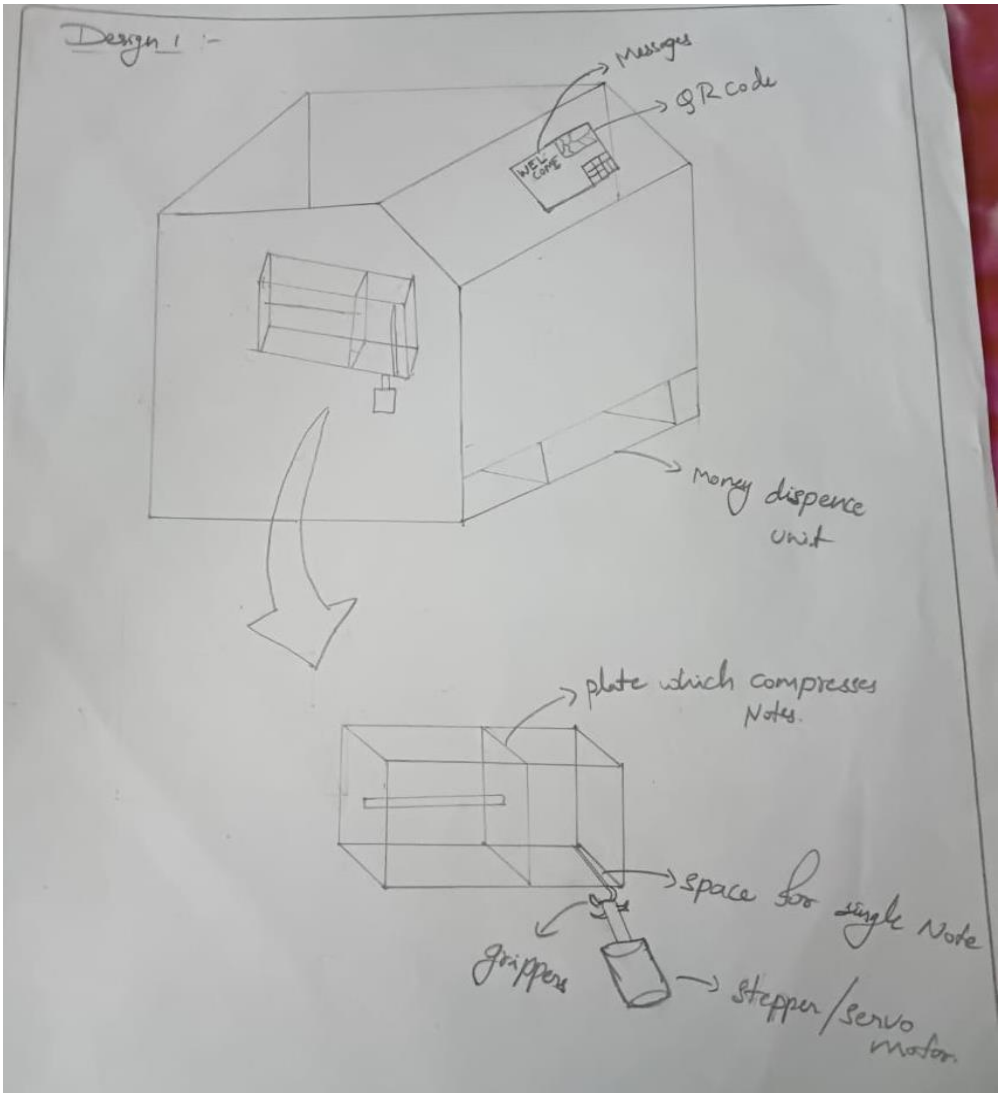
SL	Functions
1.	**Display QR code**
2.	**Indication of process**
3.	**Money dispenses from cabin**
4.	**Flow of money**
5.	**Money dispense**

4.2 Morphological Chart

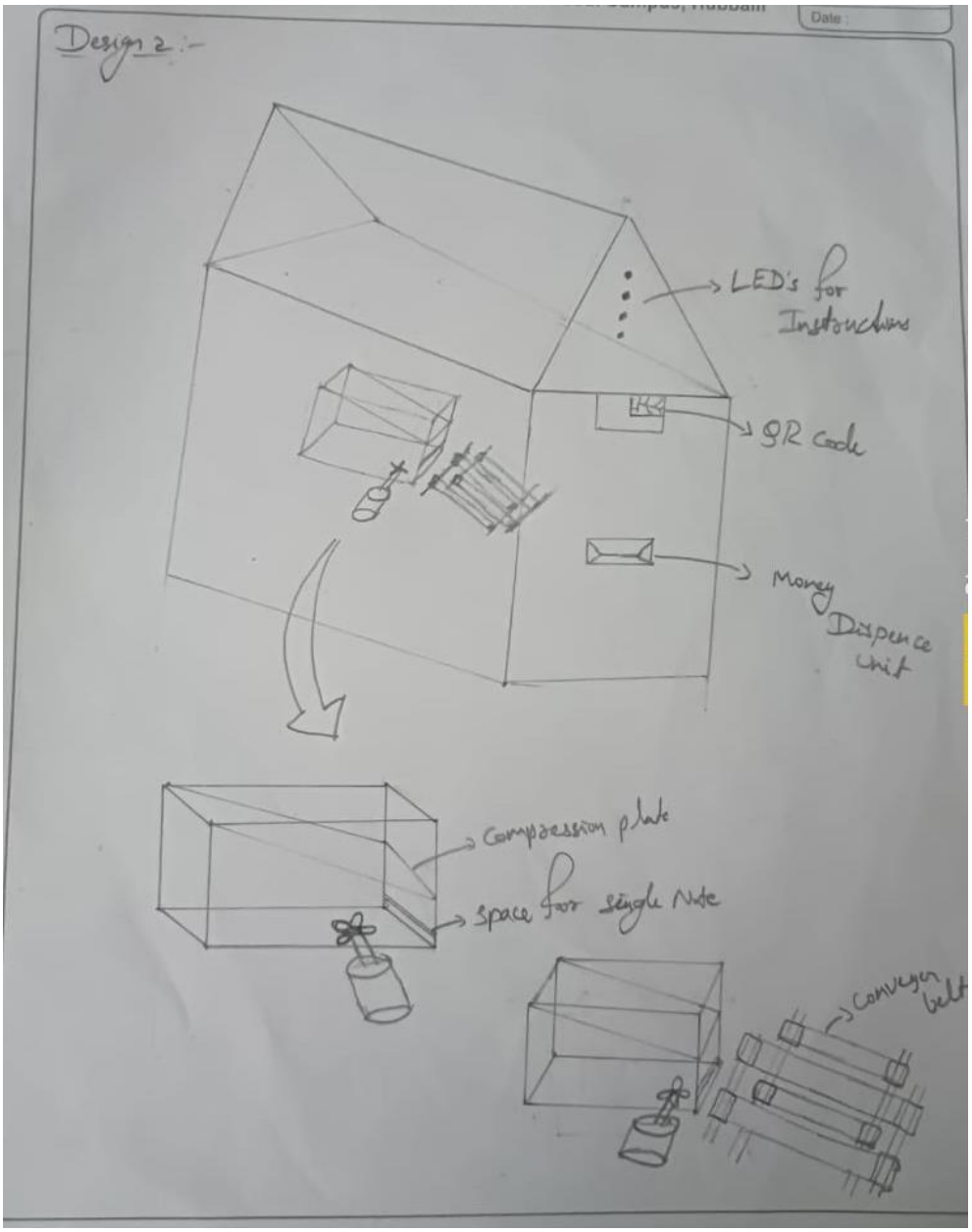
SL.NO	Functions ▼	Means►	**Means 1**	**Means 2**	**Means 3**	**Means 4**
1.	QR code showing		On Display	Option for QR code	Sticker	****
2.	Indication of process		Messages on Display	Voice Instructions	Beep sounds	LED light indications
3.	Money dispense from cabin		Dispense from bottom	Using servomotor or stepper motor	Using slider	DC motor
4.	Flow of money		Conveyor belt	Rollers	Direct flow	Glass plate
5.	Money dispense		Opening doors	Opened space	Cabin	****

4.3 Generating design alternatives

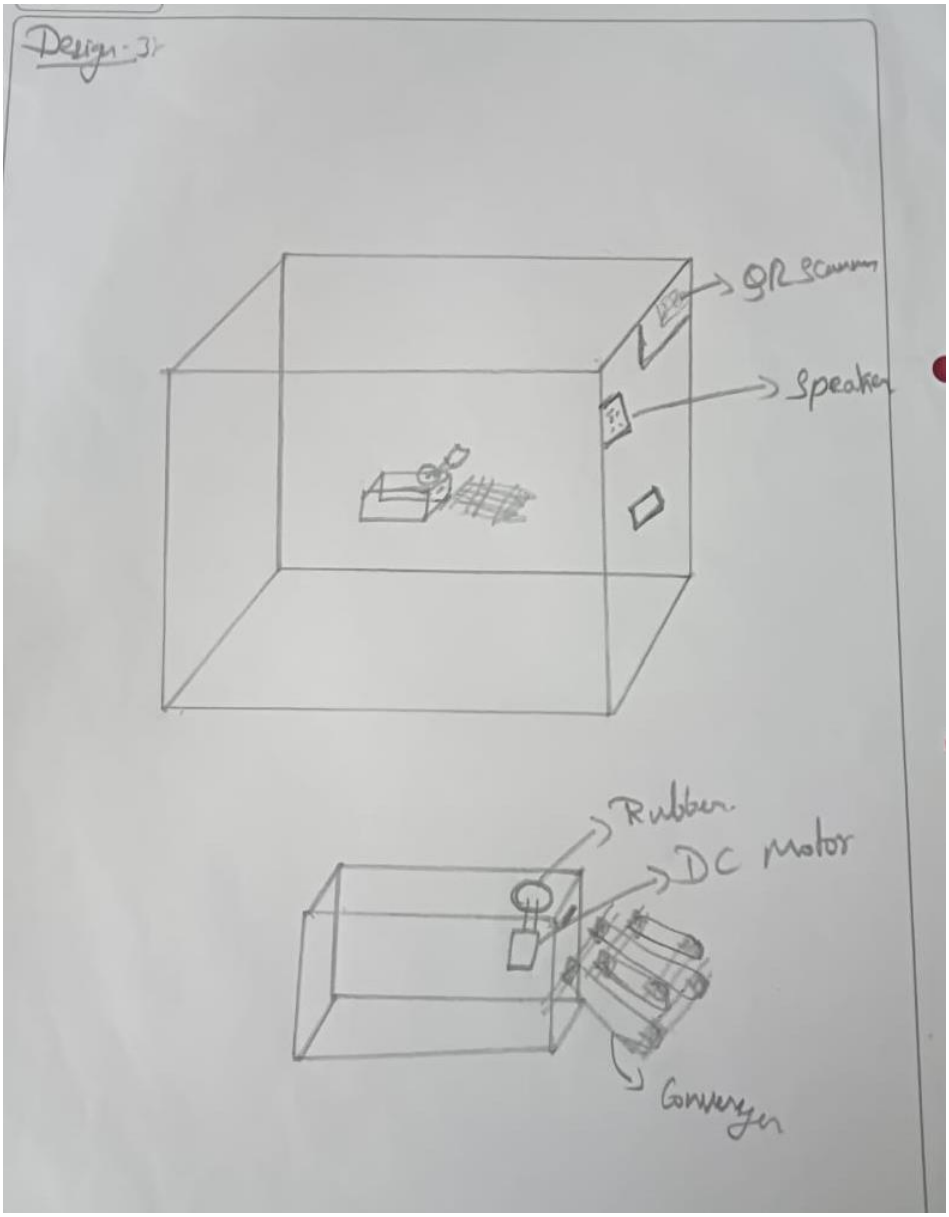
Design Alternatives 1



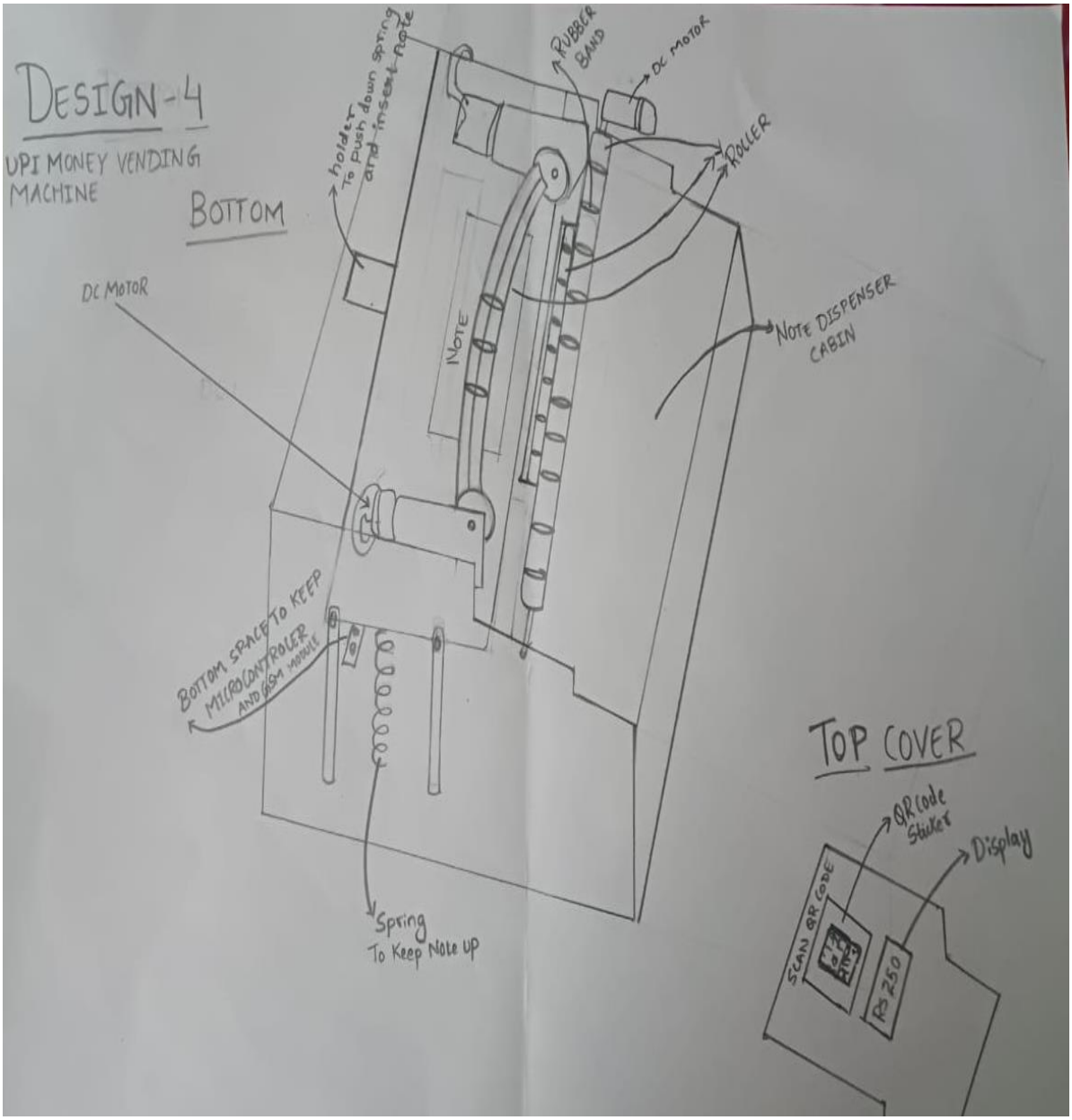
Design Alternatives 2



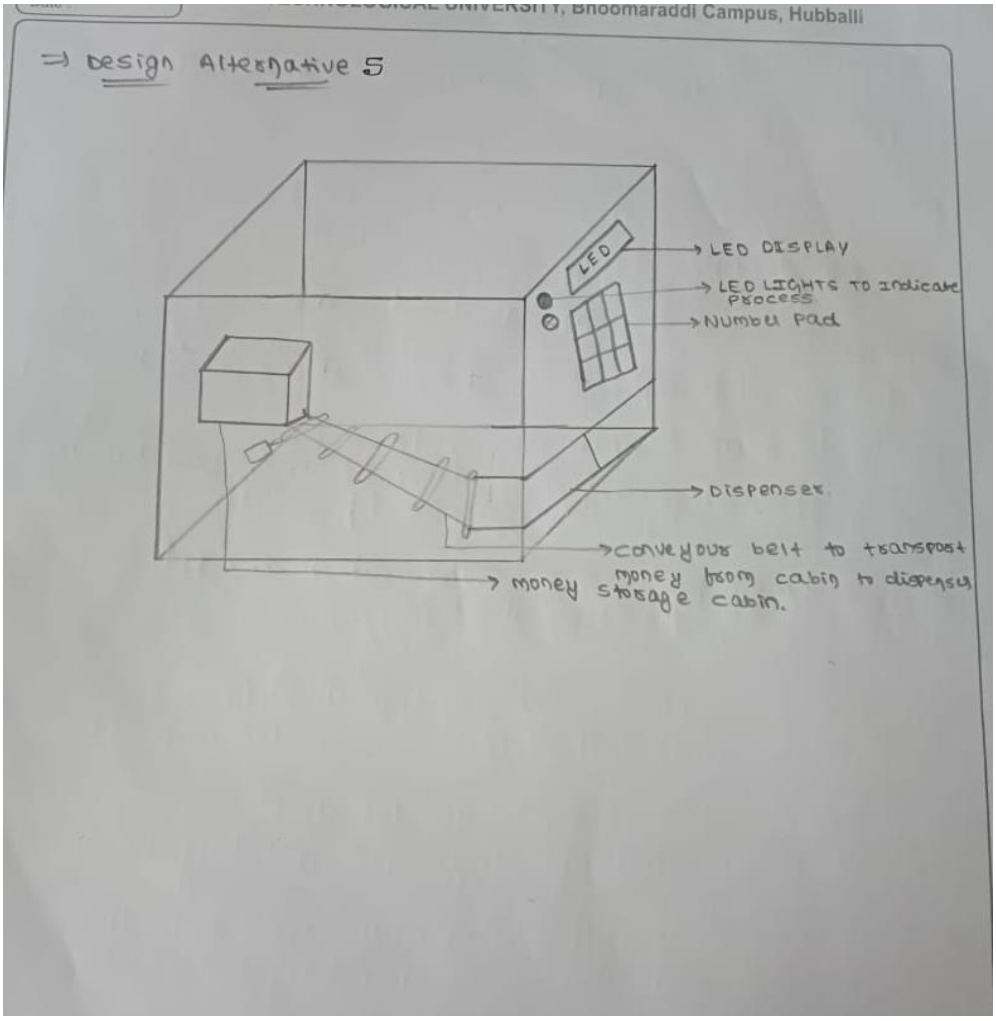
Design Alternatives 3



Design Alternatives 4



Design Alternatives 5

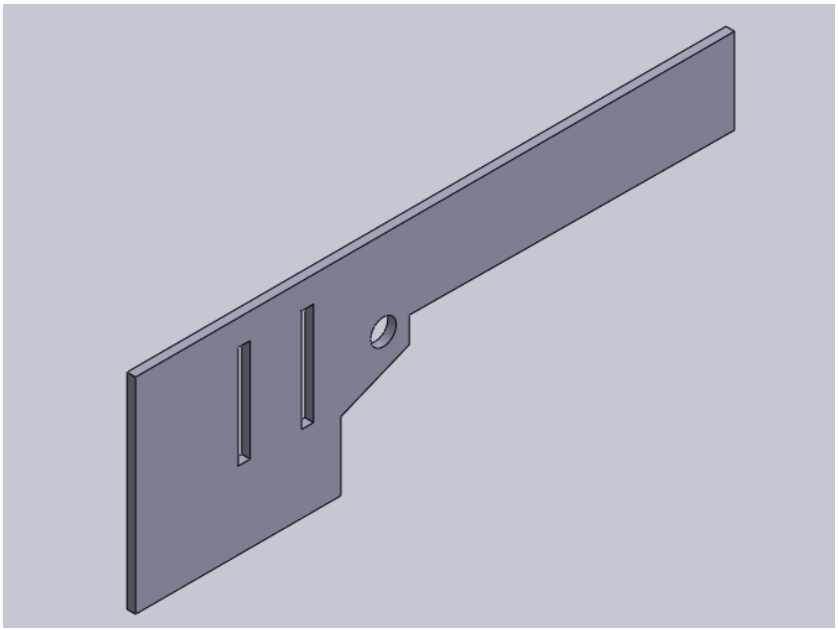
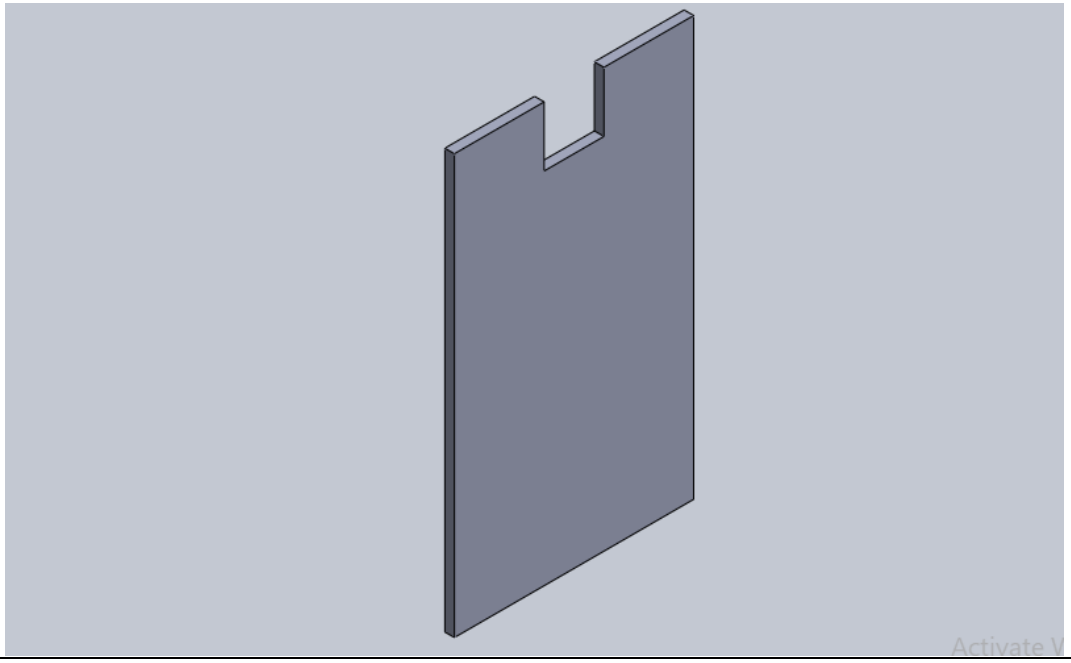


PUGH CHART

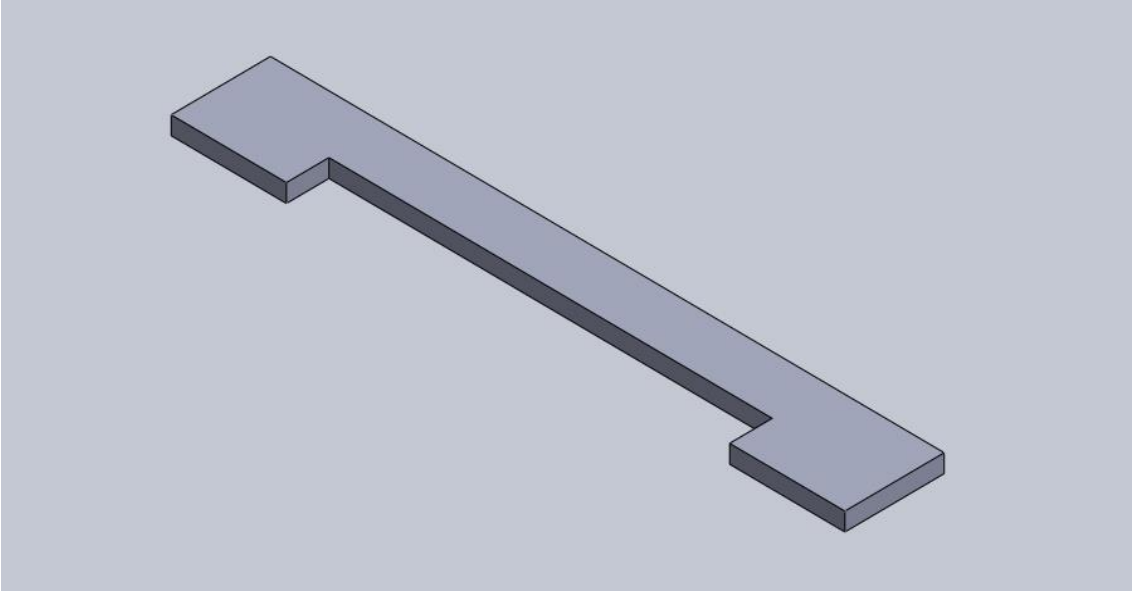
Requirements	Weight	Design1	Design2	Design3	Design4	Design5	Reference
Safety	10	+	+	0	+	-	0
User Friendly	10	0	+	0	+	0	0
Accuracy	9	-	-	-	+	-	0
Efficiency	8	+	0	+	0	0	0
Cost efficiency	4	+	+	+	+	+	0
Weight efficiency	4	+	0	-	0	0	0
Mechanism	7	+	0	-	+	-	0
Power	5	0	-	+	0	+	0
Product Attraction	3	0	+	-	-	0	0
Process Information	5	0	0	+	+	-	0
Monet feeding	7	0	0	-	0	0	0
PLUSES		5	4	4	6	2	0
SAME		6	5	2	4	5	0
MINUSES		1	2	5	1	4	0
OVERALL TOTAL		4	2	-1	5	-2	0
WEIGHTED TOTAL		24	13	-8	42	-22	0
YES/NO		No	No	No	Yes	No	

Selected Design Alternative: DESIGN 4

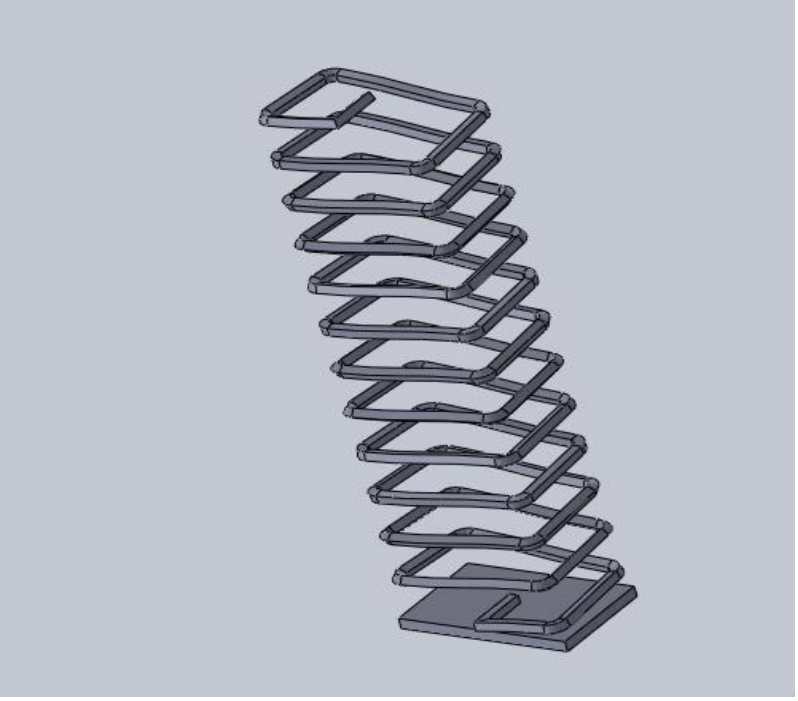
5.1 3D Model

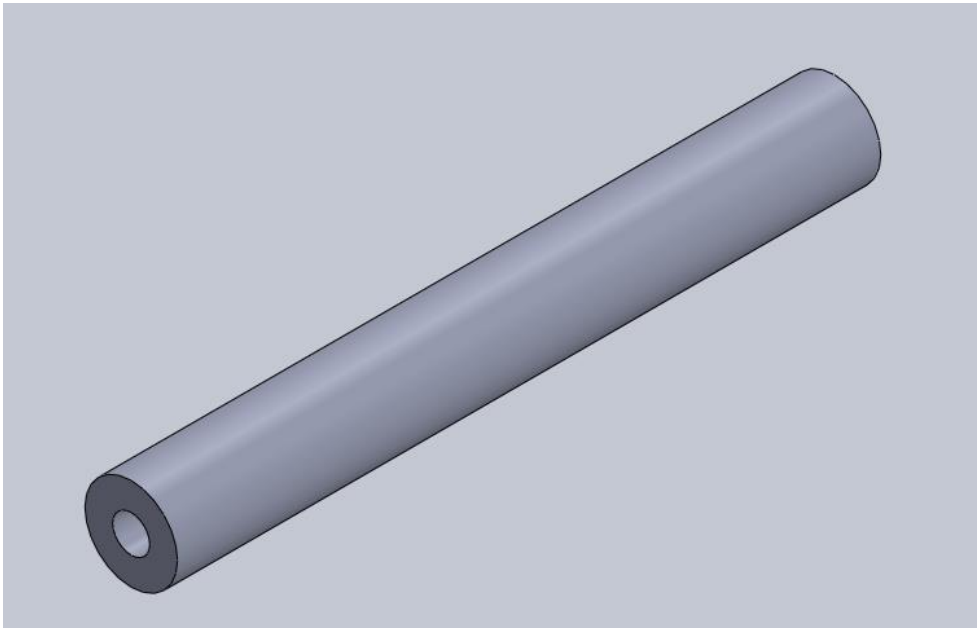
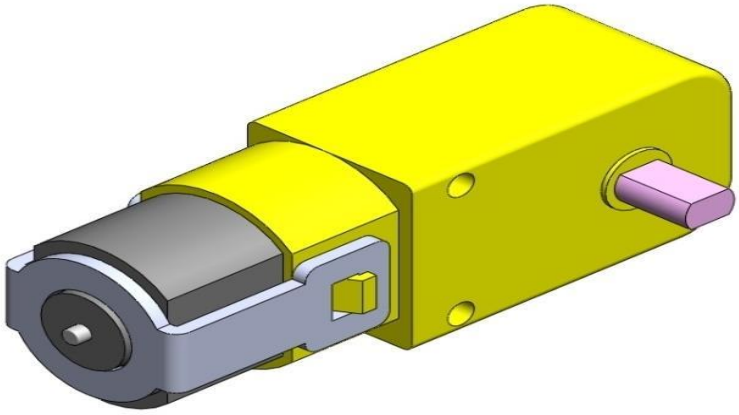
Part Model 1- Side plate

Part Model 2-Base plate


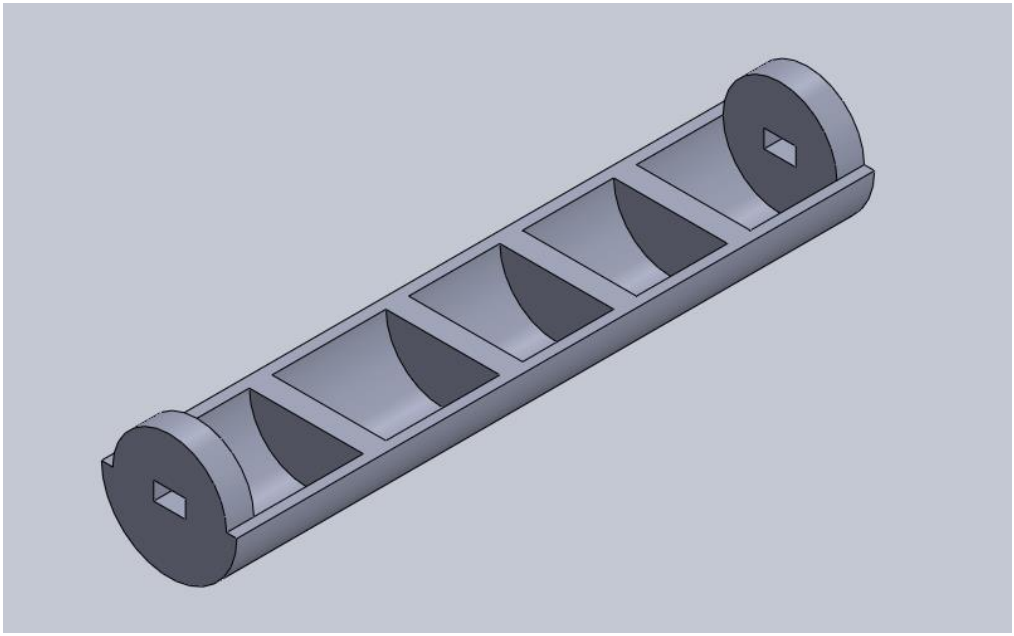
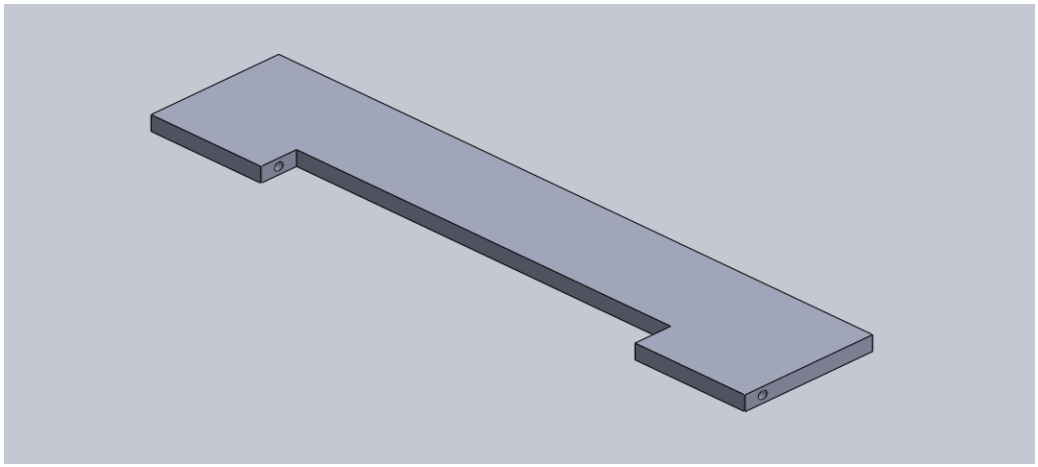
Part Model 3-Cabin supporter

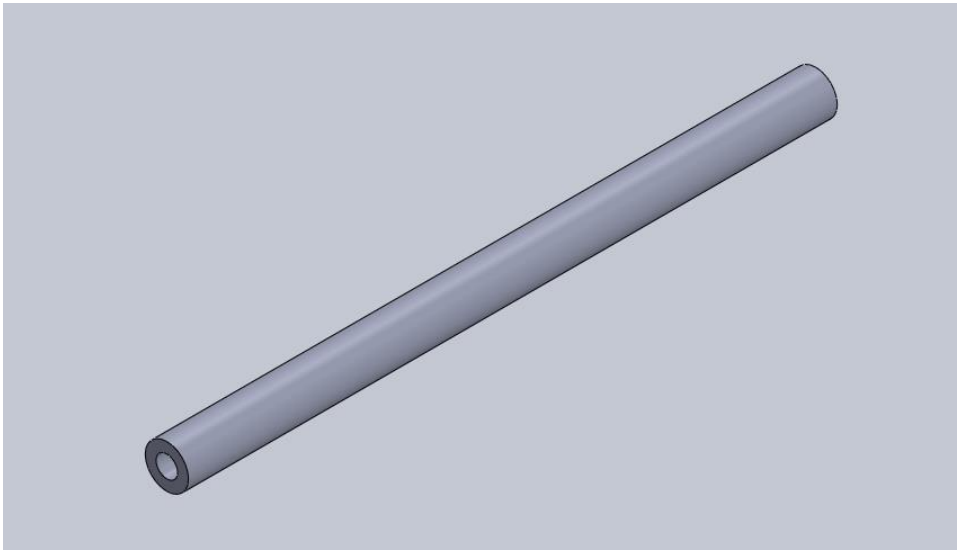
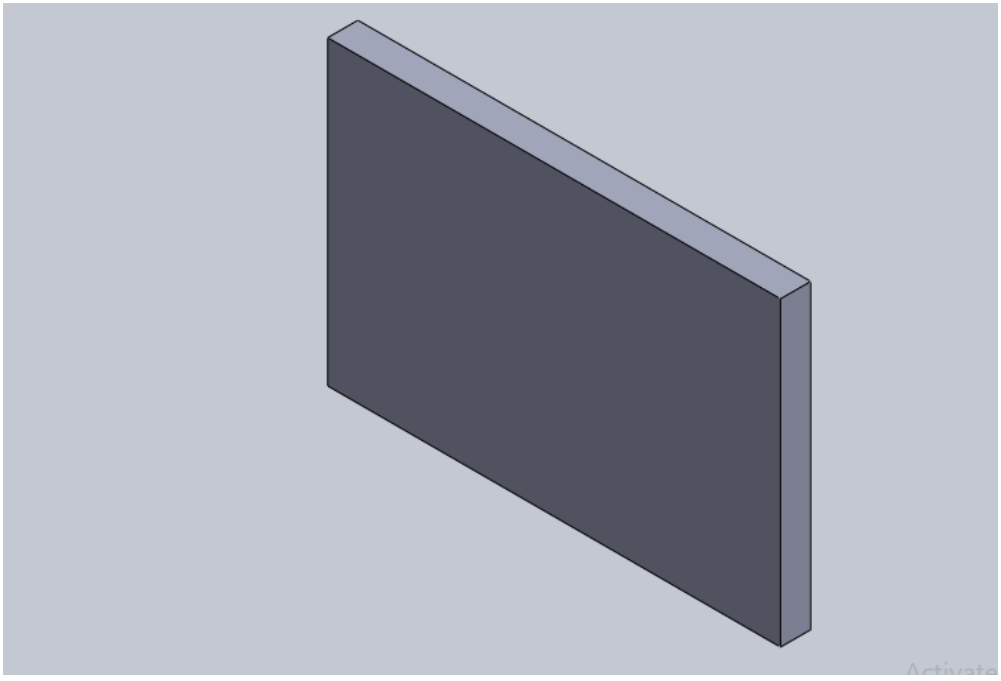


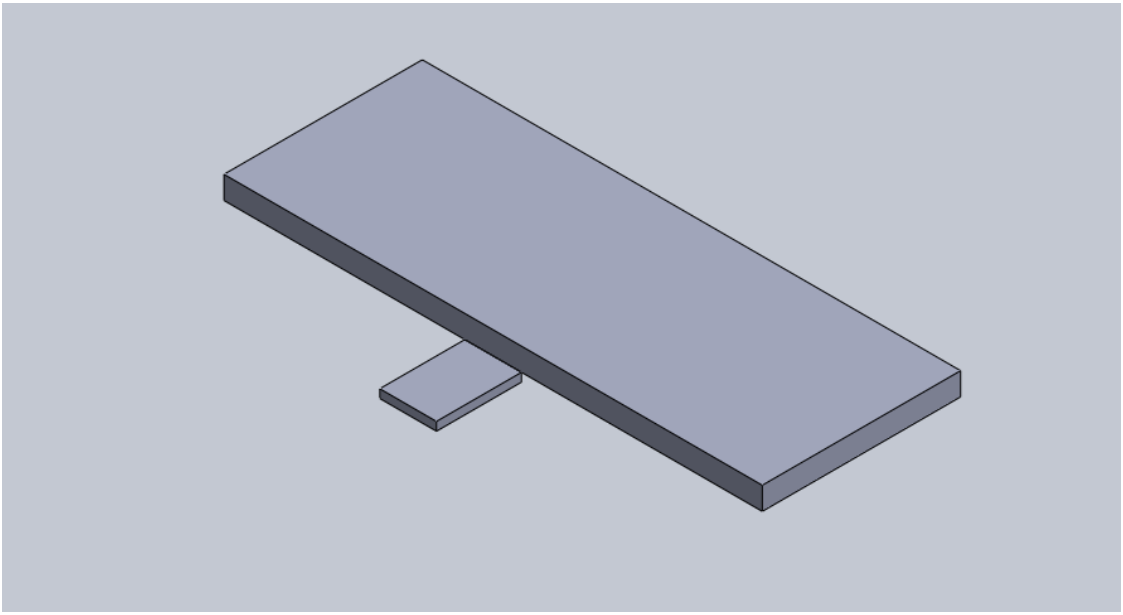
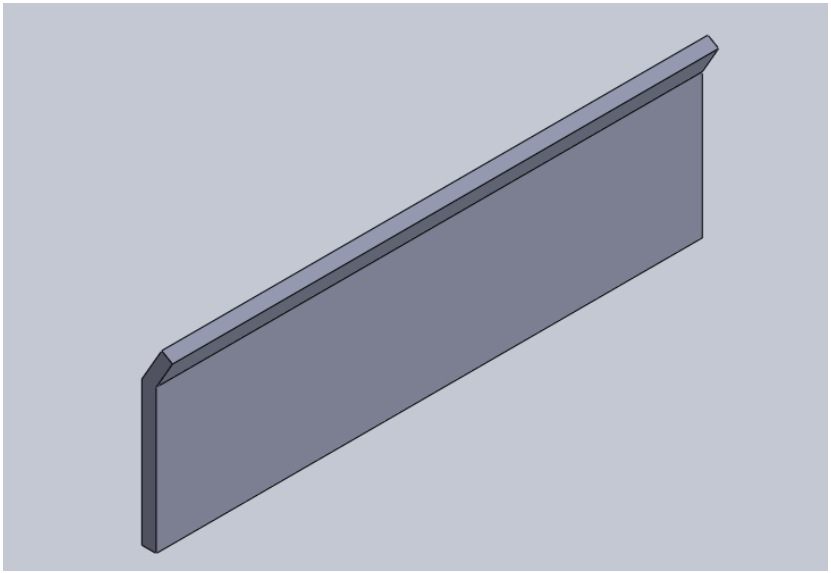
Part Model 4-Spring



Part Model 5-Shaft

Part Model 6-DC Motor


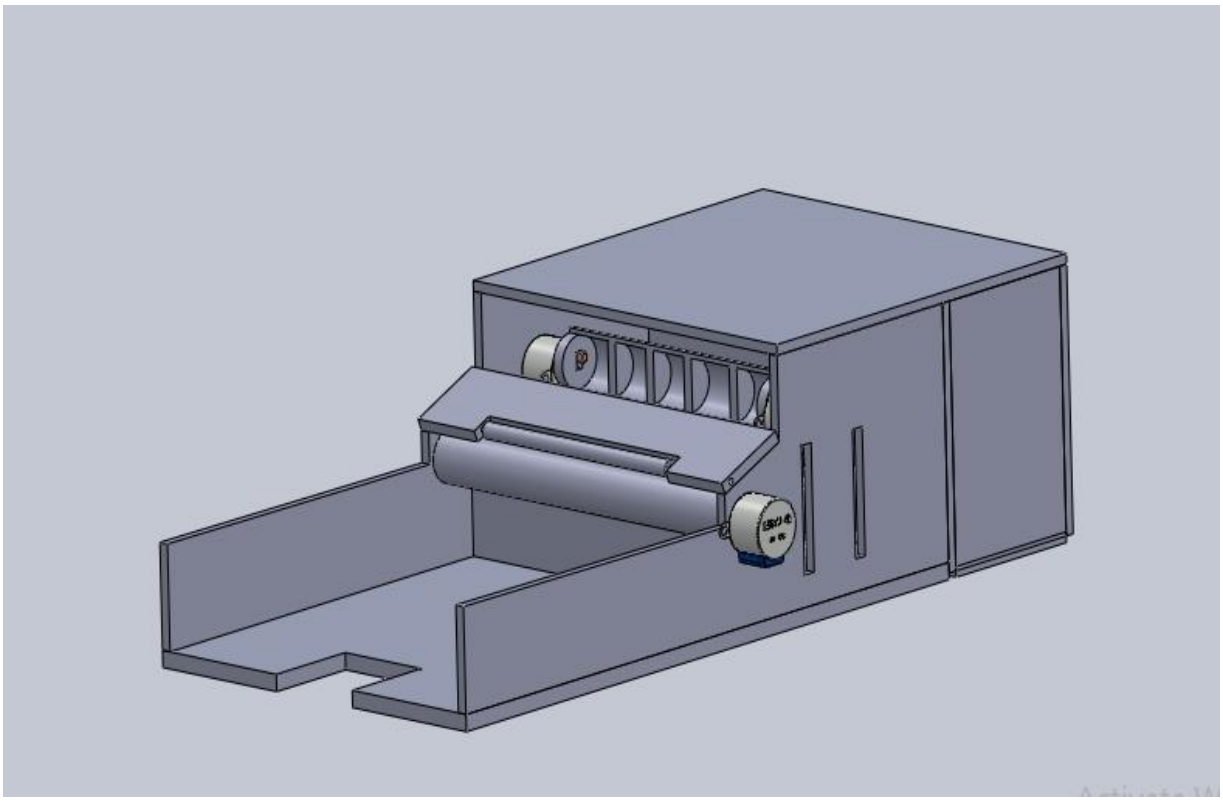
Part Model 7-Pusher

Part Model 8-Small shaft supporter


Part Model 9-Shaft

Part Model 10-Back plate


Part Model 11-Cash cabin

Part Model 12-Guide plate


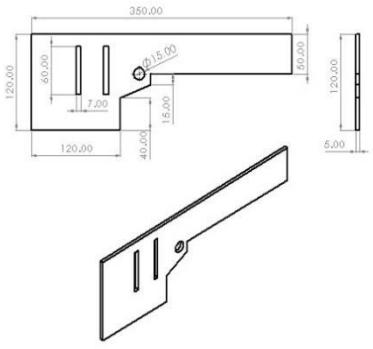
5.2 Assembly model

Assembly Model

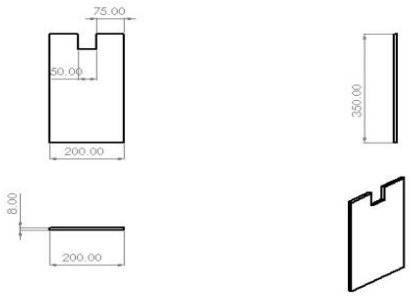


5.3 2D Drawings

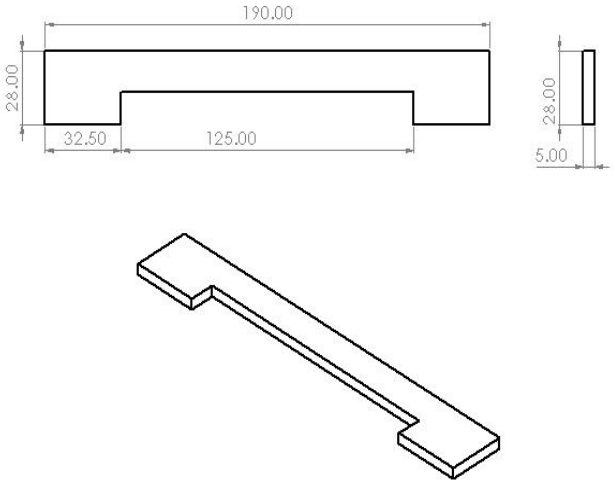
2D Drawing 1- Side plate



2D Drawing 2- Base plate

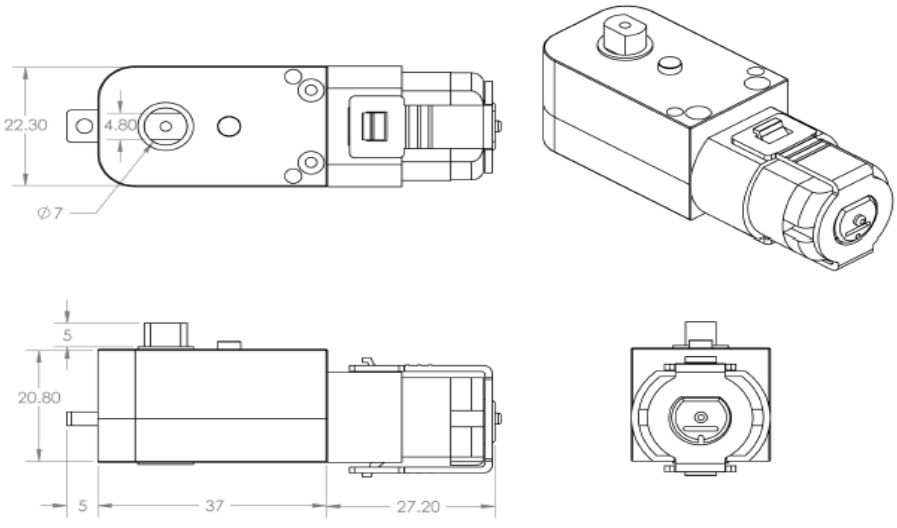


2D Drawing 3- Cabin support

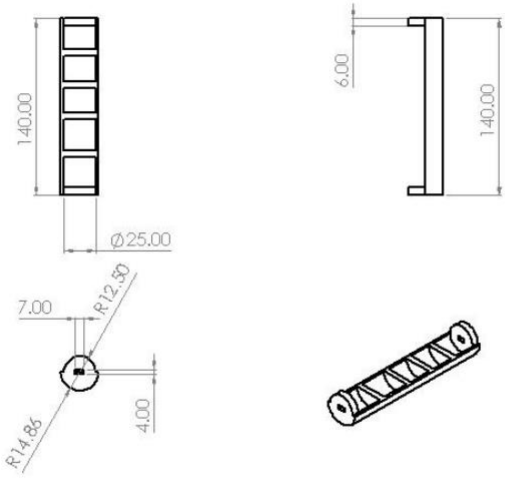


2D Drawing 4- Shaft

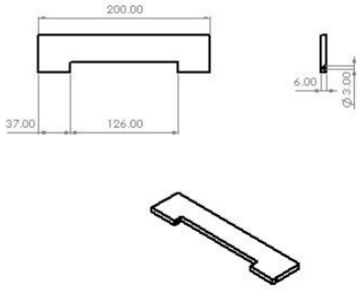
2D Drawing 5- DC motor



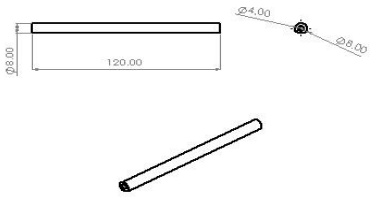
2D Drawing 6- Pusher



2D Drawing 7- Small shaft supporter

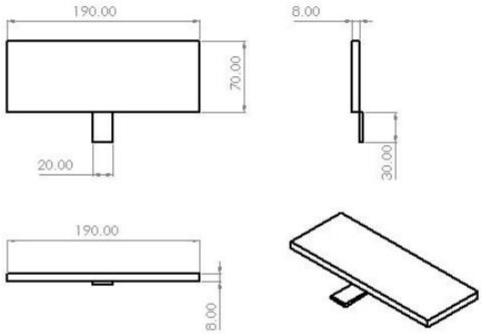


2D Drawing 8- Shaft

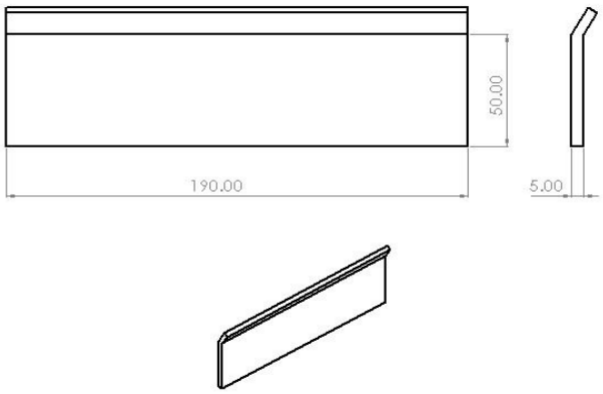


2D Drawing 9- Back plate

2D Drawing 10- Cash cabin



2D Drawing 11- Guide plate

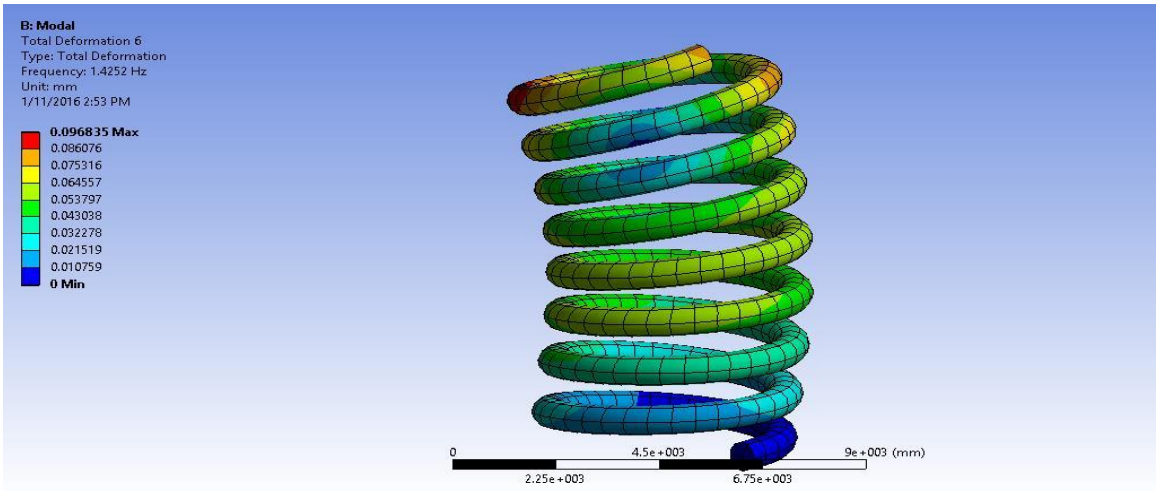


5.4 Design Calculations

Design Calculations
Spring Calculation: Taking spring length=40 mm Wire diameter=1mm, outer diameter = 12mm Inner diameter =10mm No of coils =7 k=1.063 N/mm [from Spring calculation] Restoring force/spring force F=-kx, where x=2.5mm (Amount of extension) Now, F=-1.063*25 F=26.525N DC calculation: Torque, T=F*r, take F=2F (for motor) Therefore, F=53.15N where r=12.5mm T=664.375 For Speed, For calculating speed Assume power required as 3W=P 0.003KW=P W.k.t Power= (Speed*torque)/9550 0.003=(Speed*0.664375)/9550 Speed=43.1232 rpm

6 Analysis of critical parts and Prototype Planning

6.1 FEM Analysis of Critical Parts



6.2 Raw materials required for Prototyping:

SL.NO	Material	Properties /Reason for selecting the material	Part Name and Number
1.	Foam Sheet	It is strong material to sustain weight	Base and Cabin
2.	Acrylic Sheet	It is flexible and we can make it to any shape	Side plates

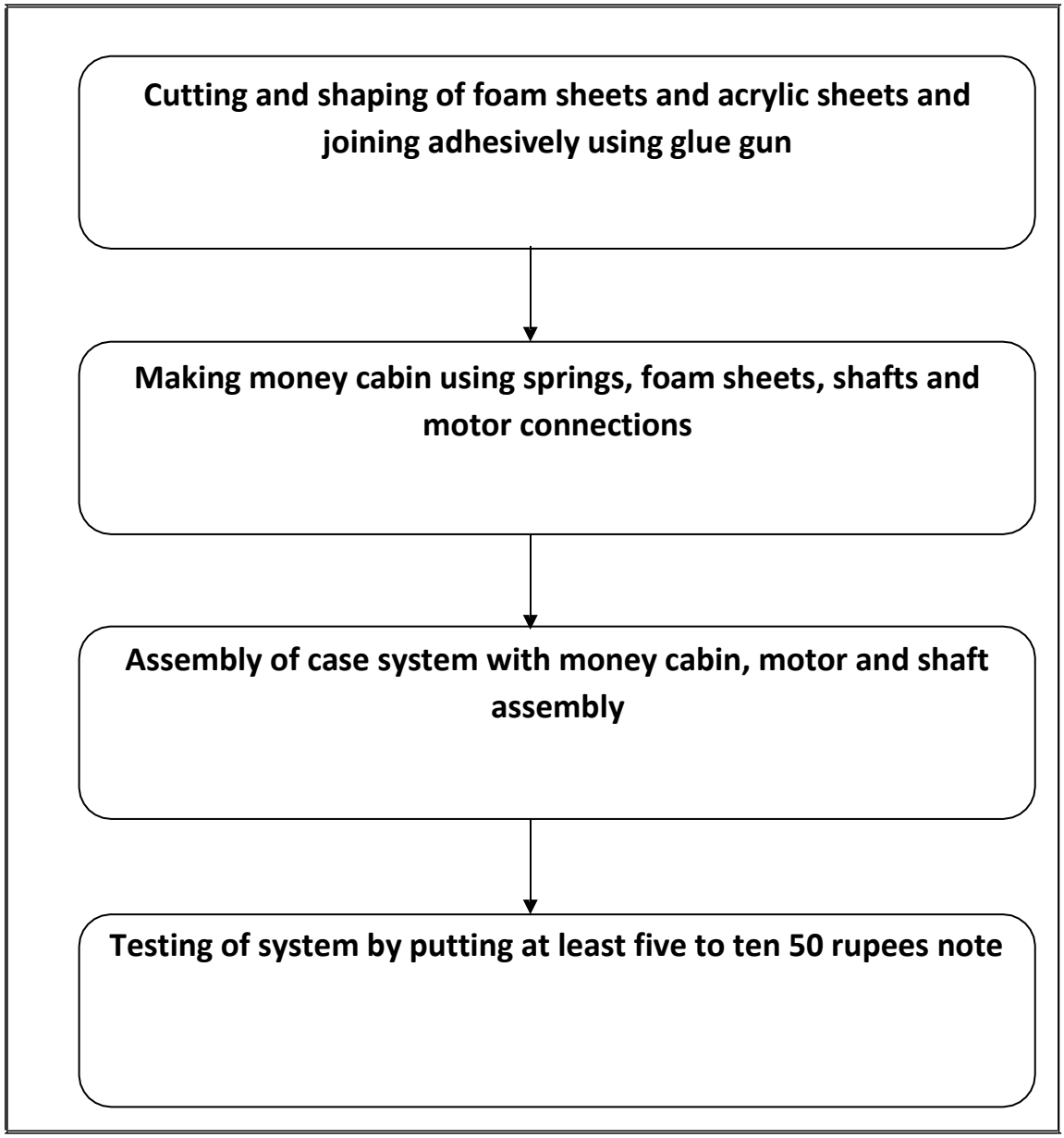
6.3 Bill of Materials

SI. No	Part Name	Quantity	Material Specification
1.	Base plate	1	Foam Sheet
2.	Side plate	2	Acrylic Sheet
3.	Supporter plate	2	Acrylic Sheet
4.	Shafts	3	PVC Pipe
5.	Springs	2	Plastic
6.	Cash Holder	1	Foam Sheet
7.	Overall Cover	1	Foam Sheet
8.	DC Motor	1	100 RPM
9.	Rubber	4	Organic Rubber
10.	Adapter	1	12 V

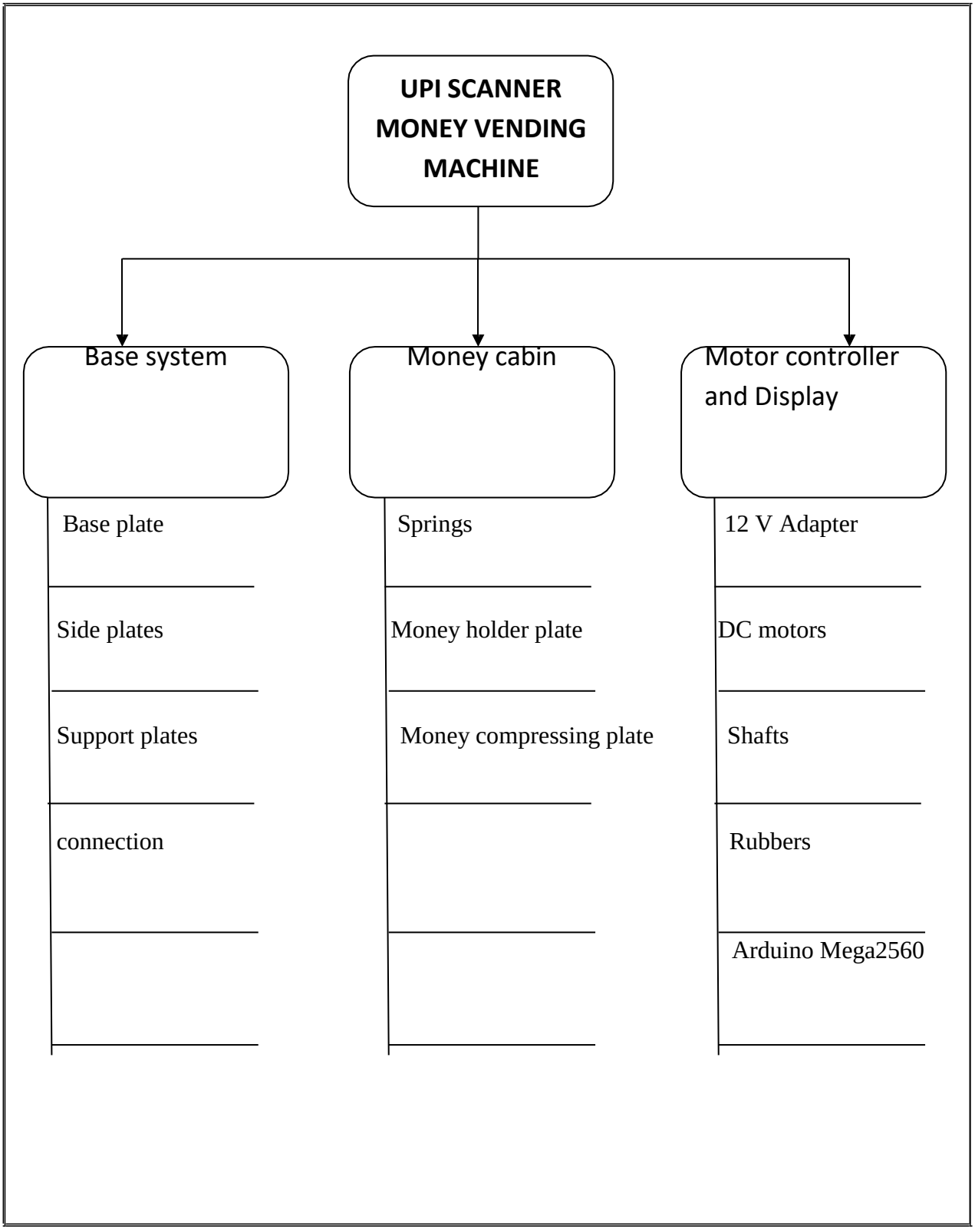
6.4 Joining techniques/ methods:

SI.NO	Joining Method	Material to be joined	Resources required and specification
1.	Adhesives	Foam Sheet, Acrylic Sheet, Springs, Shafts	Glue Gun or M seal

6.5 Flow Chart:

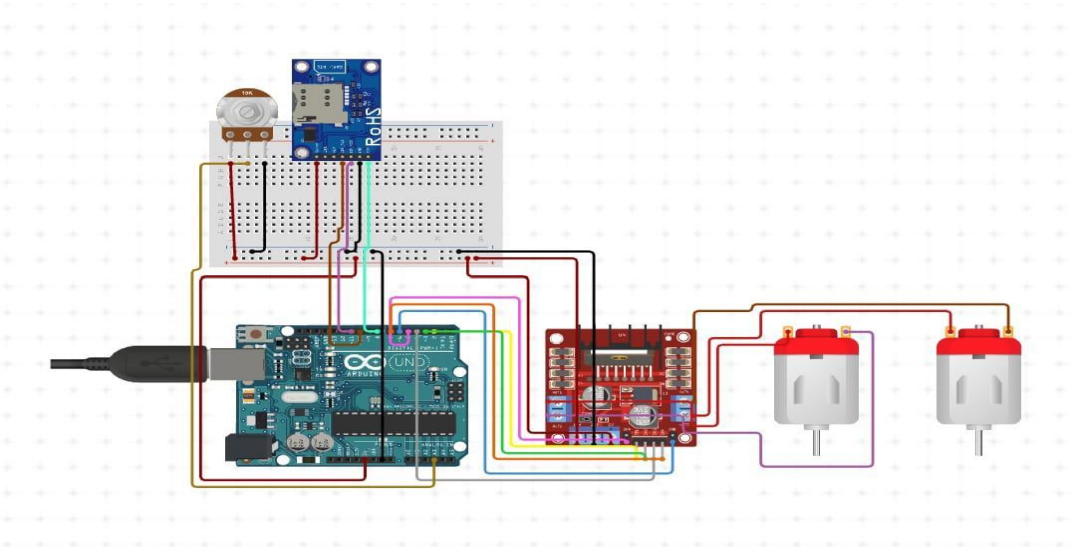


6.6 Sub-Assembly Planning:



Sub Assembly	Brought out Parts	Manufactured Parts
SA 1: Base system		Foam sheet shaping
		Acrylic sheet shaping & cutting
SA 2: Money cabin	Springs	Money holder plate
		Money compressing plate
SA 3: Motor controller and Display system	12 V Adapter	
	DC motor	
	Shafts	
	GSM Module	
	Arduino Mega 2560	

7.1 Circuit Diagram



8. Conclusion and Future Scope

After completing this prototype, we conclude that this is not only a prototype but we can make it to a complete commercialized product by increasing the features like increasing the denomination to 10,20,50,100,500 notes, process instruction display, etc.

Here we proved the mechanism & integration to show whether this idea works or not. In future for commercial purpose, we can get some percentage profit by implementing charges on the transaction i.e., 2% of charge on the 100 Rs transaction.

In future we can install this in crowded places like Bus stand, Market, Railway Station, etc. and also use for different purposes like to get changes, tokens, or anything integrated with vending machine.

PRODUCT IN USE:

Operating Instructions:

- Scan the QR code attached on the machine
- Pay the money how much changes you required
- Motor starts rotating, money dispenses from money cabin
- Take the notes from dispense area

Team Members:

Name1: Sathyam P Rane
Name2: Sharanbasappa
Name3: Darshan Chavan
Name4: Chandrashekar V Pattar
Name5: Ramesh I Battur
Name6: Kedar V Naik

Mentors:
Prof: Gururaj fattepur
Prof: Girish

Contact:
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Ph no. 6363181857
www.website.com
For more Demo, Videos and info scan the QR code:

PAYMECH

School of Mechanical Engineering

Minor Project Team #B4

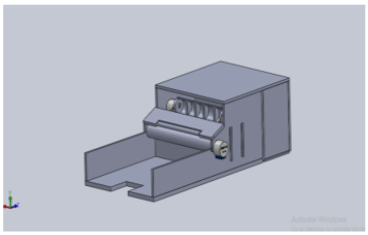
Introduction:

In this digital era, we do not need hard cash in our pocket. But in some cases, we need money physically in our hands, for ex in transports, in government offices, in some shops. Online payments are not working every time. Our prototype overcomes this problem of money(changes). Using our product, you can easily get the changes, to use our prototype you just need a mobile phone which has a payment app and by that you can pay money and get the changes you required. As in ATMs it does not need any cards and it gives only small amount changes and connected with any banks. It is fully different from ATMs.

Features:

- ✓ *Easy to use and user friends*
- ✓ *Works on both battery and power supply*
- ✓ *Safe and secure transaction*
- ✓ *Quick response*
- ✓ *Maintenance is easy*

3D DIAGRAM:



Product Specifications:

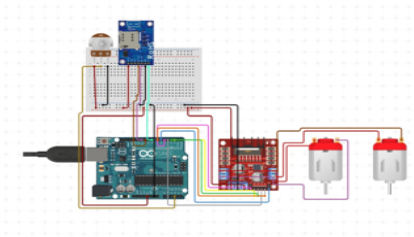
Sl No	Specifications	Units
1	Denominations	50 Rs only
2	Weight	2-3 kgs
3	Dimensions	300*180*120(mm)
4	Control system	Automated (Arduino controlled)
5	Power supply	12v
6	DC motors	100 RPM
7	Cash storage	20-25 notes
8	GSM Module	800c
9	Max transaction	1000 Rs

Background/Introduction

The problem is how to detect the money send through the online payment apps and how to dispense the notes from money cabin.

In our prototype we used the GSM module to receive the message of payment and we used DC motor to rotate shafts through the notes come out from money cabin

CIRCUIT DIAGRAM



A Minor Project Report on

"ORNITHOPTER"

Bachelor of Engineering in

Mechanical Engineering

Submitted by

Ritesh R Hegde	01FE19BME048
Dhanashri U Sobarad	01FE19BME094
Pradyumnacharya G Bijapur	01FE19BME096
Abhishek M Chabbi	01FE19BME101

Under the Guidance of

Prof. Nagraj Ekbote

Prof. Sridhar Mandal

2021-2022

School of Mechanical Engineering

K.L.E Technological University,

Vidyanagar, Hubballi - 580031

CERTIFICATE

This is to certify that Capstone Project entitled **"Ornithopter"** submitted by **Team No. 01** to the **KLE Technological University**, Hubli-580031, towards partial fulfillment for the award of the degree of Bachelor of Engineering is a bona-fide record of work carried out by him/her under our supervision. The contents of project report, in full or in parts, have not been submitted to any other institute or university for award of any degree or diploma.

Prof. Nagraj Ekbote	Prof. Dr. B. B. Kottureshettar
Guide	**Head of department**

ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without mentioning the people who made it possible and whose guidance and encouragement has made our efforts successful.

At the outset, we would like to express our deep sense of gratitude for our guide **Prof. Nagraj Ekbote** for making this project report successful through their invaluable guidance at every stage of the project report.

We also thank **Dr. B. B. Kottursheттar** for his encouragement in undertaking the task of this project.

We express our sincere regard and gratitude to our project coordinators **Prof Gururaj Fattepur** and course mentors **Prof Nagaraj Ekbote, and Prof. Sridhar Mandal** School of Mechanical Engineering, KLE Tech, Hubli

We also thankful to all faculty members of the Mechanical Engineering Department of KLE Technological University, for helping us directly or indirectly in different stages of our project work.

Student signatures

(Team C01)

Phase wise Contents:

1 Refined problem statement

Defense sector:

Customer: Prakash Hokrani (Served in Indian AirForce) Interviewer(s): Dhanashri U Sobarad Date:01/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical uses	The device should spy without giving any hints to the target	The owl is realistic.
Likes-current methods followed (traditional techniques)	The owl is characterized by its soundless flight.	Stealth property of the owl is implemented.
Dislikes-current methods followed (traditional techniques)	It is mostly imported and/or most of the modules used are imported.	MAKE IN INDIA to be ensured to regulate the economy and nationality of the country.
Suggested Improvements	We should know where the owl is flying.	The device enables the GPS location of the owl.

Customer: Sunil Badiger (Serves in Indian Army) Interviewer(s): Dhanashri U Sobarad Date:03/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical uses	The device should fly at least 20-25mins in air.	The minimum time of flight is 20-25mins.
Likes-current methods followed (traditional techniques)	It should work in cold, snowy, rainy and sunny regions and weather conditions.	Work efficiently in different climatic and weather conditions.
Dislikes-current methods followed (traditional techniques)	Any person can easily debug the device.	The ornithopter is not easy to debug and misuse.
Suggested Improvements	We should know where the owl is flying.	The device should enable the GPS location of the owl.

Customer: Ganesh Mudakavi (Serves in Indian Army) Interviewer(s): Dhanashri U Sobarad Date:03/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**

Typical uses	The targeted person/thing should be very clearly visible.	The image or video quality is very high with good pixels.
Likes-current methods followed (traditional techniques)	The device should look like an owl and behave like one.	The ornithopter is a physical mimic of OWL and its behavior.
Dislikes-current methods followed (traditional techniques)	The videos look like the footage in CCTV.	High resolution videography is to be enabled.
Suggested Improvements	The owl should fly silently.	Stealth property of the owl is implemented.

Customer: Raj Shettar (Serves in Indian Navy)

Interviewer(s):

Dhanashri

U

Soba

r a d D a t e : 0 5 / 0 2 / 2 0 2 2	
Question/Prompt	**Interpreted Need/ Expectations**
Typical uses	Stealth property of the owl to be mimicked.

Likes-current methods followed (traditional techniques)	The capacity of the battery used is more.

Dislikes-current methods followed (traditional techniques)	High resolution videography is to be enabled.

Suggested Improvements	The audio is clear.

Customer: Shweta (NCC cadet) Interviewer(s): Dhanashri U Sobarad Date:04/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical uses	The device should not be hacked or identified by any devices or rays.	The ornithopter is not identified by any of the rays or by its transmission of signals.
Likes-current methods followed (traditional techniques)	It can sit and survey.	Surveillance is enabled while it is sitting.
Dislikes-current methods followed (traditional techniques)	It gets destroyed if it goes amidst fire for a while.	It is fire resistant to some extent.
Suggested Improvements	The videos do not look like the footage in CCTV	High resolution videography is to be enabled.

Customer: Sumedh N H (Serves in Indian Navy) Interviewer(s): Dhanashri U Sobarad Date:04/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical uses	The device should be able to sit at any place for constant spying.	Ability to sit at any place at any instant of time to constantly spy.
Likes-current methods followed (traditional techniques)	It can sit and survey.	Surveillance is enabled while it is sitting.
Dislikes-current methods followed (traditional techniques)	It gets destroyed if it goes amidst fire for a while.	It is fire resistant to some extent.
Suggested Improvements	Self-destructive when caught.	Self-destruction done under the commands given such that it can also be mass destructive if the area where the bird is, is the area of target.

Customer: Rajashekar G (Served in Indian Army)
Interviewer(s): Dhanashri U Sobarad
Date:06/02/2022

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses	The device should spy without giving any hints to the target	The owl is realistic.
Likes-current methods followed (traditional techniques)	It should capture the happenings of the day.	Surveillance in the day.
Dislikes-current methods followed (traditional techniques)	It is mostly imported and/or most of the modules used are imported.	MAKE IN INDIA to be ensured to regulate the economy and nationality of the country.
Suggested Improvements	Self-destructive when caught.	Self-destruction under the commands given such that it can also be mass destructive if the area where the bird is, is the area of target.

Customer: Mahadevappa G (Served in Indian Army)
Interviewer(s): Dhanashri U Sobarad
Date:06/02/2022

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses	The device should fly at least 20-25mins in air.	The minimum time of flight is 20-25mins.
Likes-current methods followed (traditional techniques)	It should capture the happenings of the night.	Surveillance in the night.
Dislikes-current methods followed (traditional techniques)	It is mostly imported and of the modules used are imported.	MAKE IN INDIA to be ensured to regulate the economy and nationality of the country.
Suggested Improvements	Self-destructive when caught.	Self-destruction under the commands given such that it can also be mass destructive.

Security Sector:

Customer: Head Security of KLE TECH CAMPUS. Interviewer(s): Ritish Hegde Date: 04/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical uses	Keeps campus safe	Security System
Likes-current methods followed (traditional techniques)	Securing campus environment	Strong Vigilance is possible
Dislikes-current methods followed (traditional techniques)	CCTV can't cover entire campus	As the camera is fixed at its pivot there are some blind spots which is not possible for it to capture
Suggested Improvements	It should also record movements in parking institutes	The areas which are not under the coverage should also get recorded

Customer: Head Security of KLE TECH CAMPUS. Interviewer(s): Ritish Hegde Date: 06/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical uses	Maintains covid protocols	Covid Task Force
Likes-current methods followed (traditional techniques)	CCTV helps in capturing the campus movement	The design of CCTV is ergonomically efficient
Dislikes-current methods followed (traditional techniques)	The purchasing and fitting cost is too high	The entire setup cost is much high such that not all the institutes can afford it
Suggested Improvements	It should be cheap	The equipment should be cost efficient

Forest sector:

Customer: Shivanand P (Forest range officer)- 9880507485, 7975443477. Interviewer(s): Pradyumna, Abhishek. Date:03/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical uses	The device should send video of the activities and show it on a screen.	Devices should capture the live by spying and transfer those footage to the controlling end.
Likes-current methods followed (traditional techniques)	No need to walk a far distance for a security check each time.	Good ability of spying with high range.
Dislikes-current methods followed (traditional techniques)	Smugglers can identify the device easily.	Due to the sound produced the targeted people can identify easily.
Suggested Improvements	To cover a large range for controlling.	Increasing the controlling radius of range.

Customer: Yash Angadi . Interviewer(s): Pradyumna, Abhishek. Date:03/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical uses	It should be able to control from at least 5km.	The device should have a radius range at least to 5km.
Likes-current methods followed (traditional techniques)	Good quality of images.	The ability of capturing video or images with high pixels.
Dislikes-current methods followed (traditional techniques)	The amount is very high.	Unaffordable as its price is high.
Suggested Improvements	It should make less noise, so that it should not be identified.	To make it soundless as the main objective is for spying.

Customer: Prajwal P Interviewer(s): Pradyumna. Date:03/02/2022		
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**

Typical uses	The device should send the videography secretly without any clue.	The device should spy the target very confidentially without any clue.
Likes-current methods followed (traditional techniques)	Very clear image quality.	The clarity of the video or image with high pixels.
Dislikes-current methods followed (traditional techniques)	It cannot be controlled after some range of 2km.	Its limited controlling ranges.
Suggested Improvements	To increase its controlling range.	The controlling range of radius to be pushed-up.

Customer: Karthik Langoti.
Interviewer(s): Pradyumna.
Date:03/02/2022

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses	The device should look like a bird.	The device should not differ from the shape of a typical bird.
	The device should fly maximum time in the air.	Device's flight time to the maximum of the capability.
Likes-current methods followed (traditional techniques)	It can fly at 15m height.	Capability of flying at a height of 10-15m.
Dislikes-current methods followed (traditional techniques)	Cannot buy the product due to the high price.	Cannot be affordable due to its high cost.
	The device available cannot be controlled easily.	It's not user-friendly because of the complexity in controlling.
Suggested Improvements	To make it fly even in rain and strong wind.	The device should withstand any climatic conditions.

Agriculture sector:

Customer: Mahantesh Adimani
Interviewer(s): Abhishek Chabbi, Pradyumna.
Date: 04-02-2022.

Question/Prompt	Customer Statement	Interpreted Need/ Expectations

Typical uses **FARMER**	I should not have to visit the field many times for security purposes.	The device has to have the specific skill to record and transmit the video to the user.
Likes-current methods followed (traditional techniques)	Minimum cost.	It has been built within minimal cost.
Dislikes-current methods followed (traditional techniques)	It can't balance at one place while flying.	Self-stability of the device is too low.
Suggested Improvements	No suggestions.	

Customer: Sachin pujari.
Interviewer(s): Abhishek Chabbi.
Date: 04-02-2022.

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses FARMER	I have to control it far from my field.	The device has appreciable operational range
	Regular maintenance is not required.	It has long time performance capacity without being maintained regularly.
Likes-current methods followed (traditional techniques)	Has an operational range of 5 kms.	It has a good range of operational frequency.
Dislikes-current methods followed (traditional techniques)	It can't sit on a branch.	The device Does not have functional legs.
Suggested Improvements	Range should be increased further.	It has wide range of operational frequency

Customer: Praveen I kooli.
Interviewer(s): Abhishek Chabbi.
Date: 04-02-2022.

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses **FARMER**	Keep eye on the field because for one month many thefts are happening.	The device has a high-resolution camera.
	I don't have to learn any specific skill to operate it.	It is having User friendly interface.

Likes-current methods followed (traditional techniques)	It depicts a bird.	Physical appearance of the device is similar to a bird.
Dislikes-current methods followed (traditional techniques)	Can't fly on rainy days.	It is not water resistant.
Suggested Improvements	No suggestions.	

Customer: Rakesh kurubar.
Interviewer(s): Abhishek Chabbi.
Date: 04-02-2022.

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses **FARMER**	It should not be easily identified.	Should look like a bird.
Likes-current methods followed (traditional techniques)	User friendly.	The device is easy to operate.
Dislikes-current methods followed (traditional techniques)	It can't fly too low.	It has low stability.
Suggested Improvements	No suggestions.	

Customer:Smaeer eligar.
Interviewer(s): Abhishek Chabbi.
Date: 05-02-2022.

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses **FARMER**	I Should not have to charge it many times.	It's required to have good battery life.
	It should not be easily identified.	Should look like a bird.
Likes-current methods followed (traditional techniques)	It can transmit the video footage.	The system has a video transmitter.

Dislikes-current methods followed (traditional techniques)	It can't fly in a varying environment.	Not versatile in nature.
Suggested Improvements	No suggestions.	

Customer: Darshan Hamppanavar. Interviewer(s): Abhishek Chabbi. Date: 05-02-2022.

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses **FARMER**	It should spy at night also.	The device should have Night vision.
	It should not be easily identified.	Physical appearance of the device is similar to a bird.
Likes-current methods followed	It can operate at night.	The device has night vision.
(traditional techniques)		
Dislikes-current methods followed (traditional techniques)	It needs help from someone to take off.	It does not have the ability to take off by itself.
Suggested Improvements	No suggestions.	

Customer: Sagar kumbari.
Interviewer(s): Abhishek Chabbi.
Date: 05-02-2022.

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses **FARMER**	Keep eye on the field because for one month many thefts are happening.	The device should have a high-resolution camera.
Likes-current methods followed (traditional techniques)	It depicts a bird.	Physical appearance of the device is similar to a bird.
Dislikes-current methods followed (traditional techniques)	Can't fly on rainy days.	It is not water resistant.

Suggested Improvements	No suggestions.	

- **Requirements List**

Customer	**Requirements**
	The ornithopter covers the range up to 5-6kms.
	The maximum time of flight is at least 20-30mins.
	Cost efficient.
	User friendly.
	Easy to control and navigate.
Customer	**Requirements**
	Aerial vehicle comprising compact video recording system.
	Cost efficient model when compared to other vigilance products
	The operating system should be much simpler.
	Aesthetically it should resemble real bird

2. Product Benchmarking

2.1 Studying and exploring competitive products

Products (Images or name)	Specifications	Cost	Advantage	Limitations	Availability
1.Drone 	(12.5*8*5.5) cm Brand – Hillstar Material – Plastic Video Capture – 4k HD resolution Wireless communication – Wi-fi, Catian Technology Camera – 5 Mega, 2 Secondary	₹14,000/-	Optical visual Hovering, 4k HD wide Angle lens Roll 360-degree flights One key takes off & landing Speed switching	Height 40-50 meters	Mavic-mini
2.CCTV Camera 	Specifications Usage – Outdoor Brand – TP Link Connectivity Tech.- Wireless, Wired Recommended uses – Night vision, motion	₹3,699/-	Night Vision Motion Detection and notification IP66 Weatherproof Two-way audio	It is fixed at a place Continuous supply of current	TP- Link Tapo CWO, Imou IP67 waterproof Imou IP67 security Bullet camera

	detection for product Model Name – Tapo C3bQ Video Capture Resolution – 1296P Compatible devices - Smartphone		Automatic siren		
3 RC Copter with camera  	Helicopter Size: 10.63 x 1.77 x 4.72 IN Helicopter Weight: 70.6g / 2.49oz Camera: 640x480p Transmission Distance: 30m Helicopter Battery: 3.7V 350mah Li-Po Battery Transmitter Battery: 4 x 1.5v AA Batteries (not included) Flight Time: about 5-6 Minutes Charge time: About 80 minutes	₹3383/-	Wifi FPV Real-time Transmission Photo / Video Recording One Key Take-off / Landing Emergency Stop Altitude Hold Mode High / Low Speed Mode Low Battery Alarm Out of Range Alarm	Activity is limited - With electric rc helicopters, all we have to do is charge, fly, re-charge, fly, re-charge again, and fly again. Battery life isn't that compatible	In online stores

4.Festo Smart Bird.  	Torso length – 1.07m Wing span – 2.00m Weight- 0.450kg Electric power requirement- 23W Motor- Compact 135brushless. Sensor- motor positioning 3xTLE4906 Hall sensor Accelerometer - LIS302DLH Battery- Lithium polymer accumulator 2cells, 7.4V, 450mA.	₹25,000/- (excluding GST)	Safe operation through condition monitoring. Functional integration for hybrid technology. Energy efficient and resource friendly. The smart bird flight model has no rotating parts on its exterior and therefore cannot cause injuries.		Smart festo bird. Robird.
5. Security Guard (Human resource)		₹1,20,000/- per annum	Portable Decision making capacity.	Can be a fraud.	Security guards at the airport, college campus, manufacturing industries.

2.2 Patent search

Patent Name/ Number/ Date	Information
HOVERING AND GLIDING MULTI-WING FLAPPING MICRO AERIAL VEHICLE /US 9,290,268 B2 /Mar.22,2016	The basic principles of flight and how the flapping mechanism can be achieved and controlled by the rotational moment.
REMOTE-CONTROLLED FLUTTERING OBJECT CAPABLE OF FLYING FORWARD IN UPRIGHT POSITION /US 8,366,506 B2 /Feb. 5, 2013	The types of mechanisms for converting the circular motion to the flapping mechanism, and their placements for space utilization.
ORNITHOPTER /US 2011/007.9677 A1 /Apr. 7, 2011	Information regarding the three aspects of the ornithopter design can be gathered here: 1) the wing structure, 2) the steering mechanism, and 3) The appearance and construction of the body or fuselage.
FLAPPING WING AERIAL VEHICLES /US 2015/0307191A1 /Oct. 29, 2015	The basic procedure for conceptual designing of wings and its placements for better flight and the techniques for improving the efficiency.
The Sound Suppression Characteristics of Wing Feather of Owl /10.1016/S1672-6529(11)60109-1 /01-09-2012	The information gathered from this paper is that the eagle owl generates lower noise than common buzzards during flight, and its wing feather has better sound absorption properties. The leading-edge serration and trailing edge fringe can improve the pressure fluctuation of turbulence boundary, and suppress the generation of vortex sound.

Design, Fabrication and Testing of Flapping Wing Micro Air Vehicle /January 2016 /ISSN: 2248-9622	The purpose of this project was to design and fabricate a flapping wing micro air vehicle. The designed MAV will have a wing span of 40cm. The drive mechanism will be a gear mechanism to drive the flapping wing MAV, along with one actuator.

2.3 Literature survey

Literature details	Gathered Information
Design and Optimization of a Biologically Inspired Flapping Mechanism for Flapping Wing Micro Air Vehicles	In this paper, we investigate design and performance of a flapping mechanism which generates flapping motion through resonant excitation similar to flight apparatus of insects. The desired flapping motion is based on optimum aerodynamic efficiency. The mechanism is driven by a con-venational motor and gearbox. The rotary motion is converted into oscillatory excitation through a four-bar linkage. This study explores the optimal design parameters of this mechanism for peak performance.
Mechanization and Control Concepts for Biologically Inspired Micro Air Vehicles	This work has contributed to an emerging body of multidisciplinary knowledge in the area of biologically inspired microscale flight. The research activity seeks to gain and apply an understanding of the function of highly agile natural fliers in the size range of the MAV class. A key factor in this endeavor has been to design and control a vibratory wingbeat apparatus using insights provided by bird, insect, and bat morphologies. Results were presented from a benchtop testbed used to explore a vibratory system that embodied such insights

Four-Bar Linkage Mechanism for Insect like Flapping Wings in Hover: Concept and an Outline of Its Realization	This paper describes the concept of a mechanism for micro air vehicles realizing insect-like flapping based on a four-bar linkage and outlines its design, implementation, and testing. This work is part of a larger research effort at Cranfield University RMCS Shrivenham aimed at developing a flapping-wing micro air vehicle 1,2.
Flapping Flight for Biomimetic Robotic Insects Part II: Flight Control Design	In this paper we observed the design of flight control algorithms for flapping wing micromechanical flying insects. Inspired by the sensory feedback and neuromotor structure of biological flying insects, we propose a similar top-down hierarchical architecture to achieve high performance despite the MFIs' limited computational resources. Flight stabilization is formulated as high frequency periodic control of an underactuated system. In particular, we provide a methodology to approximate the time-varying body dynamics caused by the aerodynamic forces with time-invariant dynamics using averaging theory and a biomimetic parametrization of wing trajectories. This approximation leads to a simpler dynamical model that can be identified using experimental data from the onboard sensors and the input voltages to the wing actuators. Moreover, the overall control law is a simple periodic proportional output feedback. Simulations, including sensor and actuator models, demonstrate stable flight in hovering mode.
Wing transmission for a micromechanical flying insect	Flapping wings provide unmatched maneuverability for flyying micro-robots. Recent advances in modeling insect aerodynamics show that adequate wing rotation at the end of the stroke is essential for generating adequate flight forces. A thorax structure has been developed utilizing planar 4-bar frames combined with a spherical 5-bar differential to provide adequate wing stroke and rotation. Calculations using a simple resonant mechanical circuit model show that

	piezoelectric actuators generate sufficient power, force and stroke to drive the wings at 150 Hz.
Design and Construction of an Autonomous Ornithopter	We got to know that in the recent years the subject of flying vehicles propelled by flapping wings, also known as ornithopters, has been an area of interest because of its application to micro aerial vehicles (MAVs). These miniature vehicles seek to mimic small birds and insects to achieve never before seen agility in flight. This renewed interest has raised a host of new problems in vehicle dynamics and control to explore.
Designing a Biomimetic Ornithopter Capable of Sustained and Controlled Flight	From this article we learnt the design of four ornithopters ranging in wingspan from 10 cm to 40 cm, and in weight from 5 g to 45 g. The controllability and power supply are two major considerations, so we compare the efficiency and characteristics between different types of subsystems such as gearbox and tail shape. Our current ornithopter is radio-controlled with inbuilt visual sensing and capable of takeoff and landing. We also concentrate on its wing efficiency based on design inspired by a real insect wing and consider that aspects of insect flight such as delayed stall and wake capture are essential at such a small size. Most importantly, the advance ratio, controlled either by enlarging the wing beat amplitude or raising the wing beat frequency, is the most significant factor in an ornithopter which mimics an insect.

2. Design Specifications

3.1 Objectives

	Objectives	
	The owl should be realistic.	The capacity of the battery used should be more.
	Work efficiently in different climatic and	The areas which are not under the coverage should also get
	The image or video quality should be very high with good pixels.	The device should be soundless and well damped from vibrations at the time of flight.

3.2 Constraints

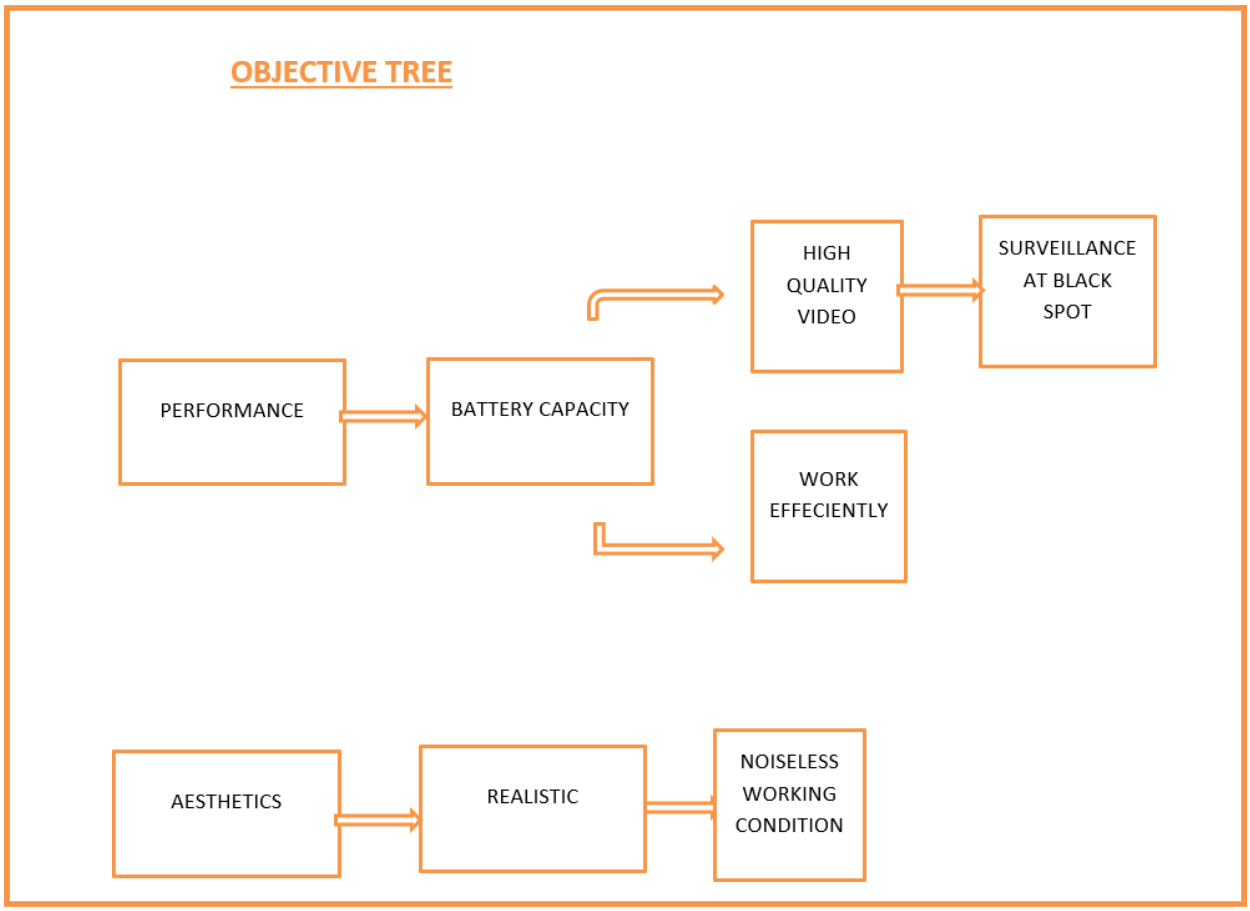
Constraints
The minimum time of flight should be 20-25 mins.
The device should have a radius range at least to 5km.

1.

3.3 Objective tree (affinity diagram)

O#	Objectives	First level objectives	Second level objectives	Third level objectives
1	The owl is realistic.	*		
2	Work efficiently in different climatic and weather conditions		*	
3	The image or video quality should be very high with good pixels.		*	
4	The capacity of the battery used should be more.	*		
5	The areas which are not under the coverage should also get recorded			*
6	The device should be soundless and well damped from vibrations at the time of flight.	*		

Objective tree: (draw your affinity diagram here)



1. **Design Specifications:**

Si.	Engineering Specifications	Units
1	Crew	Number
2	Length	m
3	Wingspan	m
4	Gross weight	kg
5	Power Plant	kW
6	Cruise speed	km/h

2. Competitive Benchmarking:

Metric #	Metric	Units	Competitive Products		
			Robird (UAV)	Drone	CCTV Camera
1.	Total weight of the product	Kg	0.450	0.249	0.28
2.	Total time of flight	minutes	7	30	NA
3.	Maximum height of flight from ground.	meters	90	50	NA
4.	Battery capacity	mah	450(7.4V,2s)	2400(7.4V,2s)	50mA-300mA
5.	Maximum tilt angle	degrees	45°(in all directions)	30° (S Mode) 20° (P Mode) 20° (C Mode)	360°
6.	Operating temperature range	degree celsius	0 to 40 (32° to 104°F)	0-40	At all climatic conditions
7.	Maximum wind speed resistance	meter per second	8m/s	9m/s	NA
8.	Wing span	meters	2m	245×289×55 mm (L×W×H)	NA
9.	Mechanical range	degrees	Tilt (-45°)-45° Roll (-30°)-30°	Tilt 110°-35° Roll (-35°)-35° Pan (-20°)-20°	NA
10.	Video resolution	pixels(maximum)	1080	1920*1080	1920*1080

Phase 4

4.1 Concept

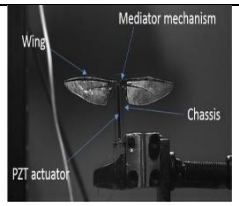
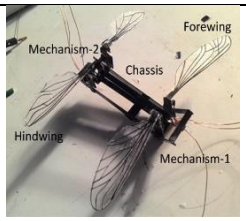
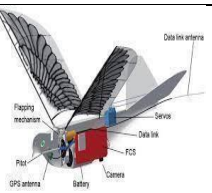
Generation

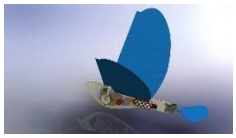
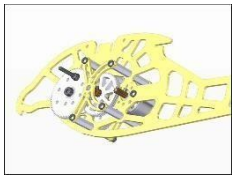
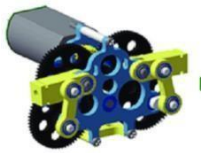
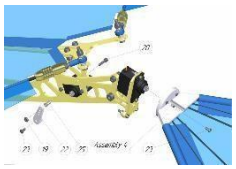
Defining Functions

Si.	Functions
1.	Stealth property of the owl should be implemented.
2.	The device should enable the GPS location of the owl.
3.	The ornithopter should be the physical mimic of OWL and its behavior.
4.	The ornithopter should not be identified by any of the rays or by its transmission of signals.
5.	It should be fire resistant to some extent.
6.	Self-destruction done under the commands given such that it can also be mass destructive if the area where the bird is, is the area of target.

4.2 Morphological Chart

Construct the morph chart for identified functions (max 5)

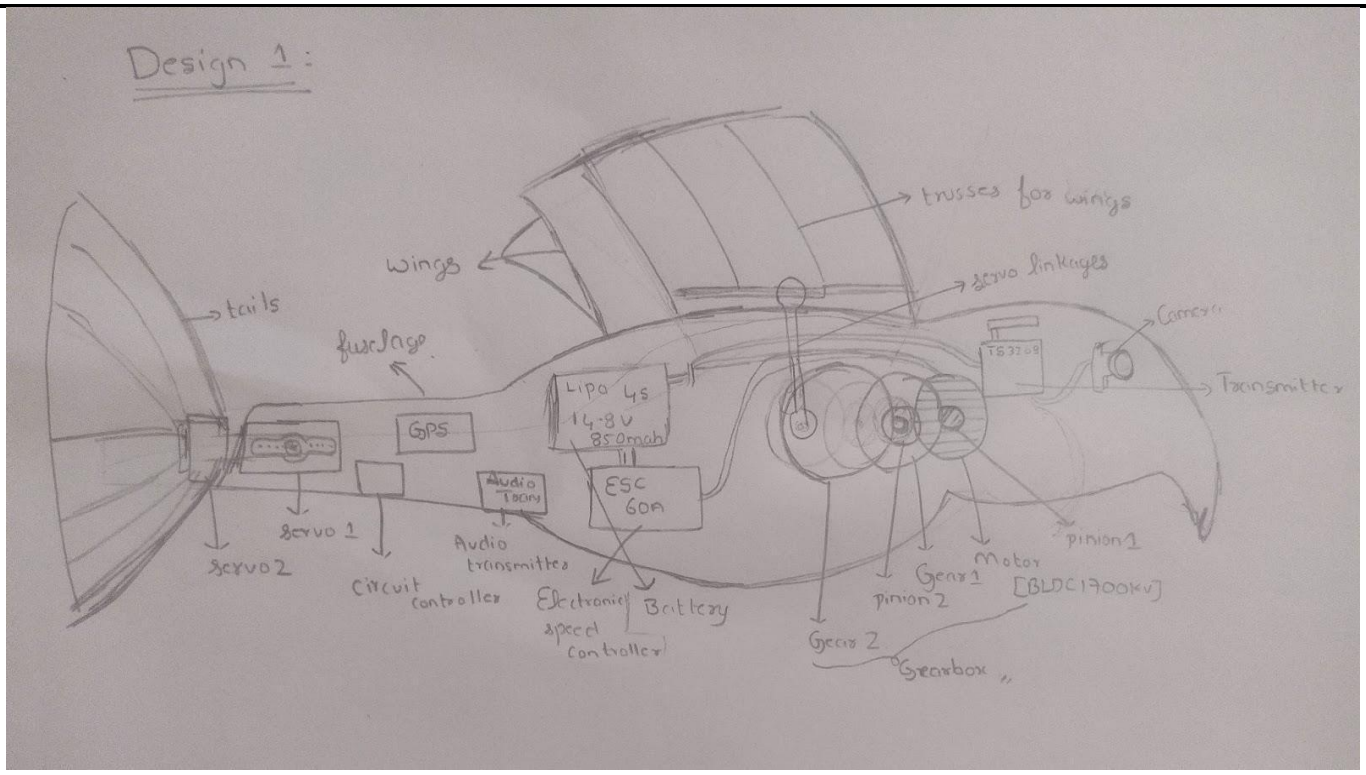
	Functions ▼ Means ►	Means 1	Means 2	Means 3	Means 4
	Stealth property				
	GPS location				

Resemblance of owl				
Flapping mechanism				
Tail moment				

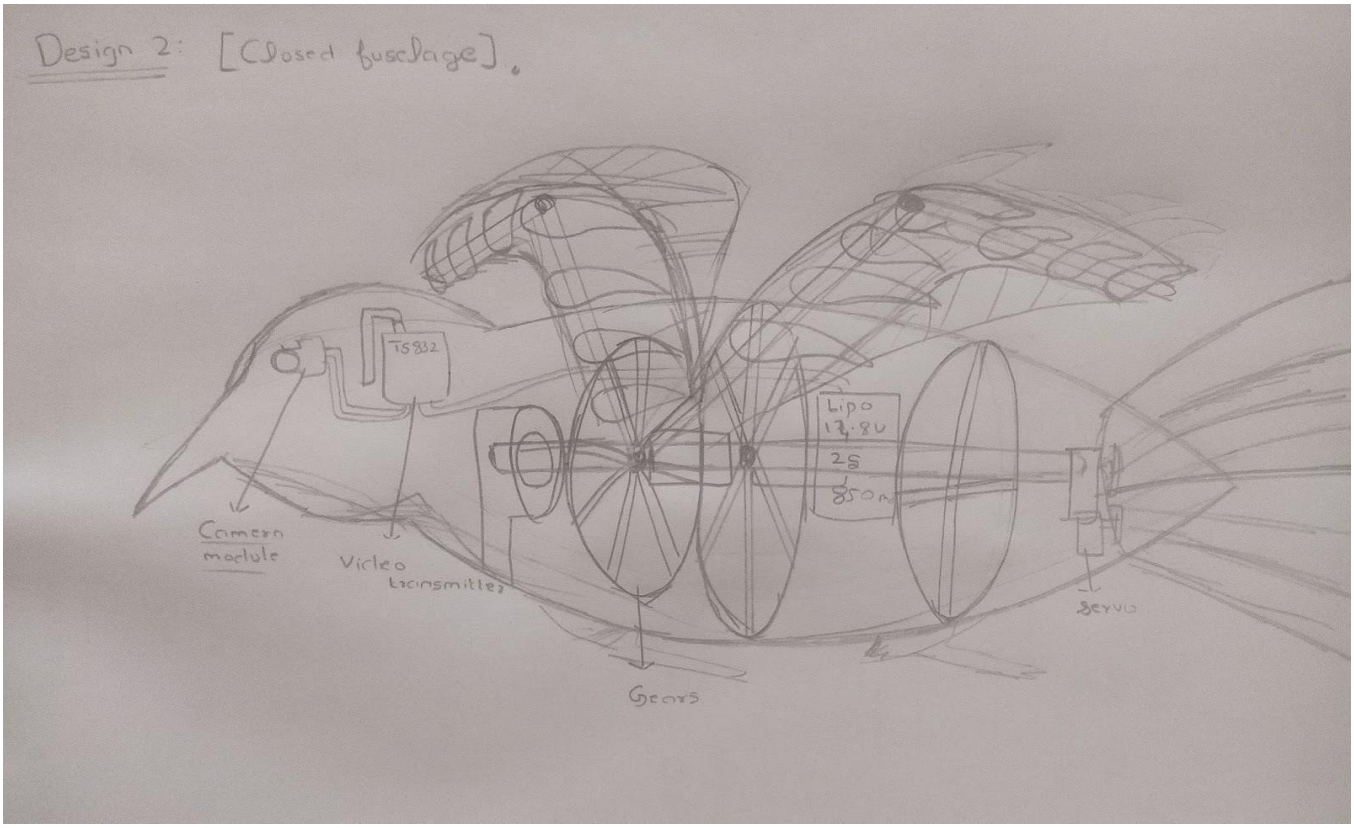
4.3 Generating Design Alternatives

Identified Design Alternatives:

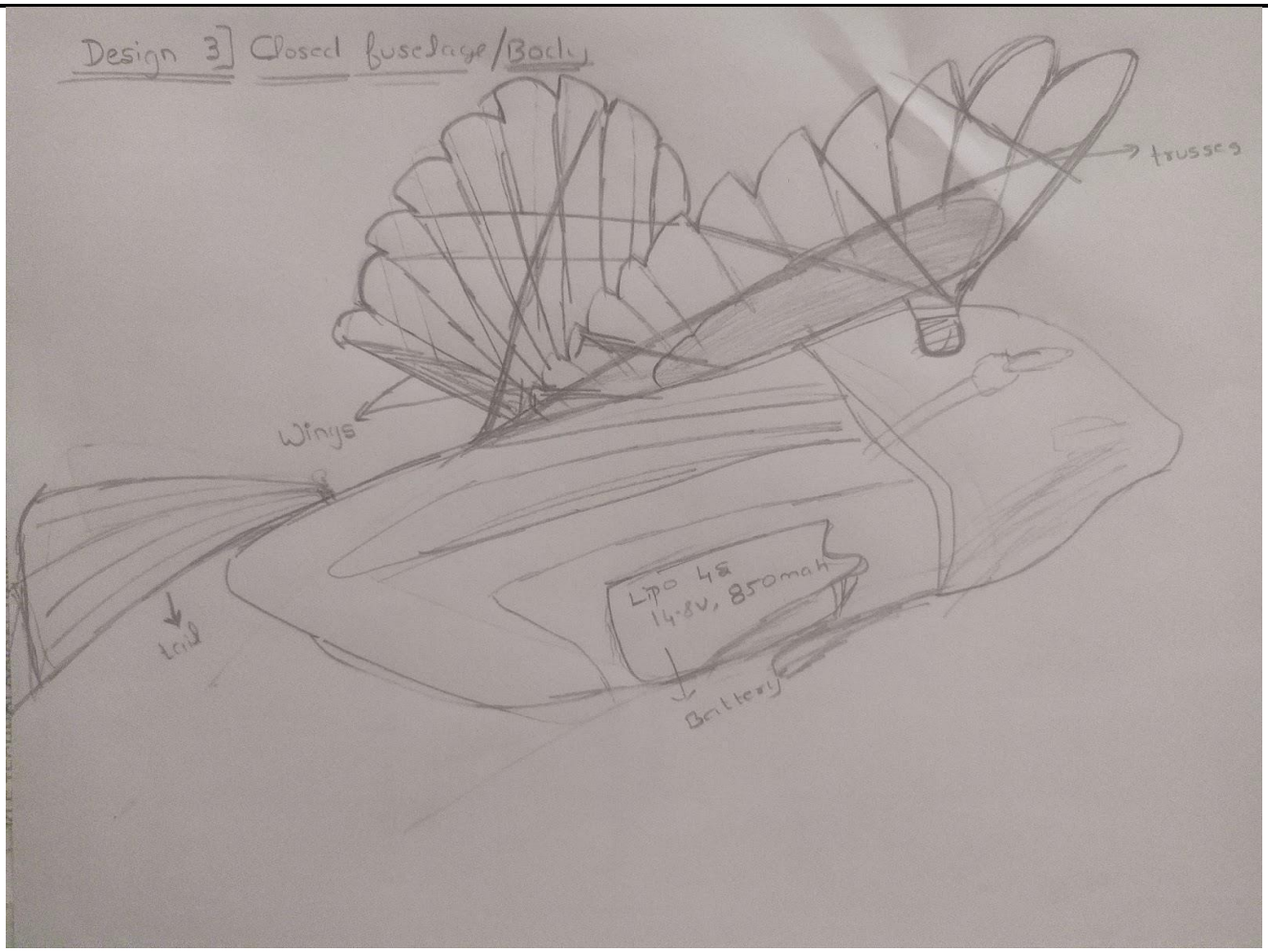
Si.	Design Alternatives
1	RC Ornithopter
2	Aero foil wing, Full body RC Ornithopter
3	Full body Ornithopter
4	Linkage Ornithopter



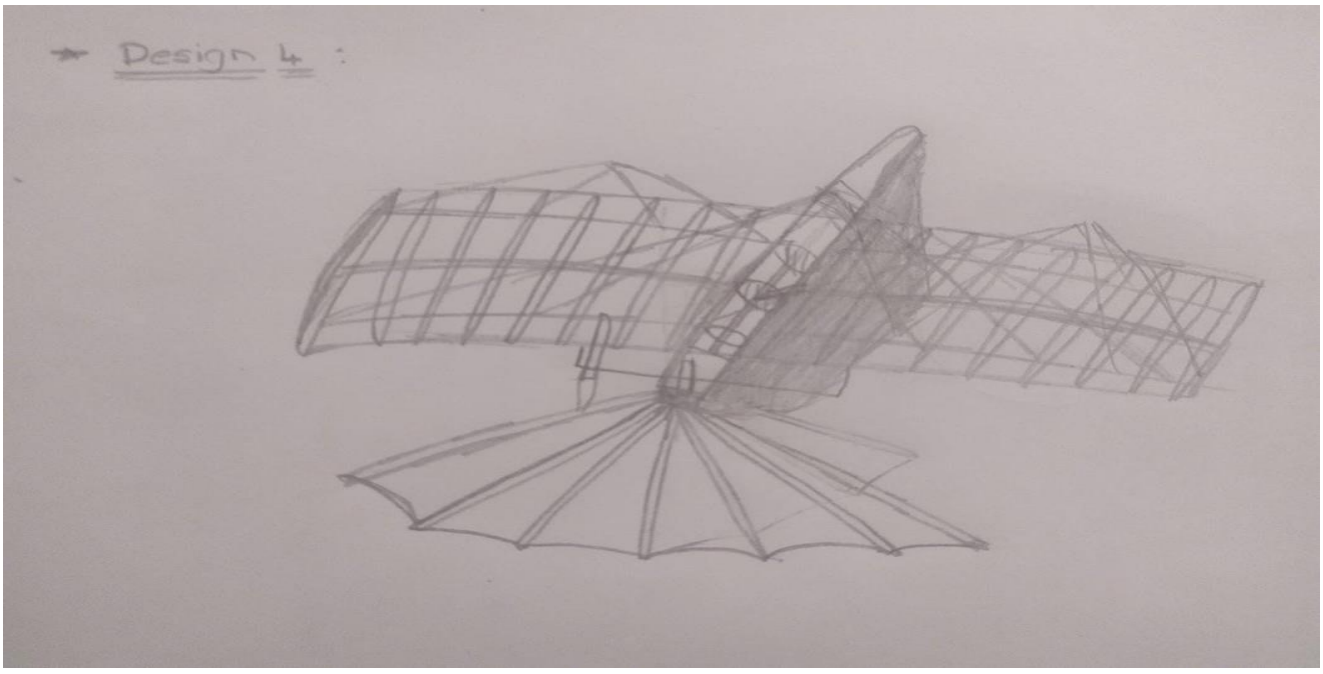
Design Alternative 2



Design Alternative 3



Design Alternative 4



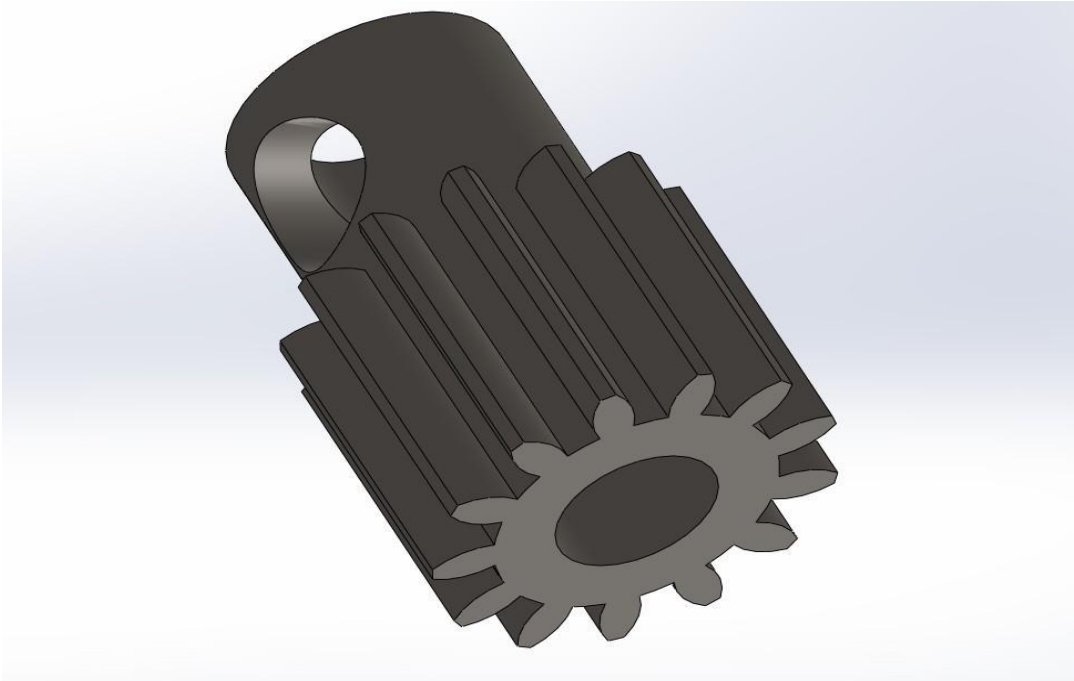
4.4 Selecting Design Alternative (Using Pugh Chart)

Requirements	Weight	Design1	Design2	Design3	Design4	Reference (Festo smart bird)
Stealth property	8	0	+	+	-	0
Resemblance of owl	6	-	+	0	-	0
Efficiency in flapping	9	+	0	0	-	0
Accuracy in motion of tail	7	+	+	-	0	0
Noiseless	5	-	+	-	-	0
Cost effective	6	+	-	0	+	0

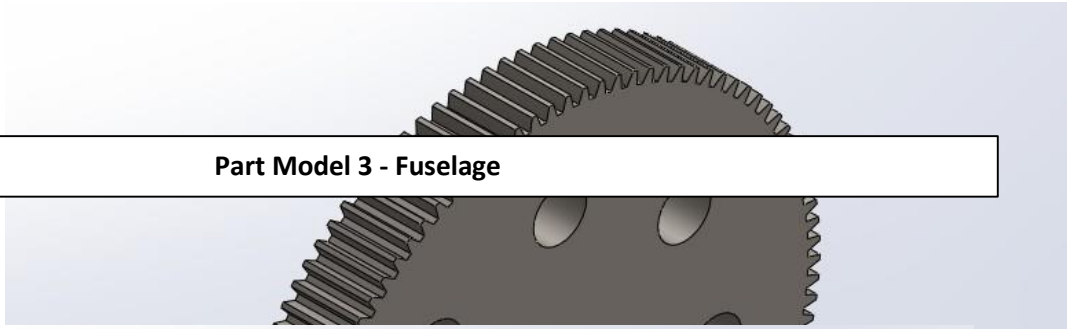
Selected Design Alternative: Design 2, Aerofoil wing, Full body RC Ornithopter

5.1 3D Model

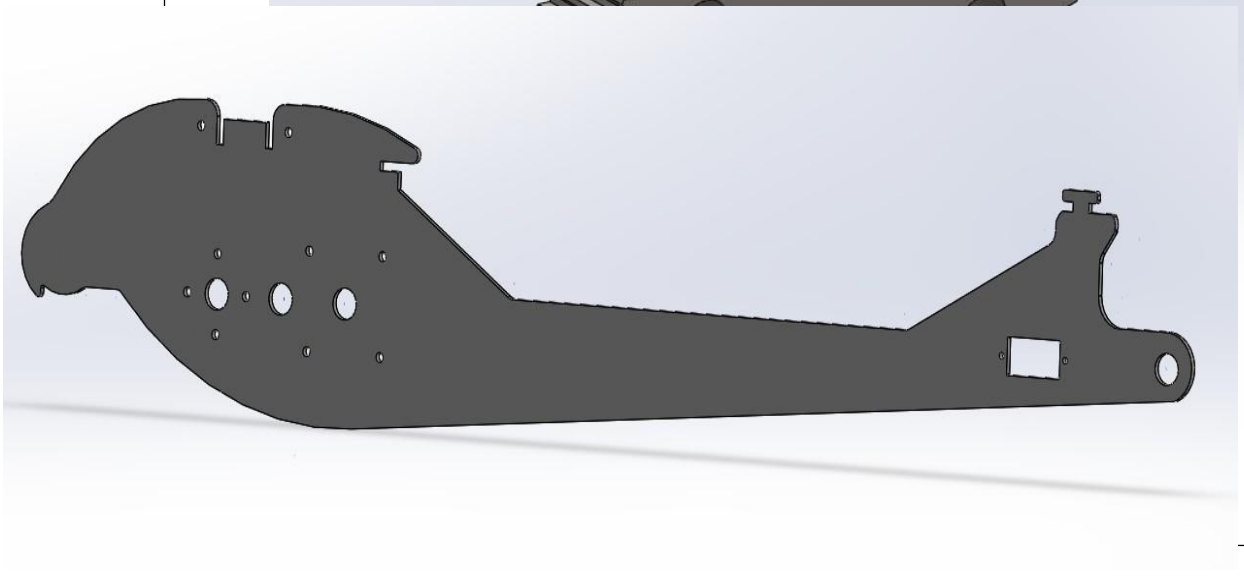
Part Model 1 - Pinion



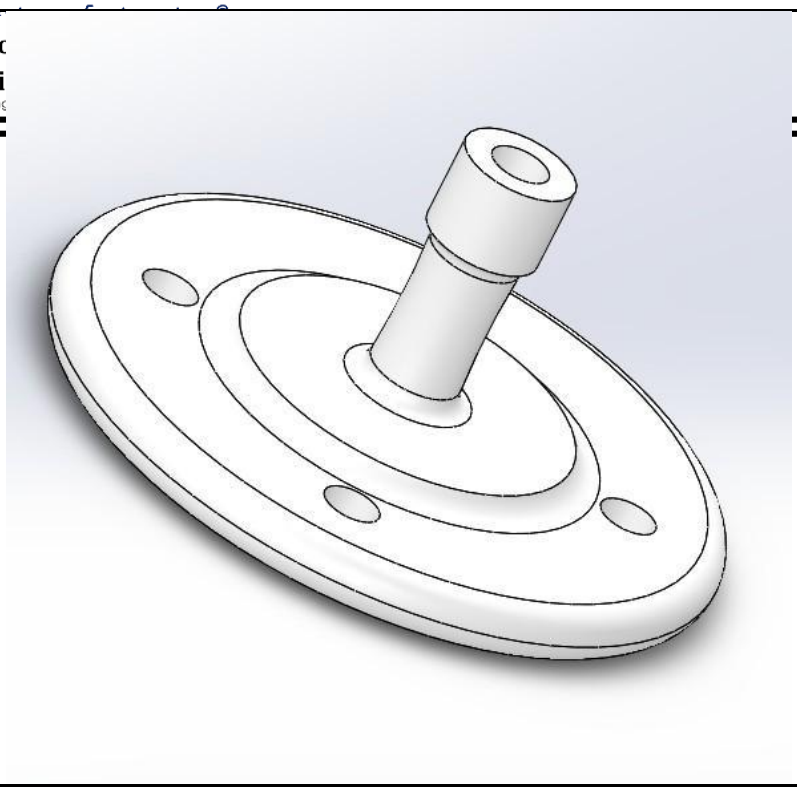
Part Model 2 - Gears

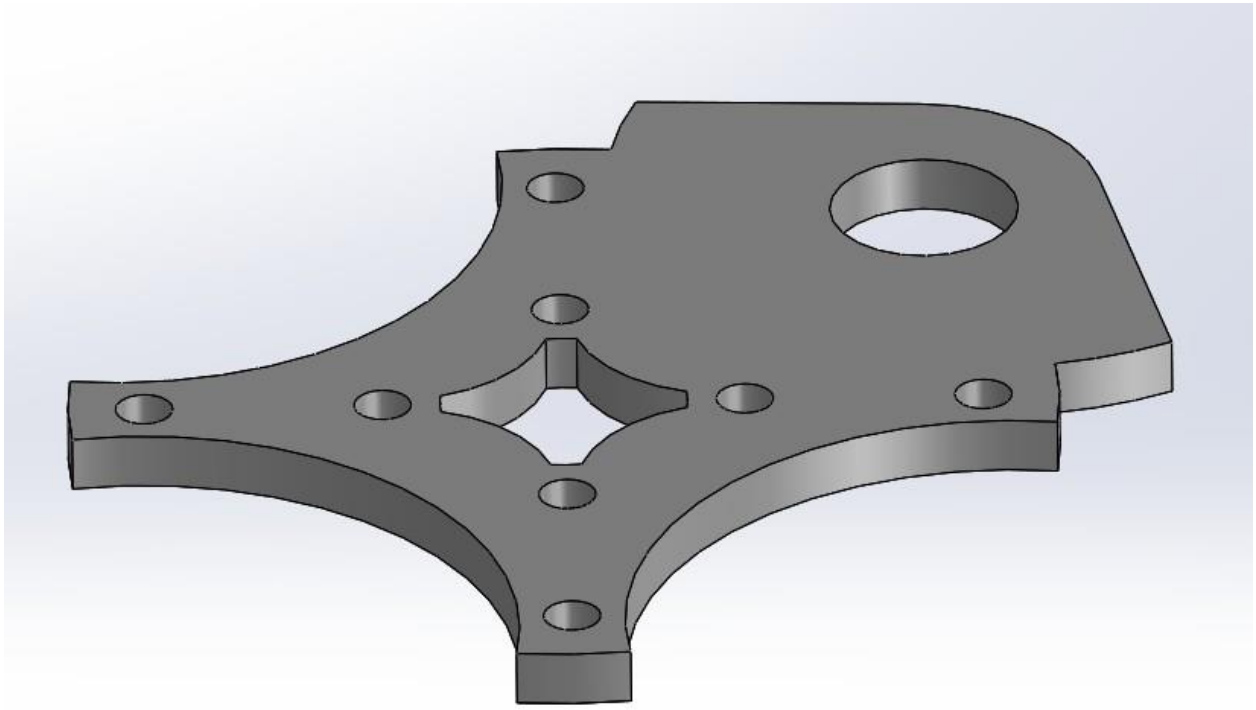


Part Model 3 - Fuselage



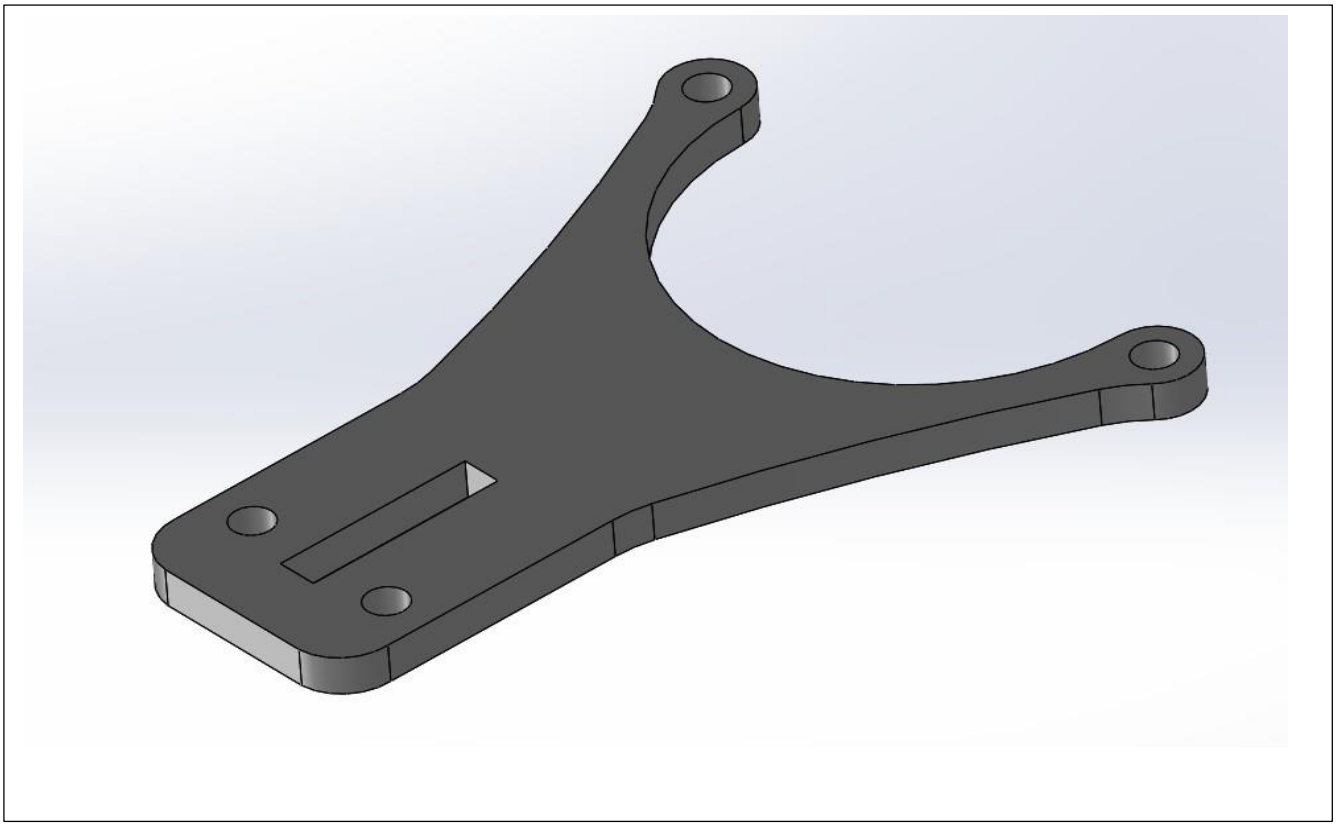
Part Model 4 - Fuselage

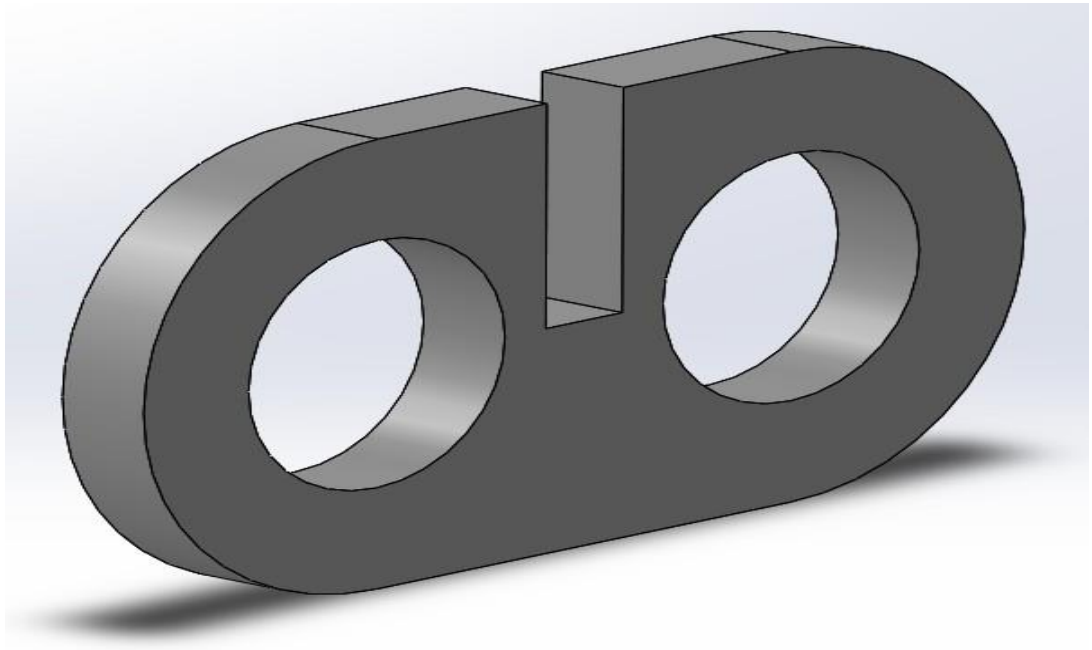




Part Model 6-Wing holder Back

Part 5 – Motor holder



Part model


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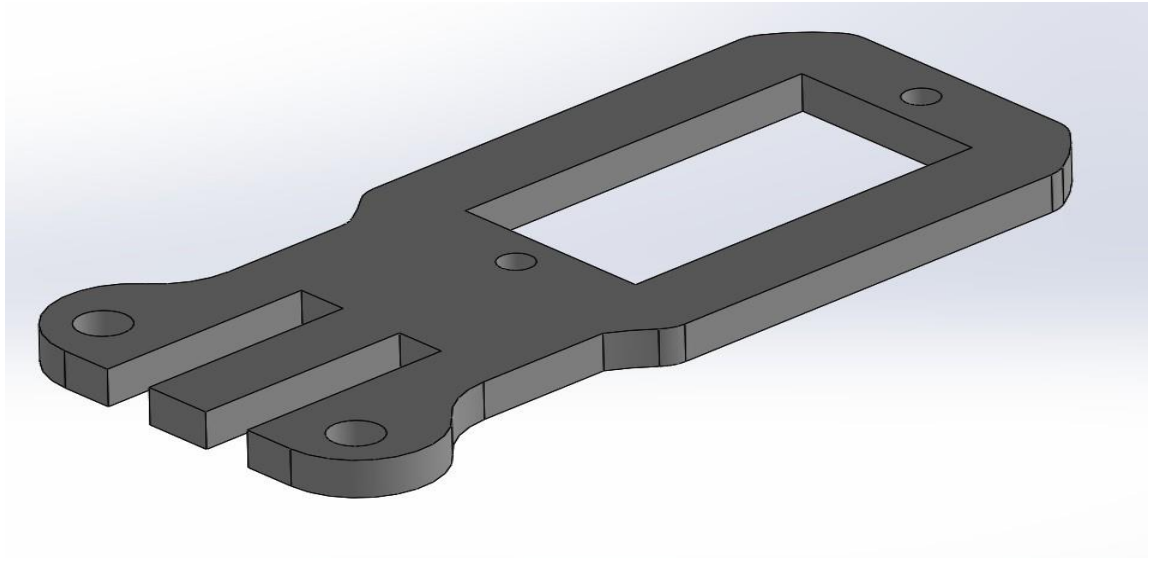

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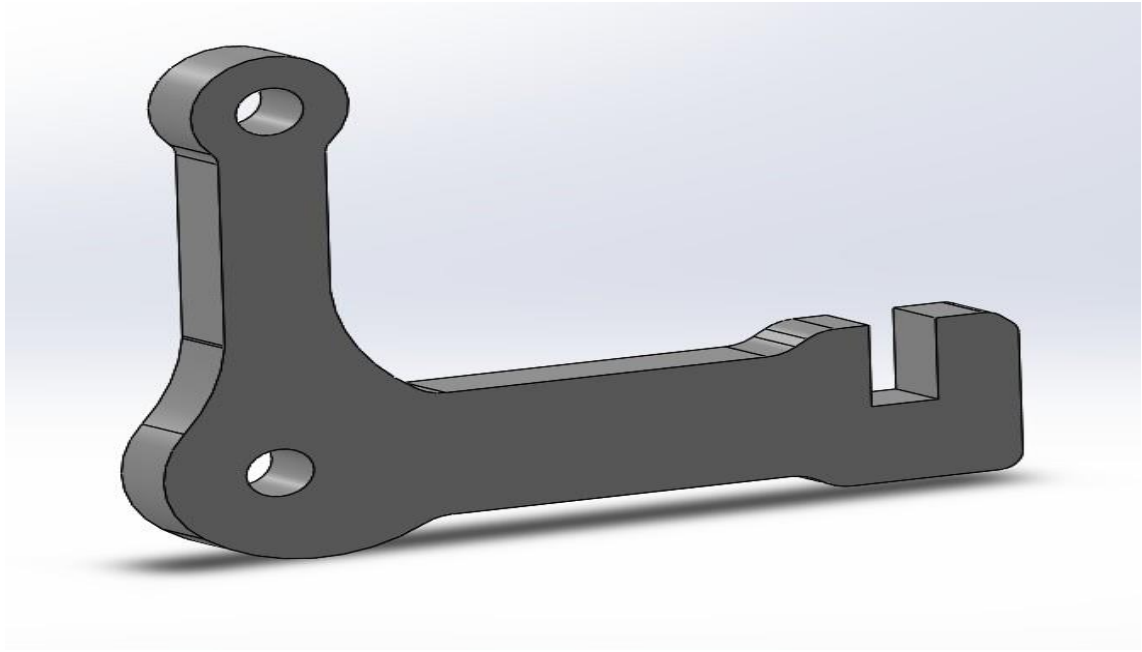

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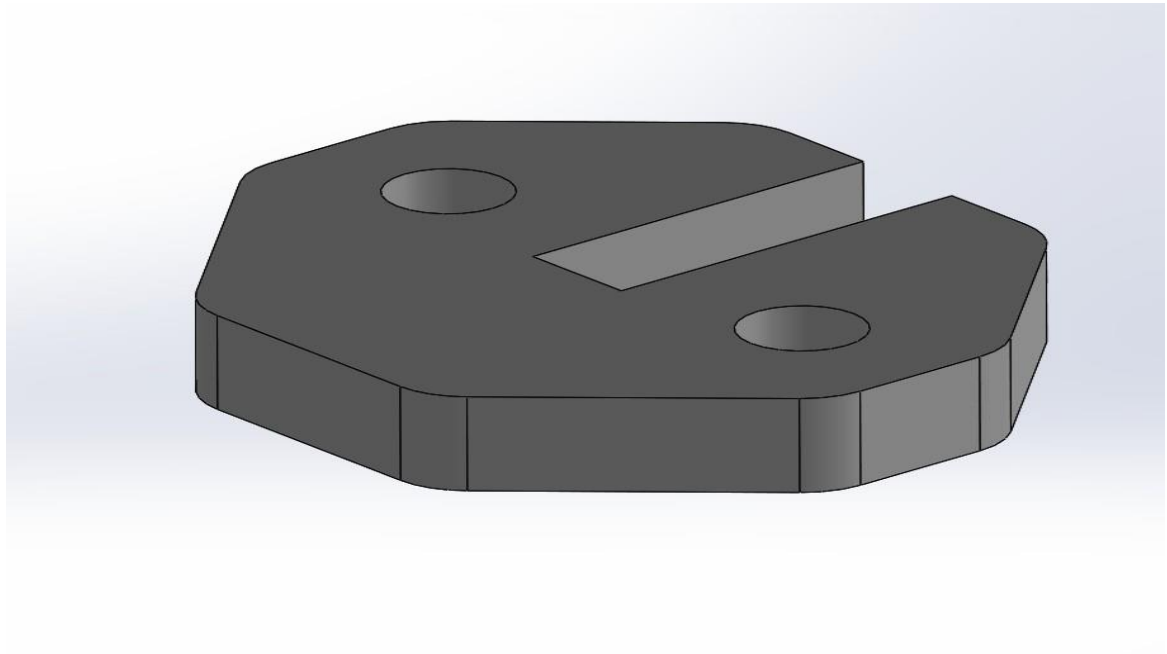
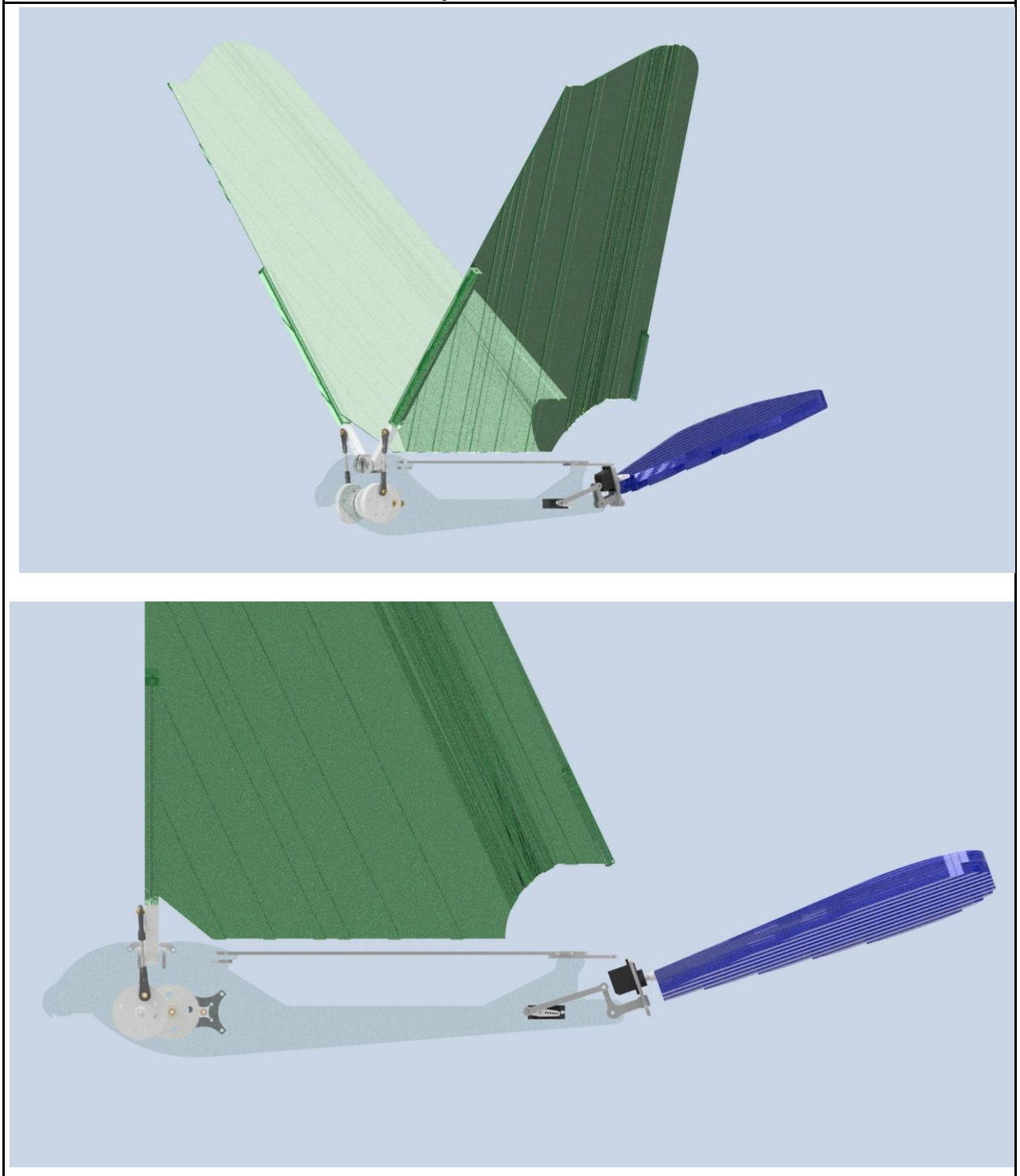


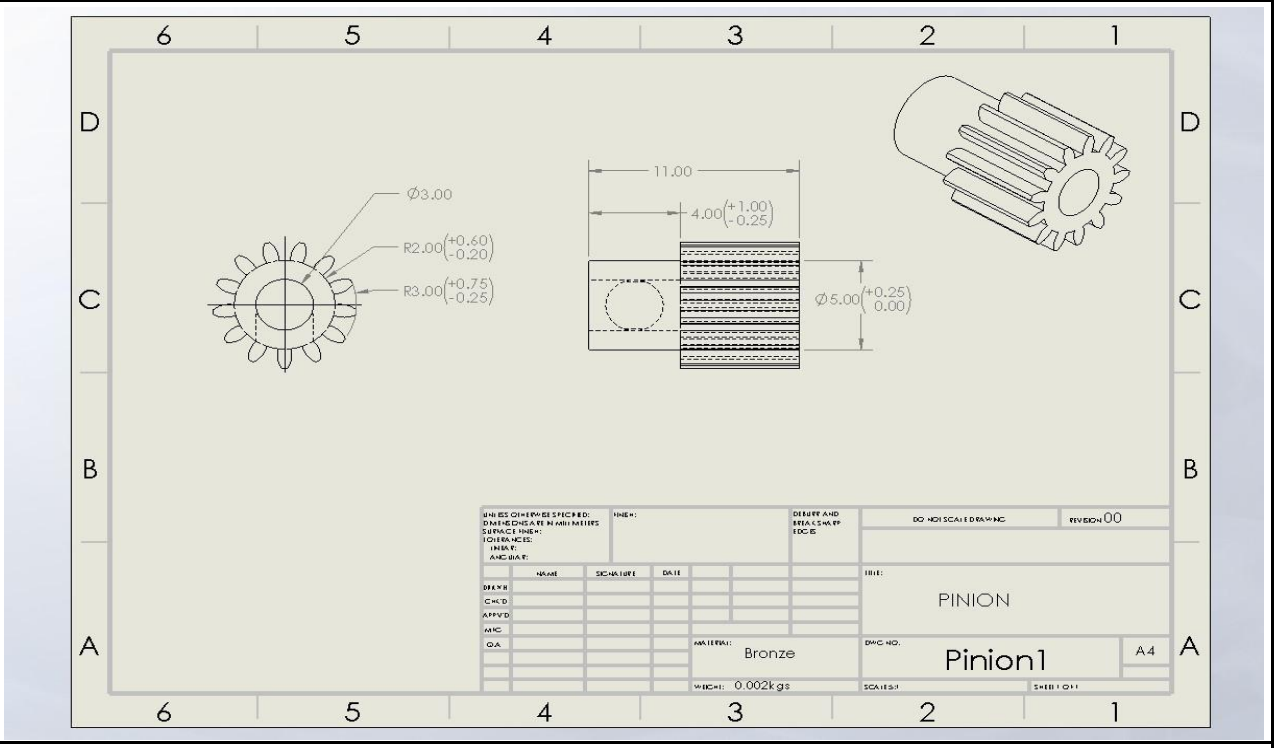
5.1 Assembly models

Assembly Model

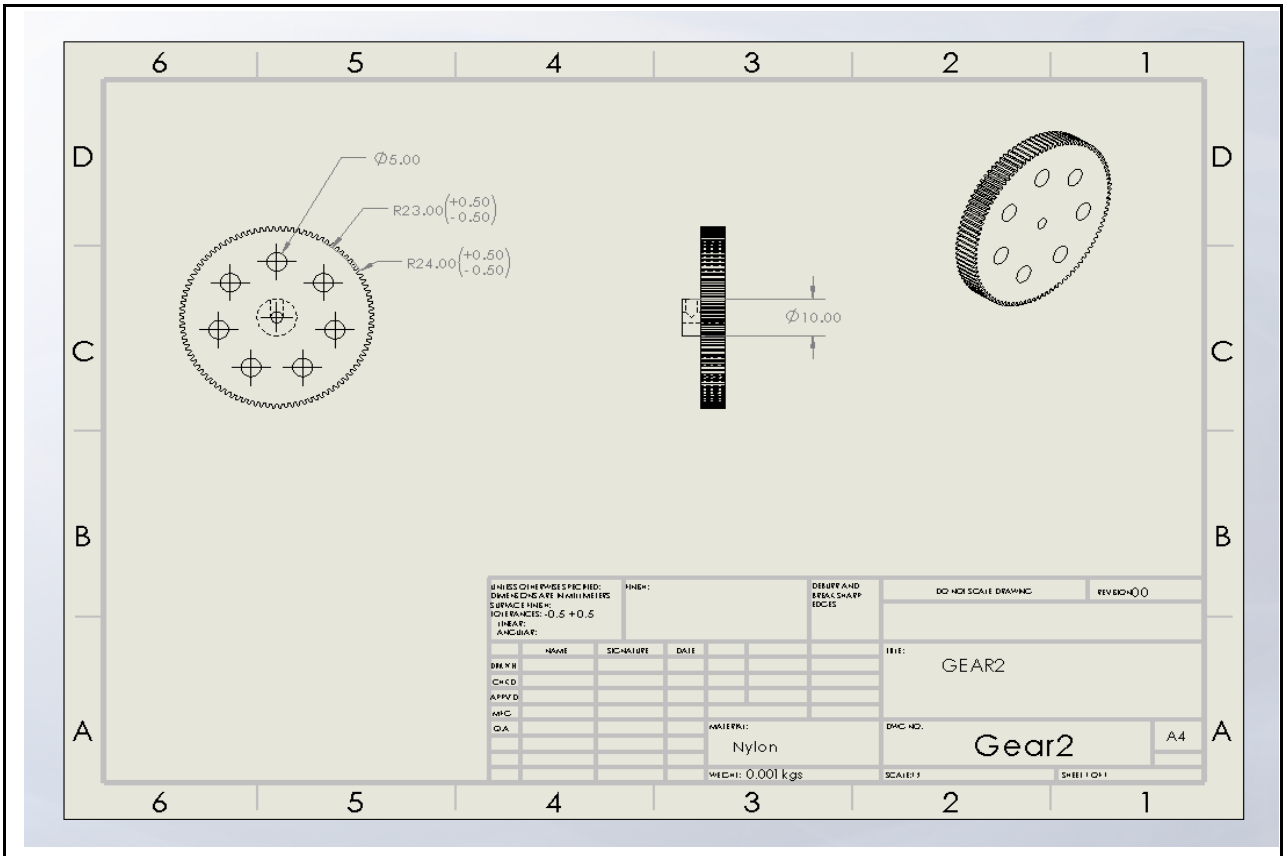


2D Drawings

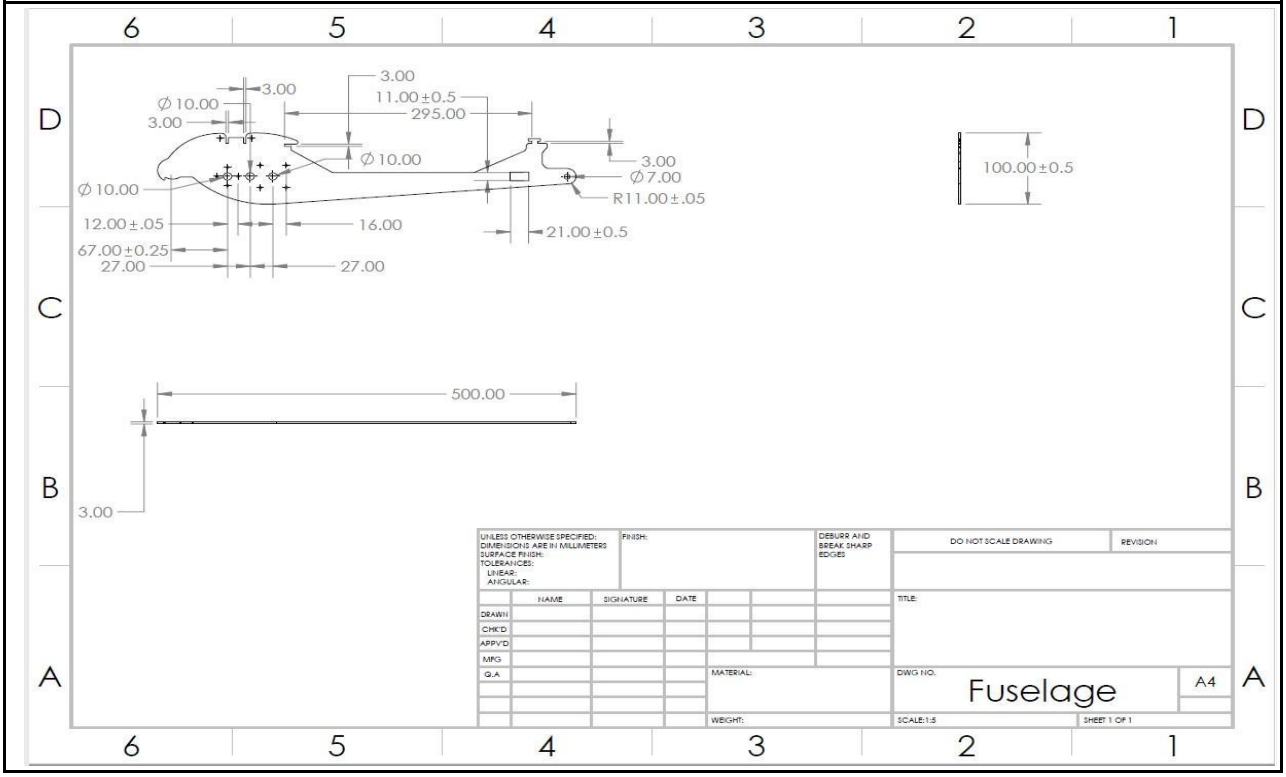
2D Drawing 1



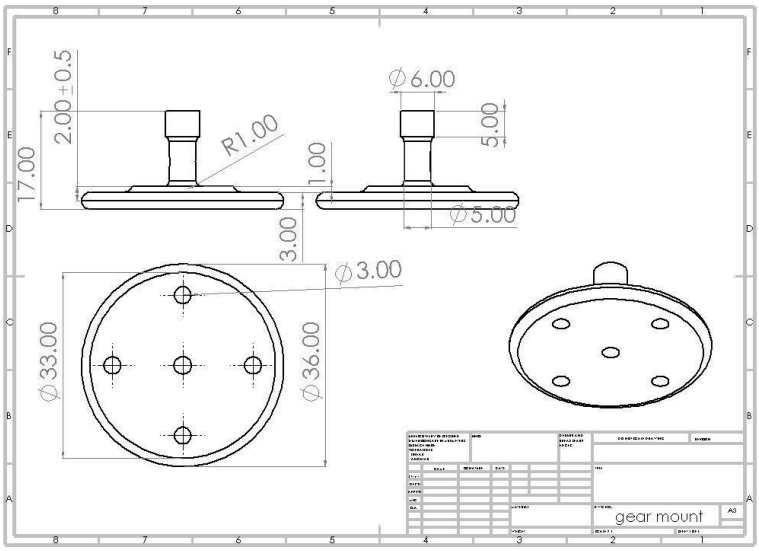
2D Drawing 2


Ø5.00
R23.00 (+0.50 -0.50)
R24.00 (+0.50 -0.50)
Ø10.00
GEAR2
Nylon
Gear2
A4

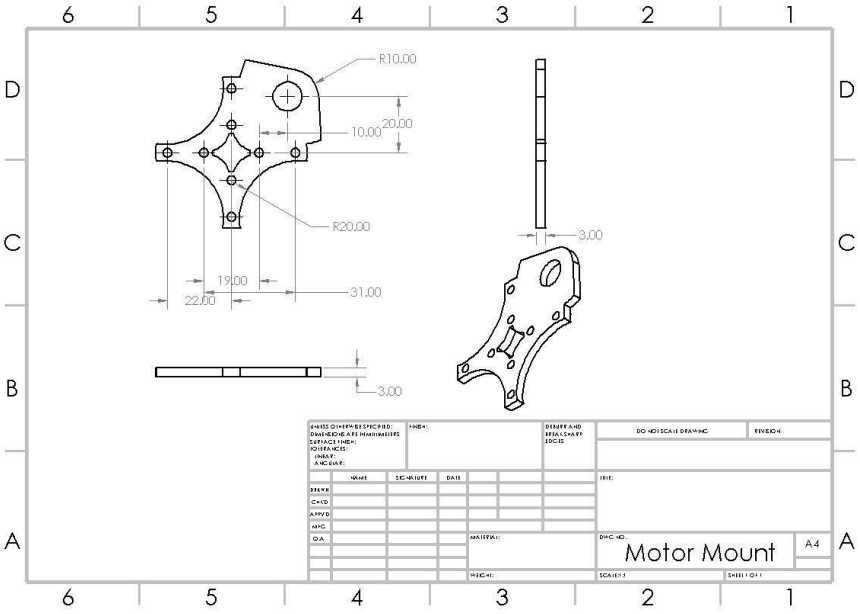
2D Drawing 3


3.00
Ø10.00
3.00
11.00±0.5
295.00
Ø10.00
3.00
Ø7.00
R11.00±.05
Ø10.00
12.00±.05
16.00
21.00±0.5
67.00±0.25
27.00
27.00
100.00±0.5
500.00
3.00
Fuselage
A4

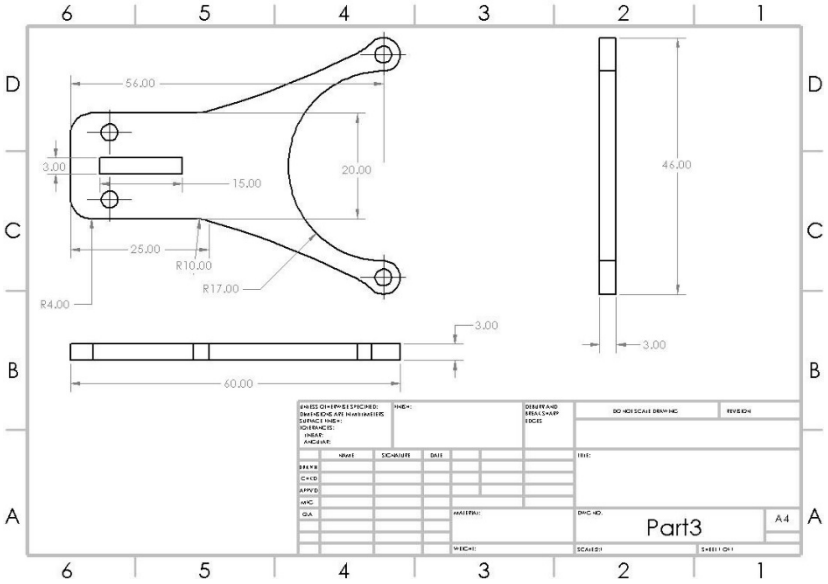
2D Drawing 4



2D Drawing 5



2D Drawing



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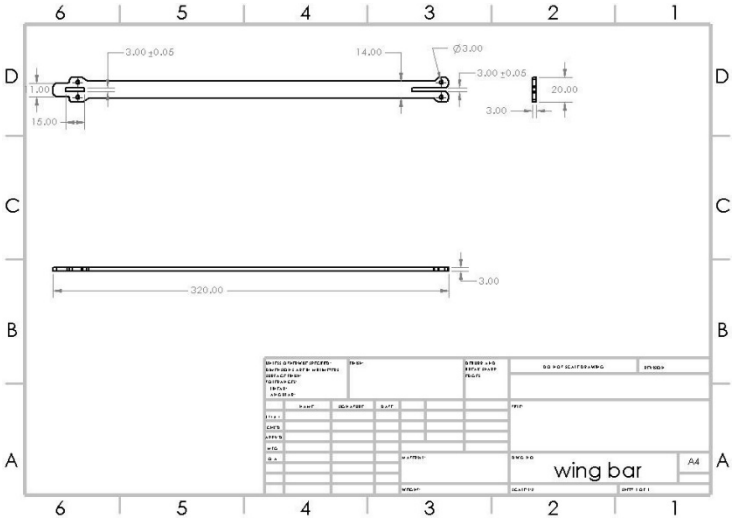

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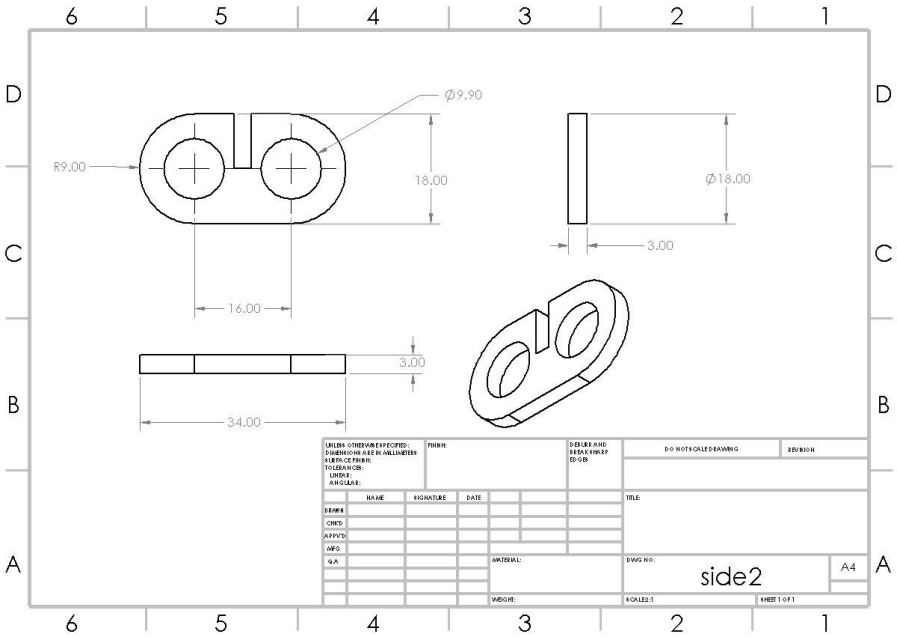

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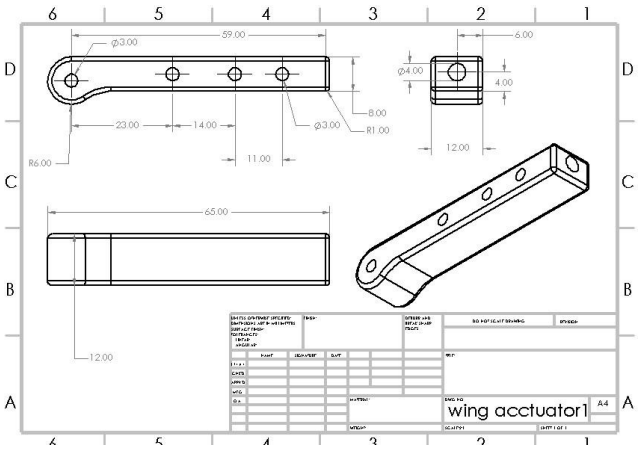

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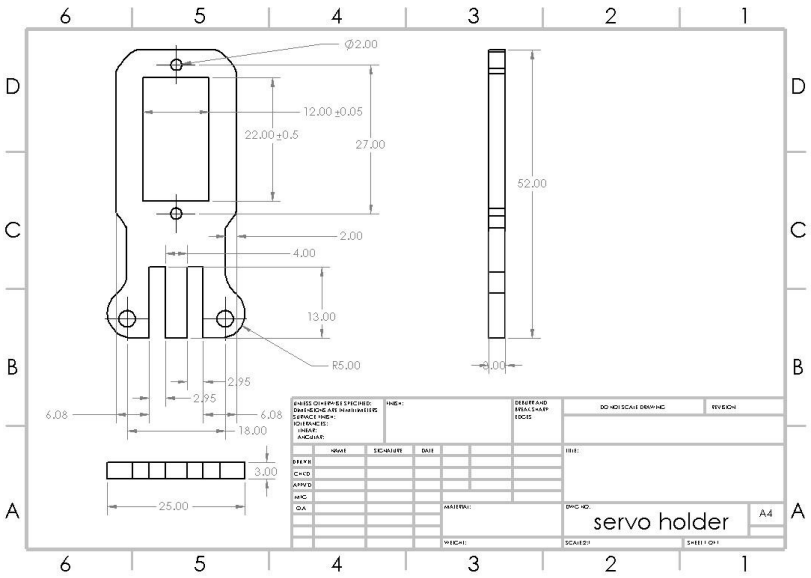
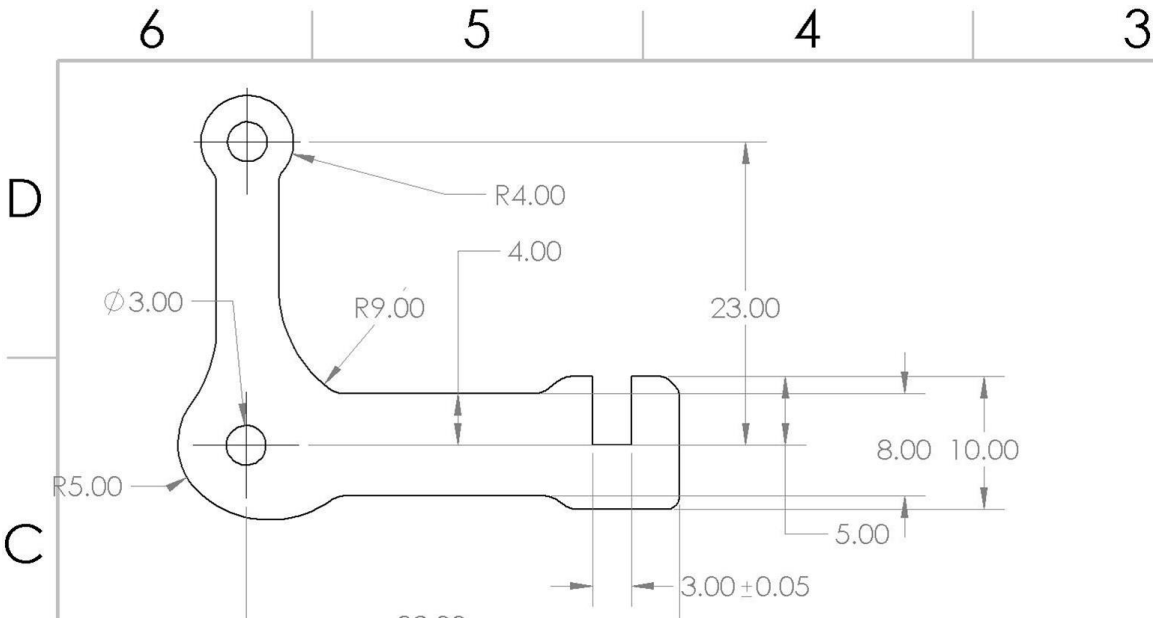
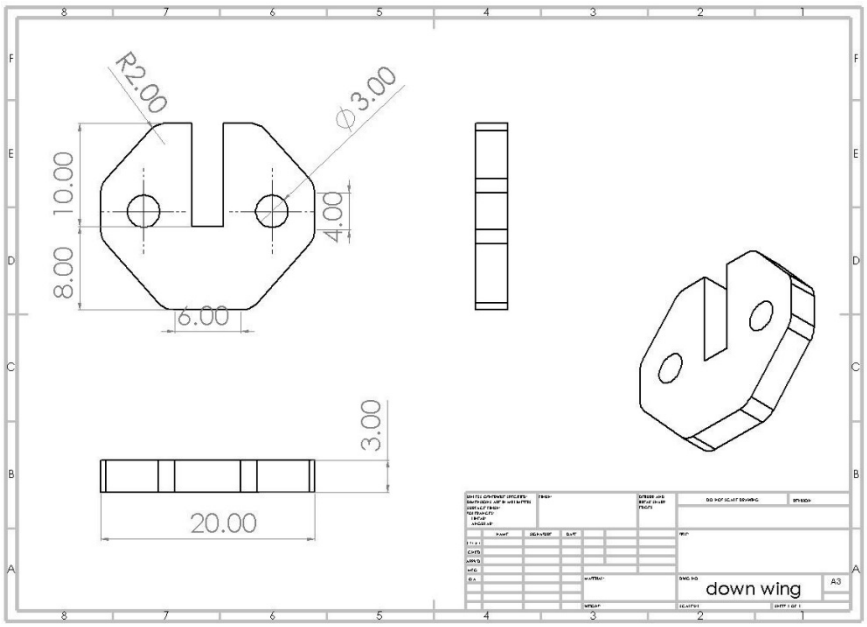


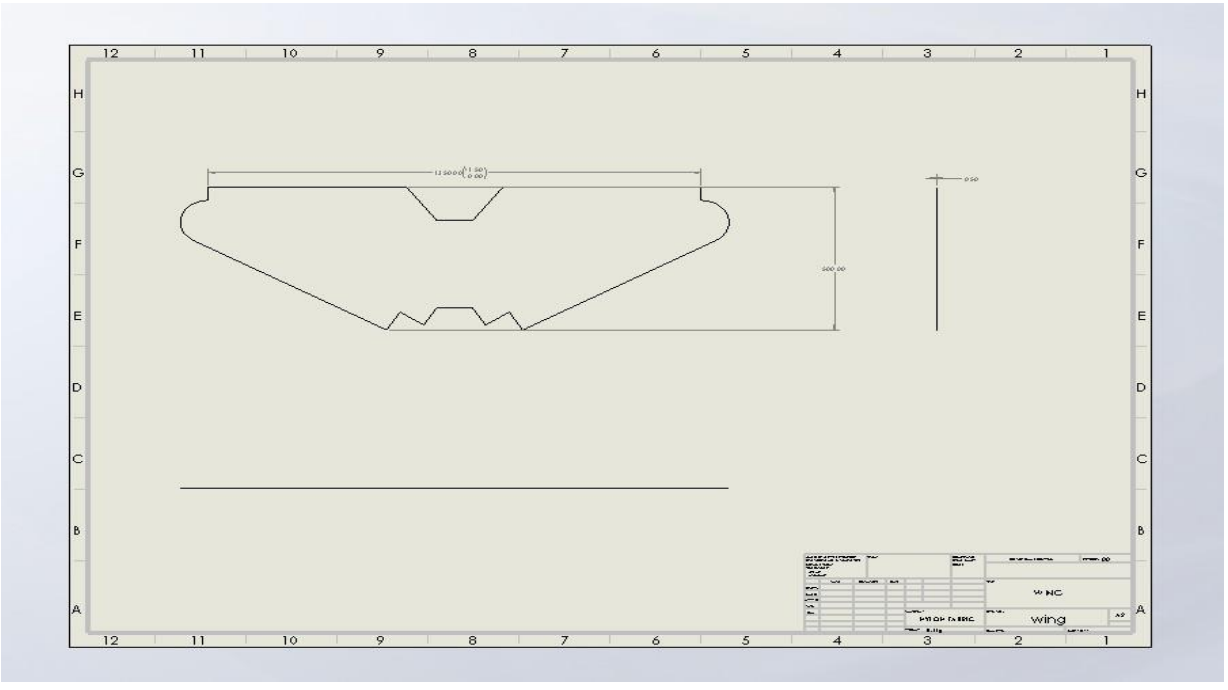
2D Drawing



2D Drawing



2D Drawing



5.4 Bought out and Manufactured Parts

Bought out parts	Manufactured Parts
Battery, ESC, BLDC Motor, Servo Motor, Gears, Nylon Fabric, Carbon fiber, Camera Module	Fuselage, Wing, Tail, Mounts, Body, Truss

5.5 Design Calculations

MOTOR SPECIFICATION

BLDC

ECOII-2807

KV1700

Power o/p: 870W= 0.87kW

Idle Current(10V) =2.1A

Peak Current= 52A

Voltage= 16.8V

Speed o/p= 1700*14.8 = 25160rpm

SERVO

MG90S

Power o/p: 36W= 0.036kW

Operational voltage= 4.8V

Rotation Angle= 180^0

Operational Torque= 2kg/cm

CAMERA

Power Supply Range: 3.7, 5V, 100mA

Angle= 170^0

Resolution: 1280*960

600TVL

TRANSMITTER

600mW/48CH

Range > 5km (open area)

Supply Voltage: 7.24V

Current: 220mA

The total current required is equal to

Current drawn from MOTOR + Current drawn from CAMERA + Current drawn from TRANSMITTER + Current drawn from RECEIVER= 2.1+ 0.1+ 0.3+ 0.4= 2.9A

BATTERY SELECTION

Capacity (mAh)	Weight (gram)	Time duration (hour)	Time duration (minutes)
1000	107	(1000/2.9*1000) = 0.3448	20.7
850	85	(850/2.9*1000) = 0.2931	17.6
600	72	(600/2.9*1000) = 0.2069	12.4

Keeping in mind, the weight and time as constraint, 850mAh battery is selected to use in the Ornithopter.

MOTOR CALCULATION

Frequency at which the wings flap= 6Hz= 360rpm

N_2= 360rpm

Let the reduction be 64:1; Thus, N_2= 393.125rpm

The weight of the ornithopter is calculated to be 1.5kg i.e, 14.715N

The total wing span of ornithopter- 1.5m

Therefore, required lift= 7.3575N/wing.

The torque needed= (2*7.3575*1.5/2)

= 11.0363Nm

This gives the motor torque equivalent to 0.1724Nm

Motor Speed= 25160/12=1700kV

We know that, P=2pi*N*T/60

=2*3.1427*1700*0.1724/60

= 454.2307 W

Motor Power (W)	Motor Speed (kV)
1310	1300
1210	1500
870	1700

Thus, for the specifications of the design, we choose A motor of 0.87kW power and 1700kV speed

Bill of Materials

Si No	Part Number	Part Name	Quantity	Material Specification
1	1	Acrylic sheet	1 slab (250mm*300 mm)	3mm thickness
2	2	Glass fiber	1 slab (250mm*300 mm)	3mm thickness
3	3	Gears	6	Standardly designed
4	4	Carbon fiber rods	8-10	ID-3mm, OD-10mm
5	5	Flanged Bearings	11	ID-3mm, OD-7mm
6	6	Bronze shafts	4-5	3mm/6mm
7	7	Flange	2	Standardly designed
8	8	Nylon Fabric	1	1.5m*1m

6 Analysis of critical parts and Prototype Planning

6. Structural Analysis and Mechanisms

6.1 Type of FEM Analysis and Justification

1. Fuselage
2. Wing Connector
3. Tail Connector

6.2 FE Analysis Details

1. Fuselage

Analysis type: Static Structural

Mesh Type: Hex dominant

Sizing type: Medium

No. of elements: 549

No. of nodes: 4531

Material Chosen- Glass Fiber

Young's Modulus: 81 GPa

Poison Ratio: 0.21

Coefficient of thermal expansion: 5.4 x 10-6 cm/cm/°C

2. Wing Connector
   Analysis type: Static Structural

   Mesh Type: Hex dominant

   Sizing type: Medium

   No. of elements: 670

   No. of nodes: 4289

Material Chosen- Glass Fiber

Young's Modulus: 81 GPa

Poison Ratio: 0.21

Coefficient of thermal expansion: 5.4 x 10-6 cm/cm/°C

3. Tail Connector
   Analysis type: Static Structural

   Mesh Type: Hex dominant

   Sizing type: Medium

   No. of elements: 1323

   No. of nodes: 7576

   Material Chosen- Glass Fiber

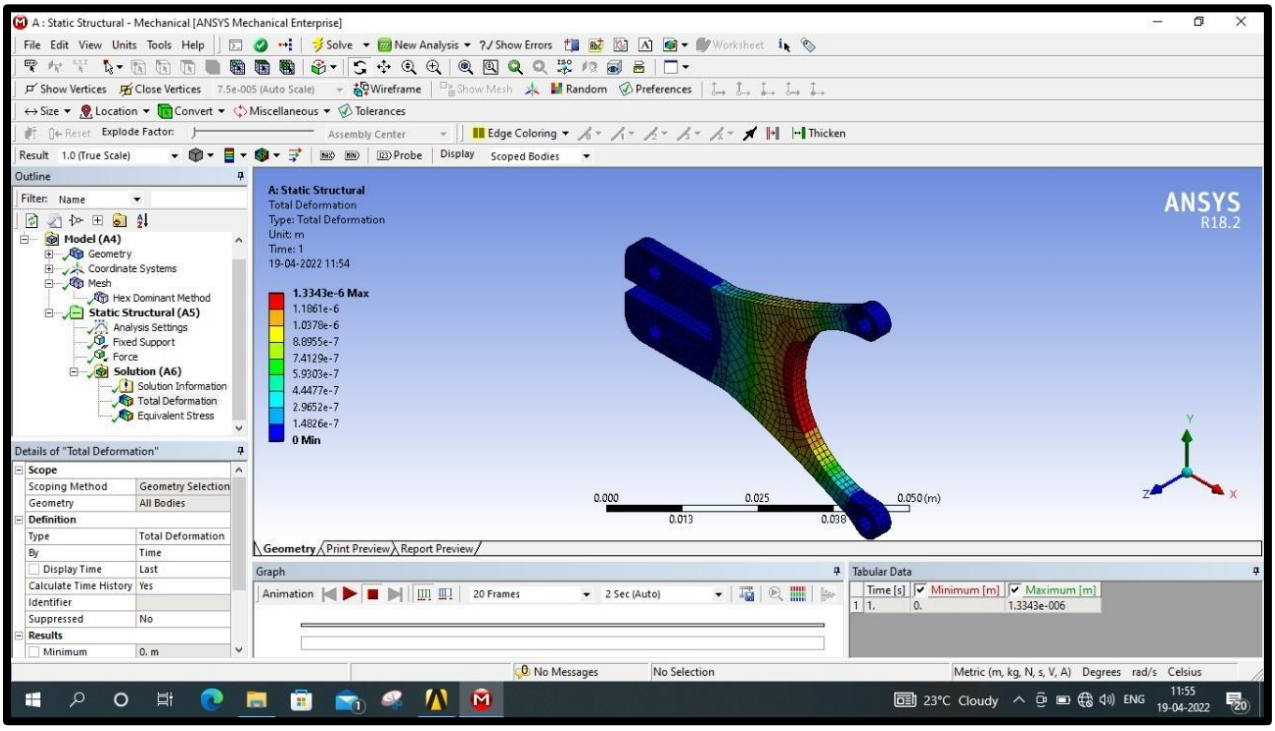
Young's Modulus: 81 GPa

Poison Ratio: 0.21

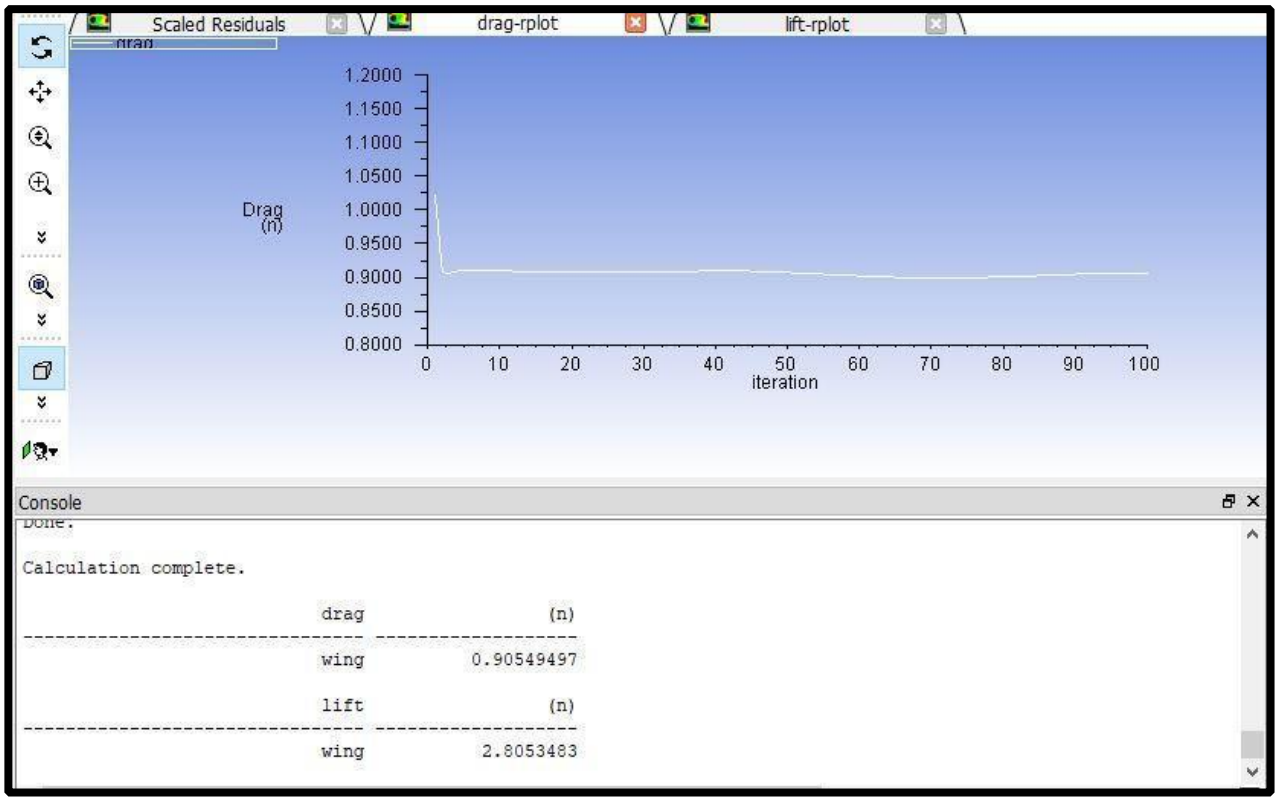
Coefficient of thermal expansion: 5.4 x 10-6 cm/cm/°C

6.3 Results and Discussions

Tail Connector

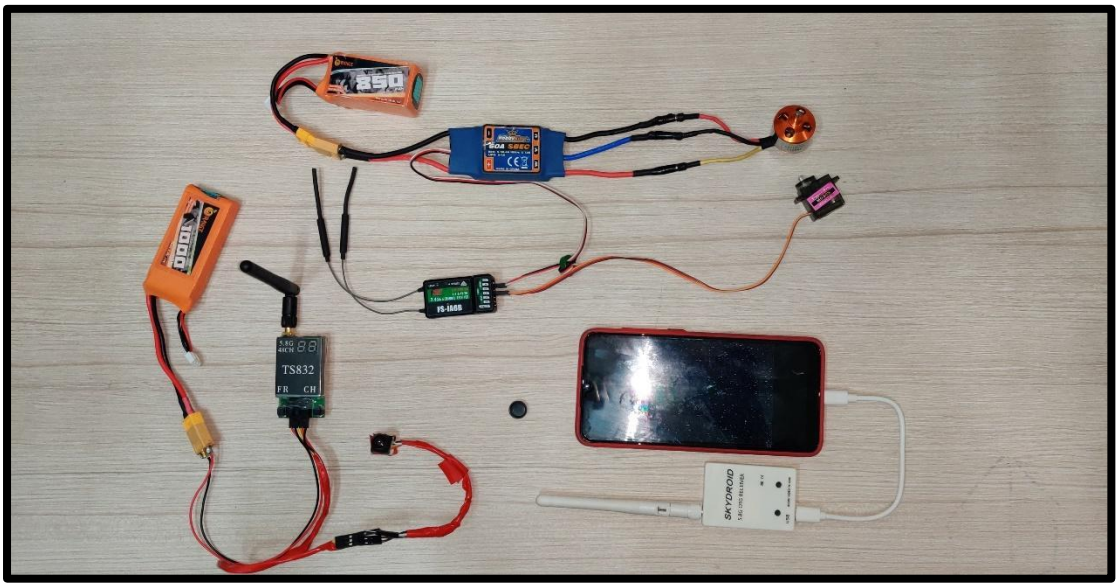


CFD of wing showing Drag7



7. Electronic Circuit and IoT details

7.1 Circuit Diagram



8. Conclusions and Future Scope

8.1 Conclusions

In this report, the case study for the construction of a small scale ornithopter suitable for surveillance systems' research is motivated. Performance and weight constraints imposed by the results depicted by FE analysis are considered.

In order to work with the dynamics and controls of a flapping wing flying vehicle while these future targets are currently in development, a scaled-up version has been designed and constructed.

The ornithopter was designed from the ground up with the needs of research in mind. All components are designed to be as lightweight and high performance as possible so as to maximize payload capacity and are intended to fail in predicable and field repairable ways.

To assess the relative role of strength, efficiency, productivity, cost differentials and other factors in global manufacturing, the team has relied on its members' knowledge and experience, received input from experts in industries and reviewed relevant literature and statistical information.

By focusing on representing the most competitive and best performing ORNITHOPTER, at its first stage, the team has tried to highlight the detailed selection, manufacturing, fabrication and aesthetic finishing process of a flying wing vehicle for surveillance taking place in prototype manufacturing.

Although generalizations must be approached cautiously in an economic activity as diverse as selection, manufacturing, fabrication and aesthetic finishing. The team believes its work and report has illustrated adequate data at work for manufacturing in global factory site.

8.2 Future Scope

- Further research and development may also increase the availability of cheaper and lighter components which will further promote projects in this field.
- With the intension of building an ORNITHOPTER, comes Stealth property as a priority. Achieving this is one such challenge in the coming days.
- R&D will help us attain mini and micro Ornithopters too.

9. Product Catalogue

Model:

Operating Instructions:

- Connect the receiver with the transmitter, and check with all with all throttles with their percentages.
- Connect the camera with the transmitter then live streaming can be viewed in the whole phone.
- Control the 3 degrees of motion i.e., lift, roll, & pitch with the help of throttles in the controller.
- Never give throttle in speed, as it might lead to misfunctioning of electrical components.

Team Members:

Name_1: Dhanashri U Sobarad.
Name_2: Ritish R Hegde.
Name_3: Abhishek M Chabbi.
Name_4: Pradyumnacharya G Bijapur.

Mentors:
Prof: Nagaraj Ekbote.
Prof: Sridhar Mandal.

Contact:
Team leader name: Dhanashri U Sobarad.
Phone no: 6366261024.

Ornithopter

Experience Engineering @
School of Mechanical EngineeringKLETECH
KLE Technological University
Creating Value Leveraging Knowledge

School of Mechanical Engineering

Minor Project Team #C1

Introduction:

An ornithopter is an aircraft designed to achieve flight by means of flapping wings. Development of bird scale flapping flight has led to interesting results and advances in the flight mechanics and control of non-flapping flight as well, under the broad umbrella of wing articulation, morphing wing technologies, and bio-inspired maneuvers. Unlike airplanes birds do not have vertical tail. Central issue of yaw stability in birds is how the aerodynamic moments are generated to provide a restoring capability against a disturbance in the side slip. Since birds do not have vertical tail which would be an efficient means for achieving yaw stability, they relay on the wing, the body and possibly the tail to produce yawing moments due to side slip.

Background/Introduction

This project is inspired by bird flight which replicates the motion of the articulated wing structure in birds. Its wings move not only up and down, but also twist at specific angles to make efficient arial moves. We aim to achieve an overall structure with minimal overall weight, in conjunction with functional integration of propulsion & lift in the wings. Further development of the bio-mimetic model will make it good option for many works related to aerial vehicles.

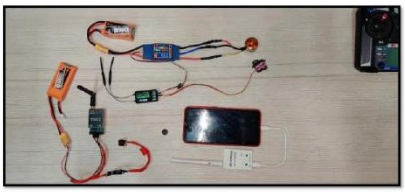
Objectives:

- ✓ The ornithopter should work in all type of climatic conditions.
- ✓ The total flight time of the ornithopter must be comparatively high.
- ✓ The surveillance of video and audio should have good quality in terms of pixels and decibels.
- ✓ The ornithopter must be realistic and it must even be controllable in the remote areas.

Product Specifications:

SL NO.	SPECIFICATIONS	UNITS
1.	Weight	650-700 gms
2.	No. of flaps	6-7 Hz
3.	Power supply	14.8V & 850mAh
4.	Control	Manual/ RC
5.	Aspect Ratio	7.5: 1
6.	Flight Time	18 Min.
7.	Controlling Range	80m (R) 10m (H)

CIRCUIT DIAGRAM:



3D Model:

A Minor Project Report on

UPI ENABLED VENDING MACHINE

Bachelor of Engineering in

Mechanical Engineering

Submitted by

Name 1	Samarth Gurav	USN 01FE19BME020
Name 2	Vinay S Kulkarni	USN 01FE19BME049
Name 3	Aditya Revankar	USN 01FE19BME063
Name 4	Danish A K	USN 01FE19BME006
Name 5	Kumar Waddar	USN 01FE19BME056
Name 6	Vidushi Bhagat	USN 01FE19BME020

Under the Guidance of

Prof Nagaraj Ekbote

Prof Sridhar M

School of Mechanical Engineering

K.L.E Technological University,

Vidyanagar, Hubballi 580031

CERTIFICATE

This is to certify that Capstone Project entitled **"UPI ENABLED VENDING MACHINE"** submitted by **Team C5 to the KLE Technological University**, Hubli-580031, towards partial fulfillment for the award of the degree of Bachelor of Engineering is a bona-fide record of work carried out by him/her under our supervision. The contents of project report, in full or in parts, have not been submitted to any other institute or university for award of any degree or diploma.

Prof. Nagraj Ekabote

Prof. Sridhar M

Guide

Dr. B. B. Kottursheettar

Head of department

ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without mentioning the people who made it possible and whose guidance and encouragement has made our efforts successful.

At the outset, we would like to express our deep sense of gratitude for our guide **Prof.Nagraj Ekabote and Prof. Sridhar M** for making this project report successful through their invaluable guidance at every stage of the project report.

We also thank **Dr. B. B. Kottursheттar** for his encouragement in undertaking the task of this project.

We express our sincere regard and gratitude to our project co-ordinators **Prof Gururaj Fattepur** and course mentors **Prof Shivaprasad, Prof Nagaraj Ekbote, and Prof. Arun Patil** School of Mechanical Engineering, KLE Tech,, Hubli

We also thankful to all faculty members of the Mechanical Engineering Department of KLE Technological University, for helping us directly or indirectly in different stages of our project work.

Student signatures

(Team C5)

Table of Contents:

1. Refined problem statement

1.1 Identifying end users (Customers)

SL No	End customers
1	Devotees
2	Shopkeepers

1.2 Customer Survey

Customer: Poojari / caretaker
Interviewer(s): Vidushi , Samarth, Danish
Date: 2 Feb 2022

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses	I sometimes make sure that the prasad distribution is done properly.	There's no hassle in distribution
	I have to report the total amount of prasad sold to the management.	Total expenditures are recorded
Likes-current methods followed(traditional techniques)	I like the personal touch of interaction with someone you know.	To give the feeling of human interaction
	I need to keep count on prasad as well as money	There is supervision of prasad and money
Dislikes-current methods followed(traditional techniques)	The manual distribution of prasad requires a table and multiple times we go to the kitchen to refill the prasad in a vessel.	Make sure that prasad is in proximity to vending machine
	On weekdays , we have 200- 300 people gathering around the prasad distribution	To assure timely dispension
	On weekdays , we have 200- 300 people gathering around the prasad distribution	Device should be as compact as possible
Suggested Improvements	I would like for it to be nice and least distracting to the devotional environment	Less noise while dispensing

1.4 Requirements List

Customer	Requirements
	To keep Proper record of money collected
	Device should feel less robot like
	Device should feel less robot like
	Device shouldn't run out of prasad without any prior indication
	Devices should be less noisy

Customer:Sweet marts ,Confectionery & Bakery Interviewer(s): Vidushi, Samarth , Danish ,Kumar ,Aditya Date: 2 Feb ..... and 3 Feb
Hari Krishna bakery and snack point

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses	Service should be fast during festivals so as to avoid rush.	Any crowd hassle has to be avoided
	We have to keep an account of prasad sold	We have to keep an account of prasad sold
Likes-current methods followed(traditional techniques)	Separate containers for different varieties of prasad.	Separate storage units for different varieties are kept.
	accept both cash and coupon coins against prasad as per the requirement.	Both methods to purchase should be acceptable
Dislikes-current methods followed(traditional techniques)	Trouble with providing change against huge amounts.	Eliminating cash currency.
	More man power is required to function efficiently.	To limit human resources.
Suggested Improvements	We should realize in time when the storage units are running out.	Pre Indication of empty storage .
	Prasad distribution should be quietly taking place in order to maintain the decorum of a devotional institute.	Dispensing of the prasad is fast
	I should be able to keep the machine inside when I close the shop	Machine is moveable
	Only selected people should be able to open the machine	Machine with locking system
	The machine should operate with different range of sizes of prasad (laddu)	The machine should be comfortable

1. Requirements List

Customer	Requirements
	Machine should work fast to avoid crowd
	We have to keep an account of prasad sold
	Separate storage units for different prasad
	To limit human resources

Customer:Devotional institution management Sri Sumanohara Chaitanya Dasa (iskcon)
Interviewer(s): Vidushi, Samarth ,Vinay , Danish , Kumar ,Aditya
Date: 2 Feb and 3 Feb

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses	We have to keep an account of prasad sold	Proper account statements on money collections .
Likes-current methods followed(traditional techniques)	The eatables are served fresh	The filling of prasad is logged by the machine.
	leftover ladoos are sent to 4000 regular donors . hence there is 0 wastage	Machine handles the prasad -s very delicately so that it doesn't break .
	Our ladoos are of standard size . and we have 2 counters, a pushpanjali seva counter (for direct takeaway) and a devotee counter for buying.	Machine has customized standard sizes of goods tray for Ladoos.
Dislikes-current methods followed(traditional techniques)	There has to be a person appointed to take care of the distribution and payments.	The payment and eatable is safe in the machine From theft and environmental elements.
	The placement of big vessels and supervision is tedious	Easily trolleyable yet unbudging when stationed at a place.
Suggested Improvements	I want the payment accepted by QR code, Cash & coin tokens	For the payment,the machi -ne accepts only QR code & coin tokens.
	dispense time max 30 se	After the payment machine dispenses the prasad within 30 sec.
	Let the vending look as simplistic as possible at first but as you progress i want the vending to look like Shri Krishna giving out ladoo	A smart and attractive design of the machine,

1. Requirements List

Customer	Requirements
	A software system records the bill statements and time of filling of the ladoo
	The payment and eatable is safe in the machine
	Customized sizes of goods tray
	The Dispensing time of the machine is less than 30 sec

Customer:Devotees Interviewer(s): Samarth ,Vinay , Danish
Date: 18 Feb and 19 Feb
Places visited ISCON, Ganapati temple (vidyanagar hubli), Hanuman temple
Devotes visited (12+11+10)

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses	I normally visit the temple once a week at least, mostly weekend	Frequency of visiting the temple is once a week Probably on weekend
Likes-current methods followed(traditional techniques)	I buy the prasad for my children almost every time I visit	Prasad is purchased for almost every visit.
	I am comfortable with UPI payment system as its more hygiene (for age <50)	UPI payment system is mostly preferred form adults
	I mostly come to temple with family	People come with family
Dislikes-current methods followed(traditional techniques)	I rarely parcel the prasad	Parceling the prasad is rare.
	I wou;d choose a shopkeeper over a machine	People are unfamiliar with vending machine
	I am not comfortable with UPI payment system (for age >50)	Cash payment system is mostly preferred by old age people.
Suggested Improvements	I feel comfortable to use machine if it looks hygienic	Machine should make people feel Hygienic

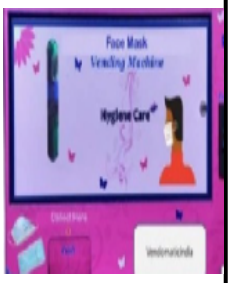
1. Requirements List

Customer	Requirements
	Frequency of visiting the temple is once a week
	Adults choose cashless payment system where as old age people choose cash payment system
	Machine should be hygiene
	People feel more comfortable with shopkeeper

2. Product Benchmarking

2.1 Studying and exploring competitive products

Products (Images or name)	Specifications	Cost	Advantage	Limitations	Availability
1.(Chocolate vending machine) 	Payment method : Coins, Swiping card,Paper Money Number of trays:6 Machine Type :Automatic Storage Capacity: 40-60 items Minimum Order Quantity :1	Rs.2.60 L	**1.**This product is fabricated with superior raw material which is not harmful for human kind. **2.** In both the sector commercial as well as residential can make a use of this product. **3**.Easy maintenance	**1.**The maximum storage capacity of this machine is 60 items,not more than that. 2.The machine doesn't accept any tokens.	1.In Bakeries, hotels, restaurants, cantin.

2.(Face mask vending machine) 	Weight : 10 kgs Payment mode: Cash and cash less(UPI) Storage capacity:100 products Machine operating Type:Token Uses: Hospital,school, office	Rs.350 00	**1.**It's a compact hand carry wall mounted machine and easy to use. **2.**This machine is weightless. **3.**This machine is used in HiTech sectors,like airports, hospitals,Office.	**1.**The maximum storage capacity of the machine is 100 products only. **2.**The machine accepts Tokens only .	1.In hospitals, colleges, offices, airports.
3.(Coffee vending machine) 	Dimension: 21*15*26 (L*W*H) Serving Capacity :More than 200 cups per day Dispensing Rate:15-20 cups per minute Boiler Capacity : 2 liters insulated. Minimum order quantity:1	Rs.165 20	**1.**The machine is low maintenance. **2.** Minimum Power Consumption **3.**Take Minimum Place **4.** User Friendly Systems	**1.**The maximum dispensing rate of the machine is 20 cups per minute. 2.No digital payment option.	1.In function halls, hotels, restaurants, busstand, railway stations.

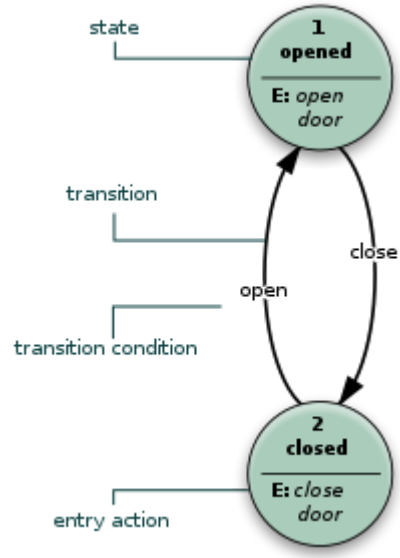
4.(Milk vending machine) 	Capacity: 100 to 500 L Weight : 250 Power : 1.5 -3.5 HP Machine type:Automatic Payment mode : Cash Country of origin : Made in India	Rs.2.25L	**1.**.The quality of the milk can be better **2.** It is more hygienic 3.The machine serves fresh natural milk	1.This machine accepts only paper money. 2.The storage capacity is maximum 500 liters 3.So it restricted to some places.	1.In milk stores ,kirani stores and also in milk dairy.
5(Beverage vending machine) 	Type of Beverage : Soda or Cold drinks Material : Stainless steel Max cooling Range : 9-12 (degree celsius) Dispensing rate : 60 - 80 Cups per minute Ice weight range : 0-5 kg	Rs 2.50 L	1.Fully automatic 2.Digital payment 3.It takes less time to serve 4.It is hygienic	1.High initial cost 2.High power consumption . 3.Its require more space	1.In Bakeries, hotels, restaurants, cantin.

2.2 Patent search

Patent Name/ Number/ Date	Information
Patent No.: US 8,386,074 B2	Smart vending machine with multi functions electronic circuit, a first electronic combination display device and input device attached to the door, a second electronic display device attached to the door and configured in one mode to display advertising or other con tent, a physical product display area in the door, a signage display area in the door, a payment receiver in the door, a product retrieval area in the door, a lock configured to lock the door to the housing, and a computer control system including at least one processor configured to control various functions of the vending machine.
Pub. No.: US 2012/0316672 A1	A vending machine retrofitted with digital signage has a door with a window in the door, where the door closes to form an interior compartment and where the vending machine has a top surface. A display panel is affixed to the window by double stick tape from the interior compartment so that images displayed on the display panel are visible through the window. A media player is coupled to the display panel to play video content on the display panel. A cellular wide area network (WAN) radio coupled to the media player to receive video content via the cellular WAN. A cellular antenna is coupled to the cellular WAN radio and affixed to the top surface of the vending machine.
Pub. No.: US 2010/0237091 A1	During operation of a vending machine, an image is obtained of an area of interest in the vending machine. As a product selected by a customer moves toward a product retrieval location, images of the area of interest are obtained and transmitted to the database. Images in the database are compared to determine whether or not the selected product has moved to the area of interest.
Patent No.: US 7,844,363 B1	Vending machine apparatus to dispense herbal medications and prescription medicines.
Pub. No.: US 2002/0077724A1	The present invention involves various combinations of new and existing technology to create vending machines with a number of improvements Such as, credit and debit card verification in real-time, incorporation of CDPD technology,multiple vends per one payment, vending of large products,bag dispensing, and the incorporation of food heating units into Vending machines.

2.3 Literature survey

Literature details	Gathered Information
Automatic Vending Machine Using IOT 	To provide a solution on a coin based vending machine which is not returning the money.
Electronic Unit and Programming IDE: 	It consists of an arduino microcontroller which will check for the authenticity by comparing the speed calculations with a specific fixed criterion and thereby send signals for the starting dispensing mechanism. We make use of basic concepts of Embedded C language clubbed with Arduino Instruction Set.
Processing and control Unit: 	It consists of a microcontroller which upon receiving the genuine coin sends a signal to the dispensing mechanical unit to start vending the required quantity of papers.
Currency transaction 	1. Once RFID is scanned then User can select the product and collect the product at the output unit. There are three parts; First part is scanning of RFID card which provides cashless payment.This paper attempt to provide solution on coin based vending machine which is not returning the money

	2.FSM based automatic dispense machine which has an expiry date feature using VHDL programming language. This machine accepts money as an input to dispense the products and returns back the money without dispensing the product to the customer if the product is out of date. Thus it can be useful to ensure the good quality of the product along with quantity and cost
UPI UNIFIED PAYMENTS INTERFACE	3. UPI Payment : An API interacts with the payment app and checks if the payment is successful . It then collects all of the data related to the purchase and stores it for future reference and communicates the same to the vending system to vend out .

3. Design Specifications

3.1 Objectives

Objectives
1. Bill statements are recorded in tabular. **(for future iteration)**
2. Devices is not noisy
3. Machine works fast to avoid crowds **(for future iteration)**
4. The machine is portable with the help of wheels **(for future iteration)**
5. analytical/logistical data is recorded/provided by the system **(for future iteration)**
6. Cashless payment
7. The physical condition of the Prasad should be maintained

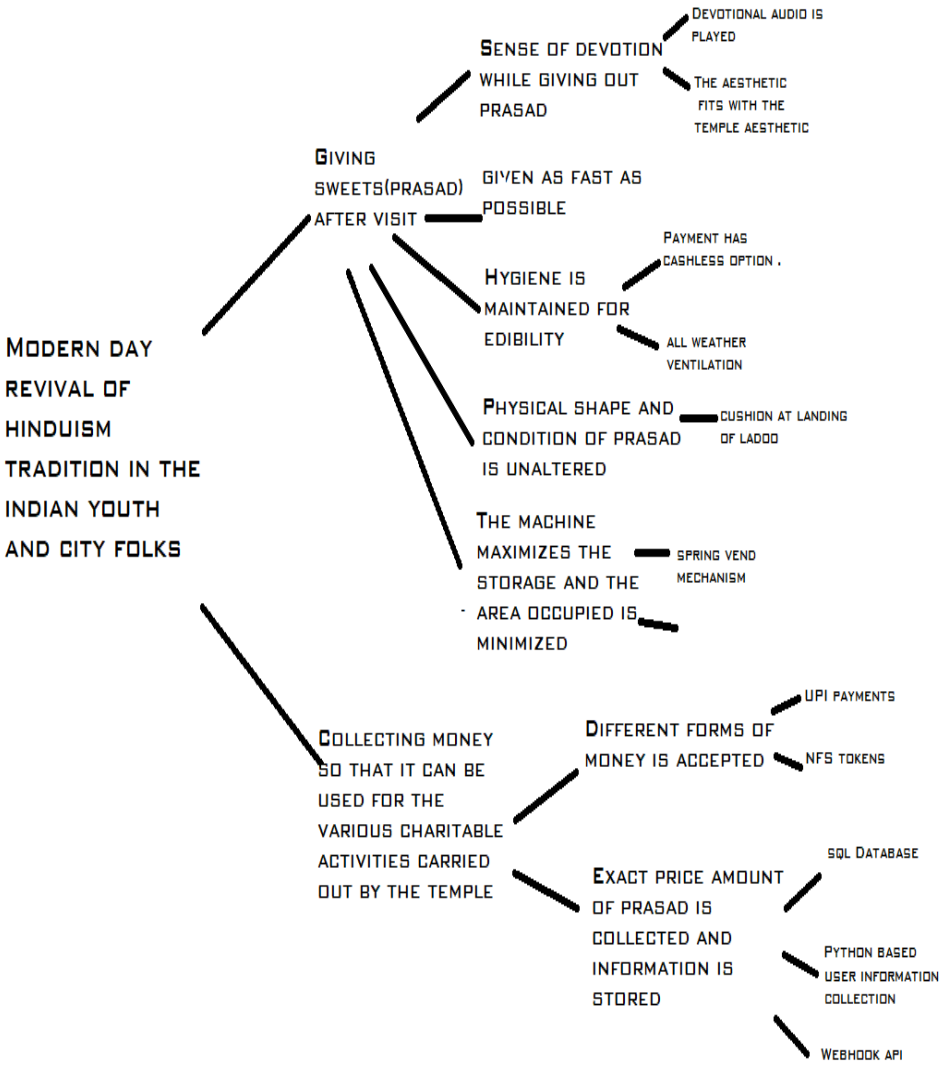
3.2 Constraints

Constraints
1. The machine should work with domestic current
2. The machine should work with 3 plug
3. two Customized sizes of goods tray
4. The Dispensing time of the machine is less than 30 sec

3.3 Objective tree

O#	Objectives	First level objectives	Second level objectives	Third level objectives
1	Bill statements are recorded in tabular.			yes
2	Devices is not noisy	yes		
3	Machine works fast to avoid crowds		yes	
4	The machine is portable with the help of wheels		yes	
5	Analytical/logistical data is recorded/provided by the system			yes
6	Cashless payment	yes		
7	The physical condition of the Prasad should be maintained	yes		

3.4 Objective tree: (affinity diagram)



3.4 Design Specifications:

Sl.No	Engineering Specifications	Units
1	Torque	N/m
2	Speed	m
3	Weight	Kg
4	Density	Kg/m^3

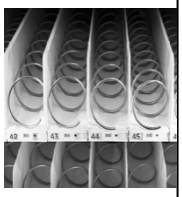
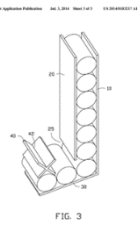
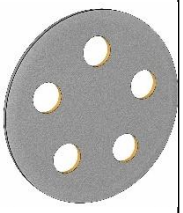
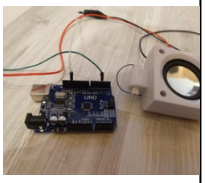
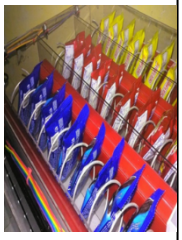
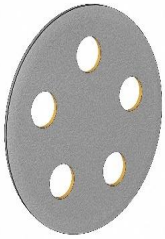
4. Concept Generation

4.1 Defining Functions

Sl.No.	FUNCTIONS AND SUBFUNCTIONS
1.	To have a Proper and efficient distribution
2.	The machine is devotionally attractive
3.	The machine maximizes the storage
4.	Separate storage units for different prasad
5.	Proper indication of the successful payment
6.	The machine area occupied is minimized
7.	Large capacity feeder
8.	No breakage while dispensing
9.	Indicating the dispensing
10.	Dispensing time is less than 60 sec.
11.	Select the required product
12.	Scan the QR code and make the payment
13.	Collect the prasad
14.	Refill the storage
15.	Converting electric energy to mechanical energy
16.	The physical condition of the Prasad is maintained

4.2 Morphological Chart

Construct the morph chart for identified functions(max 5)

Functions	Means 1	Means 2	Means 3	Means 4	Means 5
Proper distribution	Conveyor belt 	Spring 	Roller 	Disc 	Arm 
Indication	LED 	Screen 	Voice 		
Payment method	UPI system 	RFID system 	Cash transfer 		
Storage unit	Conveyor 	Spring 	Disk 		

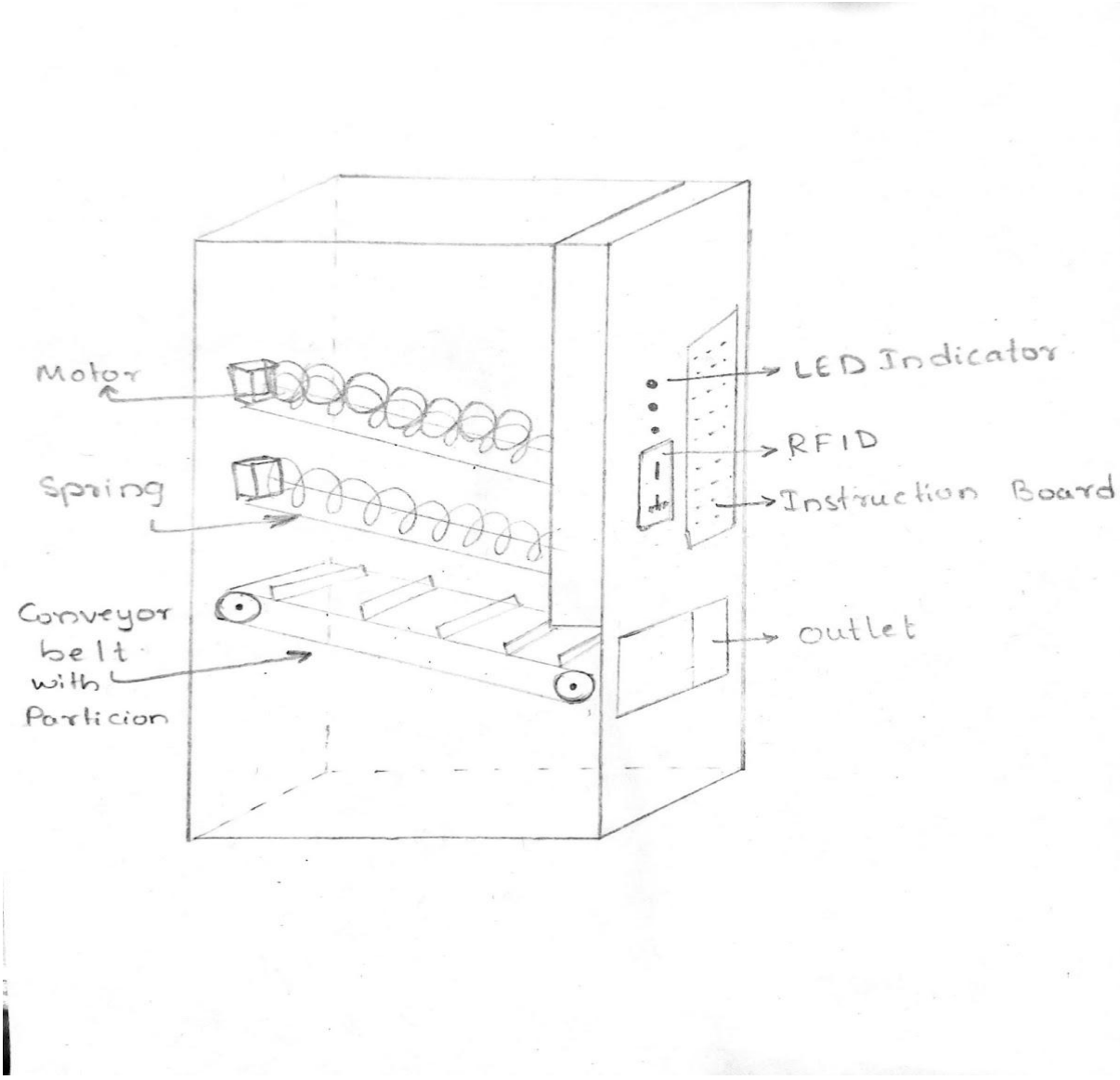
4.3 Generating design alternatives

Identified Design Alternatives:

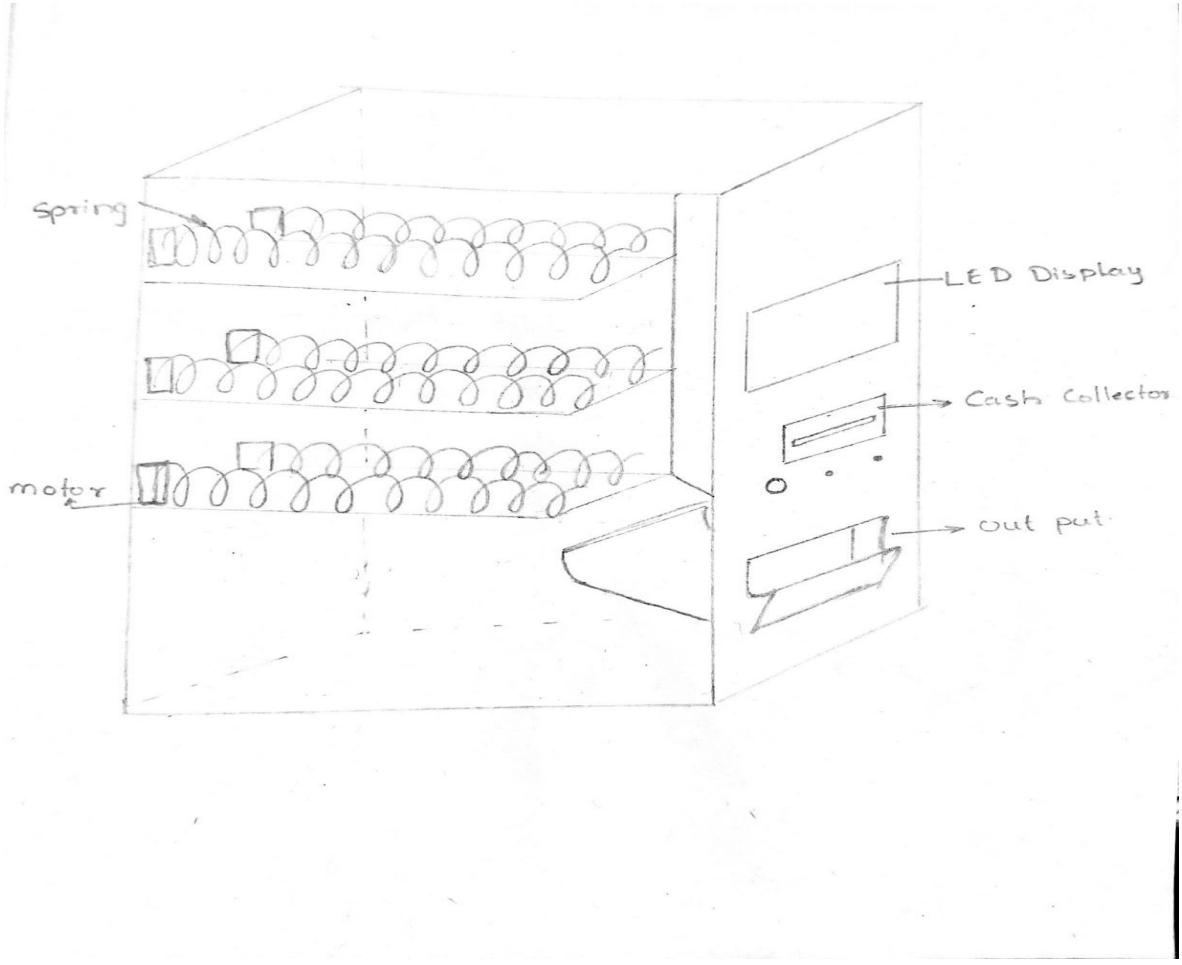
Si.	Design Alternatives
1	Design Alternatives 1
2	Design Alternatives 2
3	Design Alternatives 3
4	Design Alternatives 4

Sketch of generated design concepts/ alternatives:

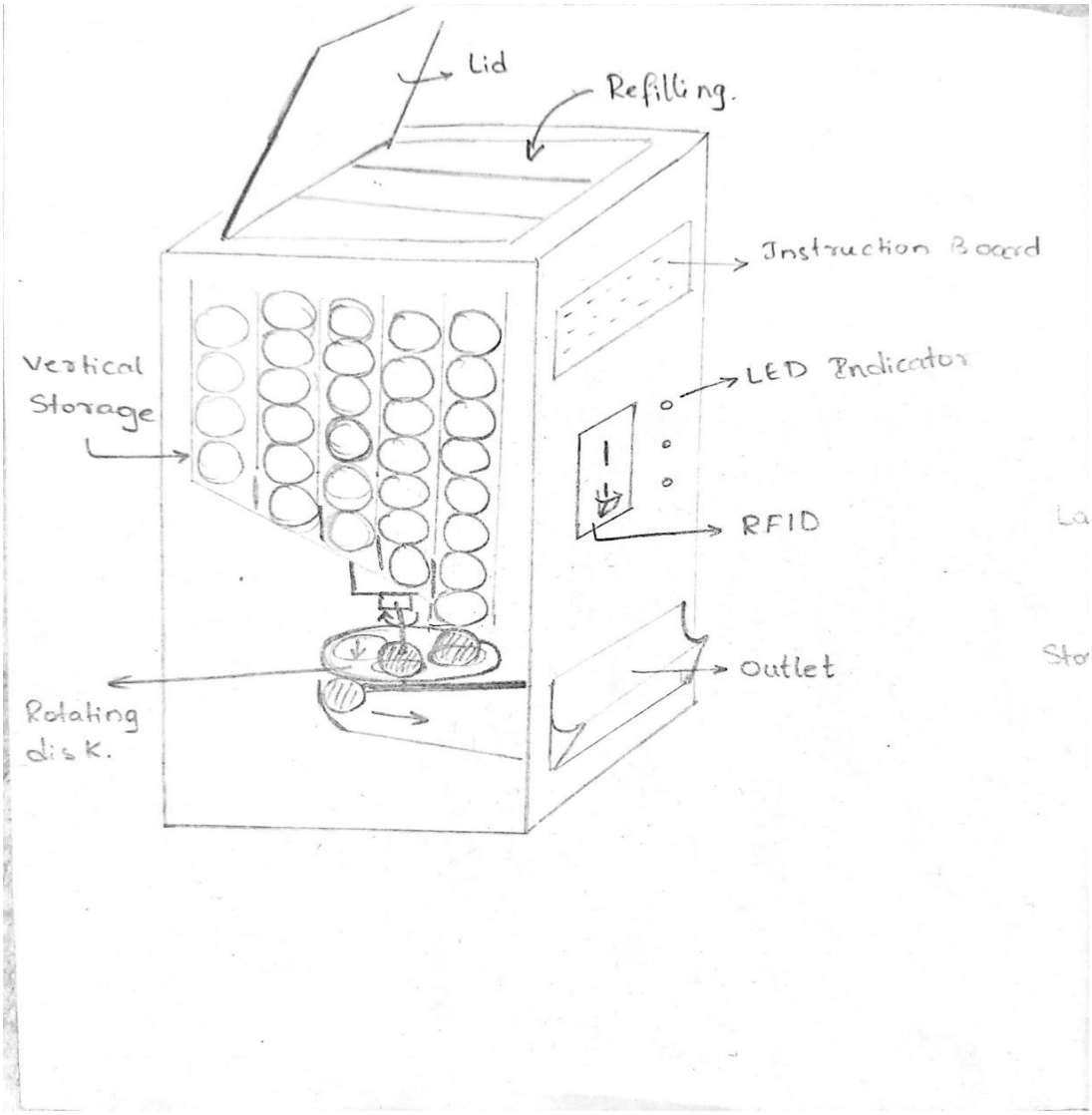
1st Alternative



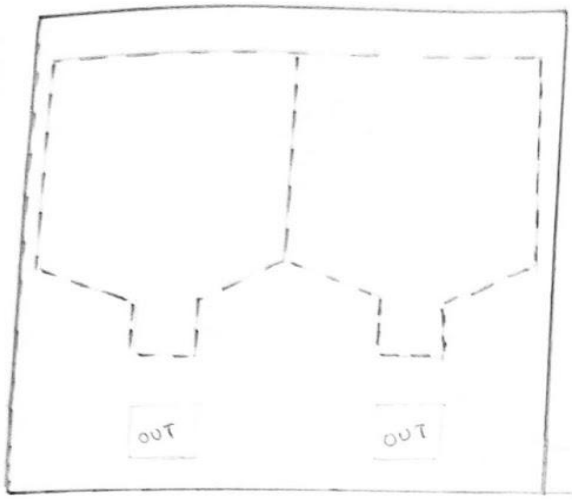
2nd Alternative

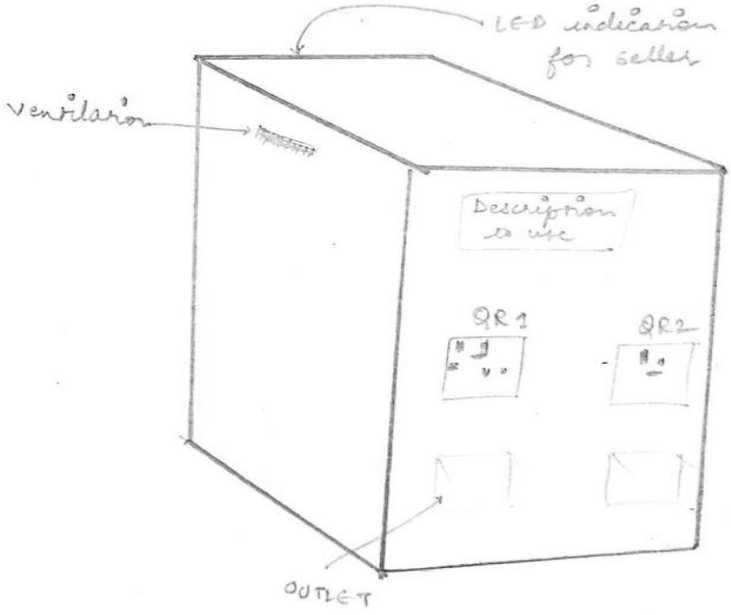


3rd Alternative



4th Alternative



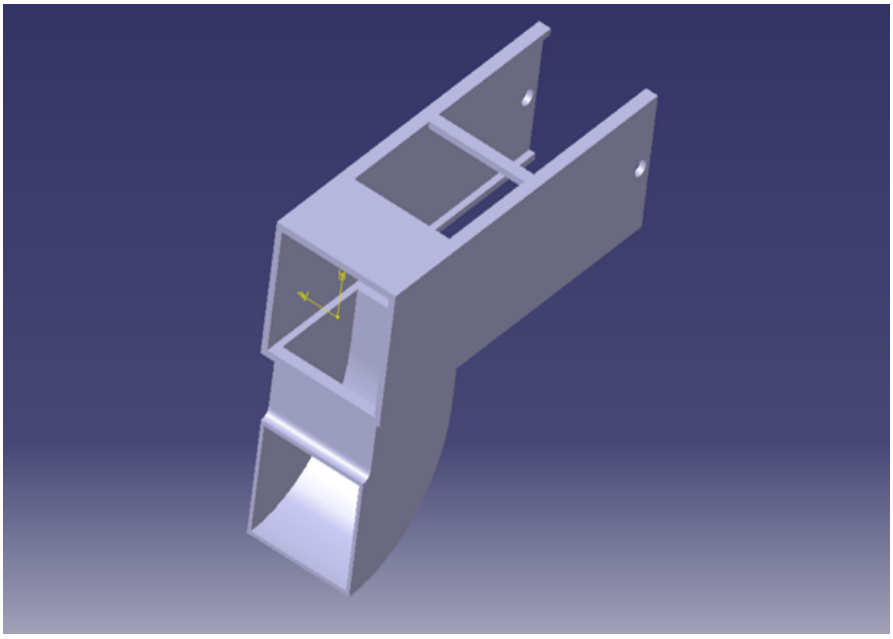
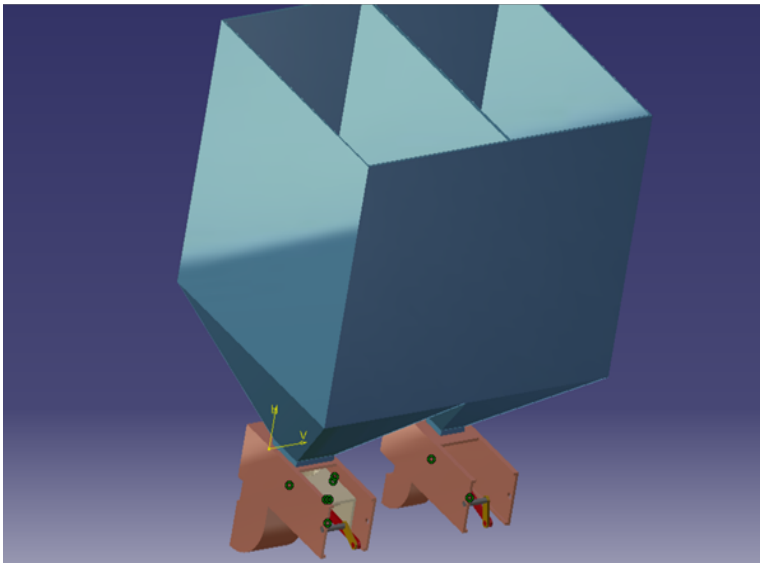


4.4 Selecting Design Alternative (Using Phugh Chart)

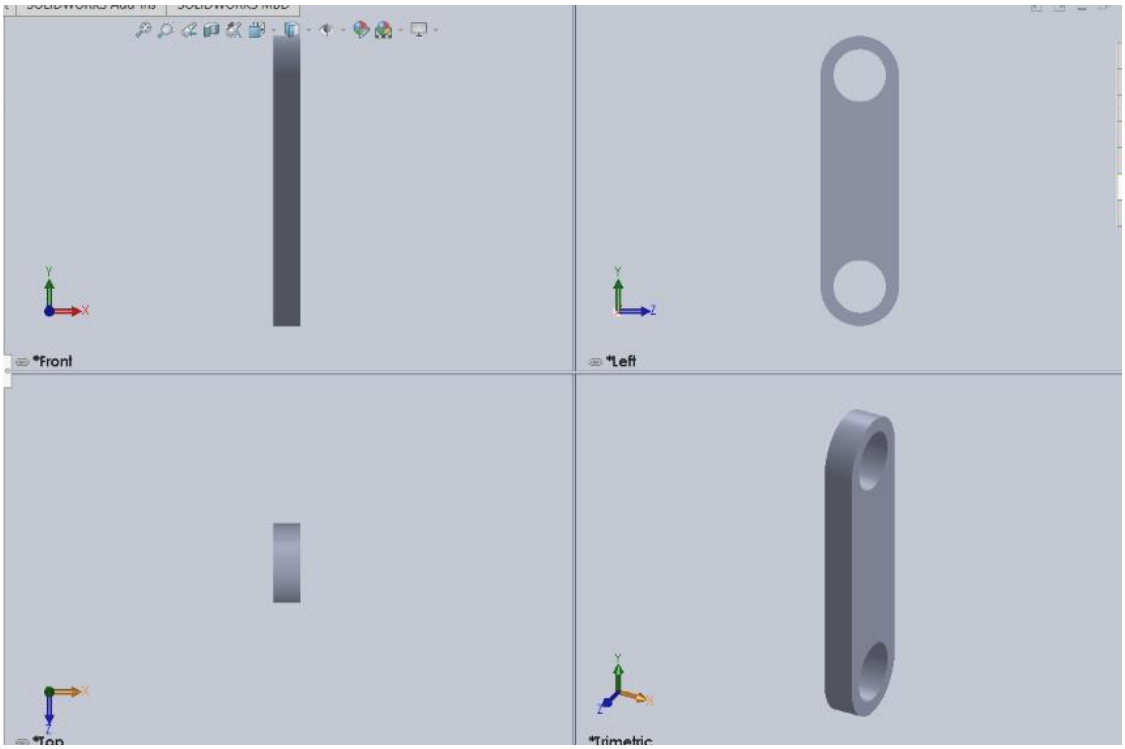
Sl. No	Requirements	Objectives Weight /10	Design 1	Design 2	Design 3
1	Storage capacity	8	—	—	—
2	Dispensing complexity	5	—	0	0
3	payment	10	--	--	--
4	Hygiene	9	--	--	--
5	Easy to use	8	0	--	0
6	Easy to refill	7	0	--	+
7	Noice dispensing	7	0	0	0
8	More storage in less area	9	--	--	--
9	Fast dispensing	8	0	0	0
Total +			0	0	1
Total -			5	6	4
Overall total			-5	-6	-3
Total weight		71			

5 Model

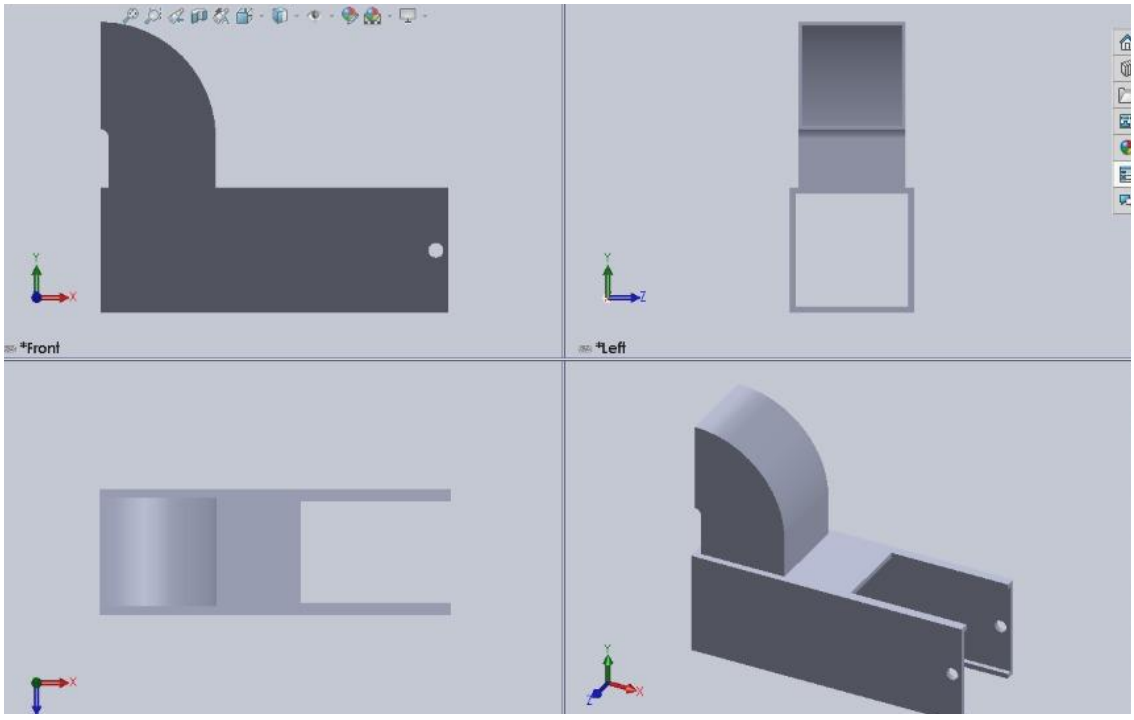
5.1 3D Model

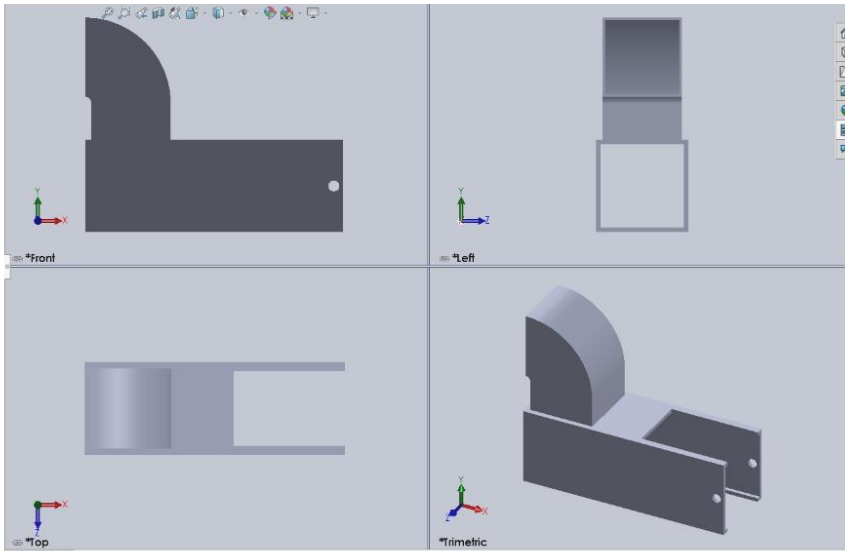
Part Model 1

Part Model 2


Part Model 3

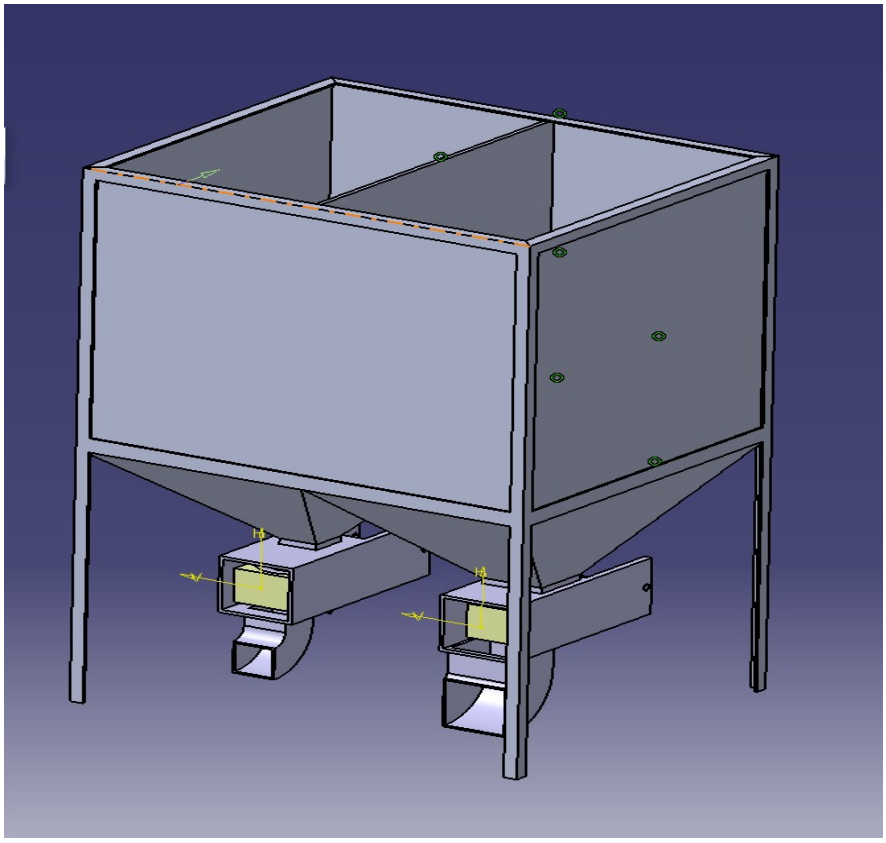


Part Model 4



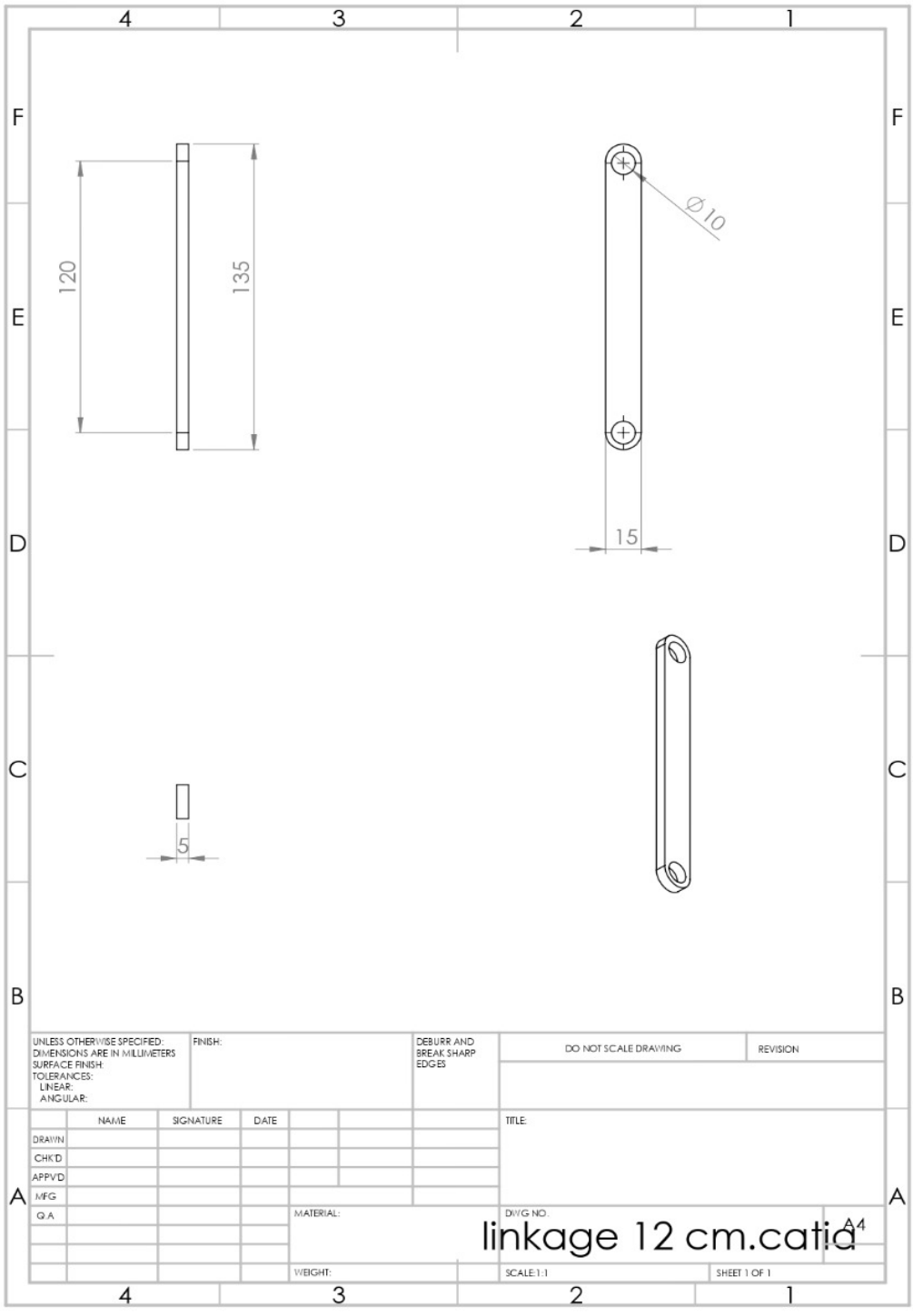
Part Model 5


5.2 Assembly models

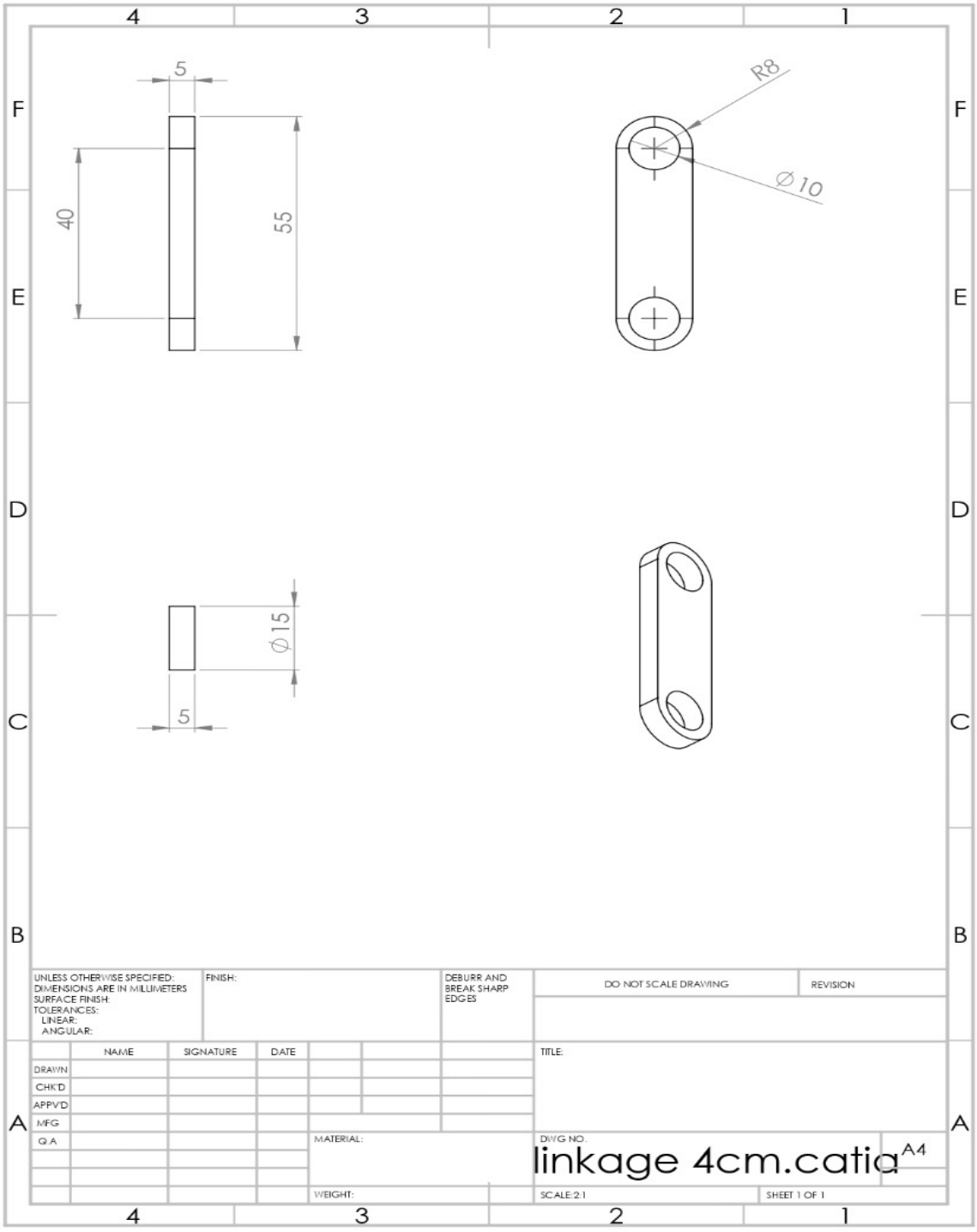
Assembly Model


5.3 2D Drawings

2D Drawing 1



2D Drawing 2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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
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TOLERANCES:
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ANGULAR:
FINISH:
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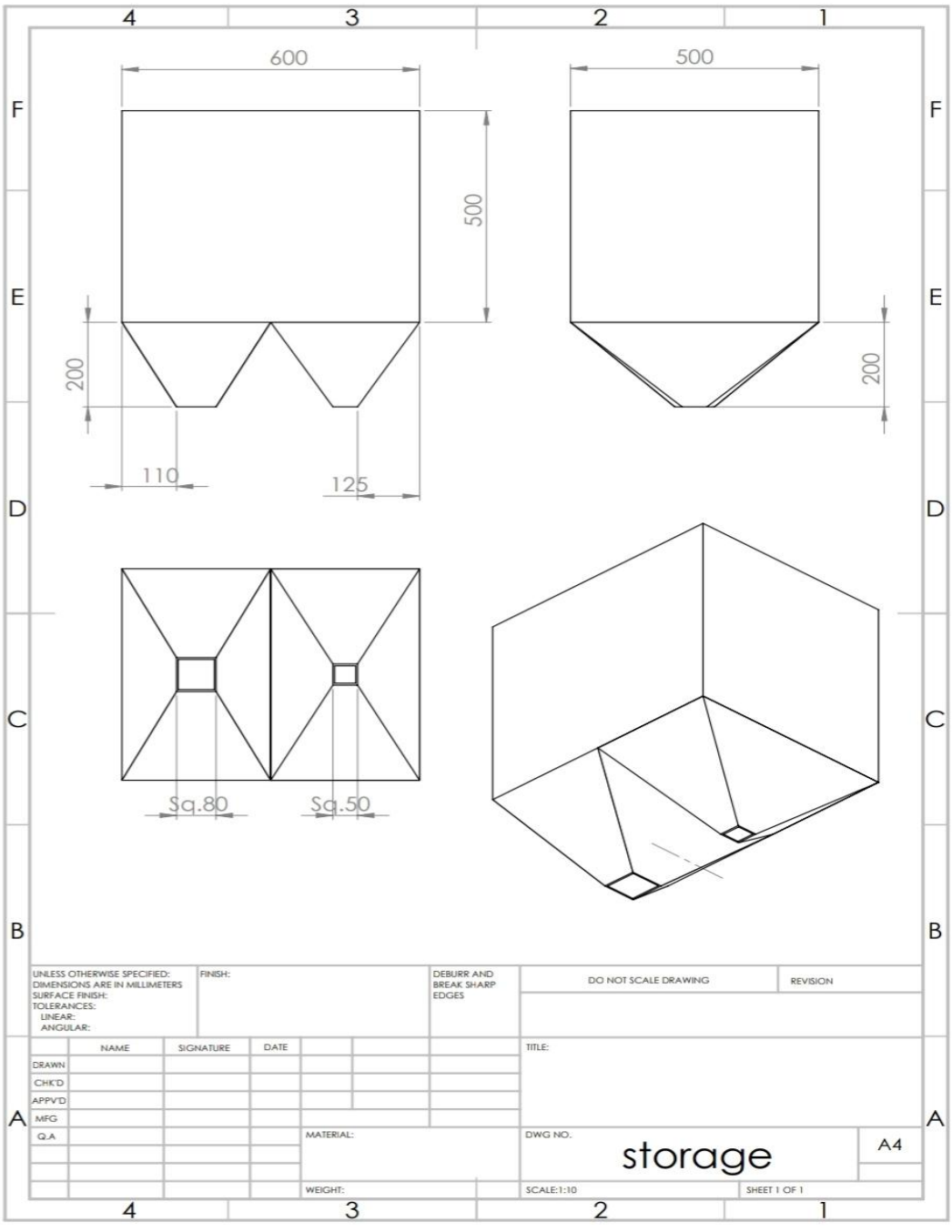
SHEET 1 OF 1

2D Drawing 3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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
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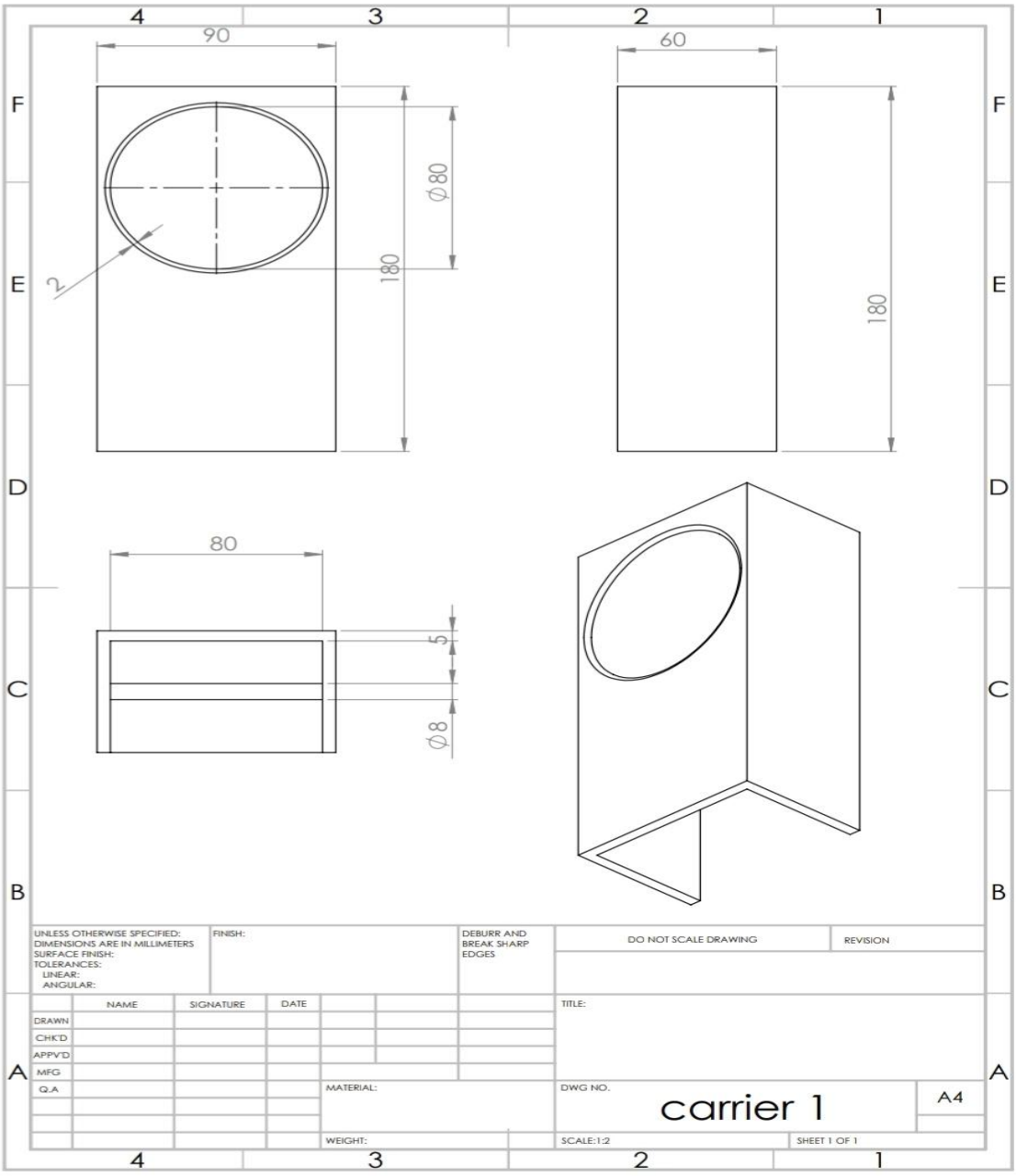
SHEET 1 OF 1

2D Drawing 4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DEBURR AND BREAK SHARP EDGES
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WEIGHT:
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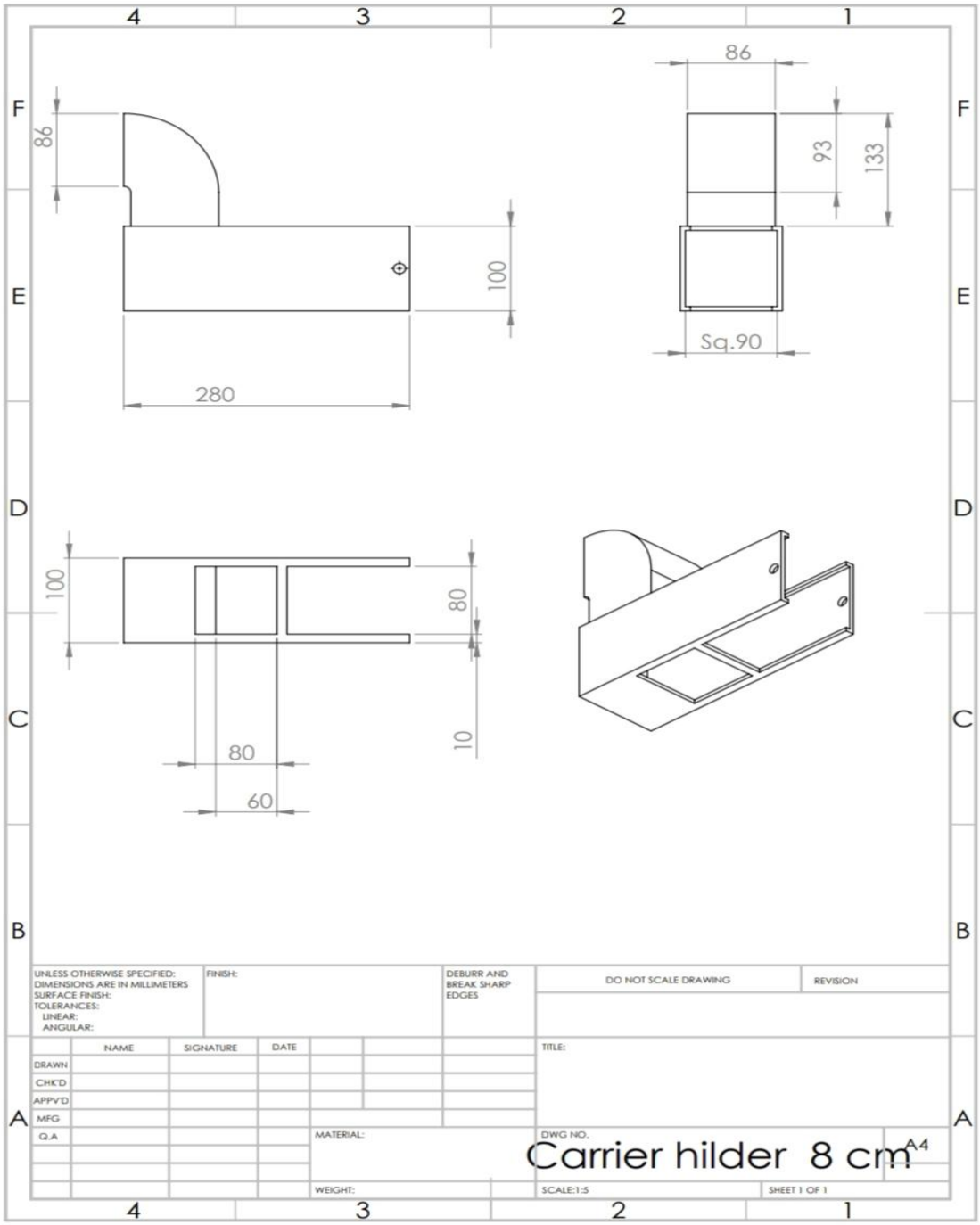
SHEET 1 OF 1

2D Drawing 5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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH:
TOLERANCES:
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DEBURR AND BREAK SHARP EDGES
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WEIGHT:
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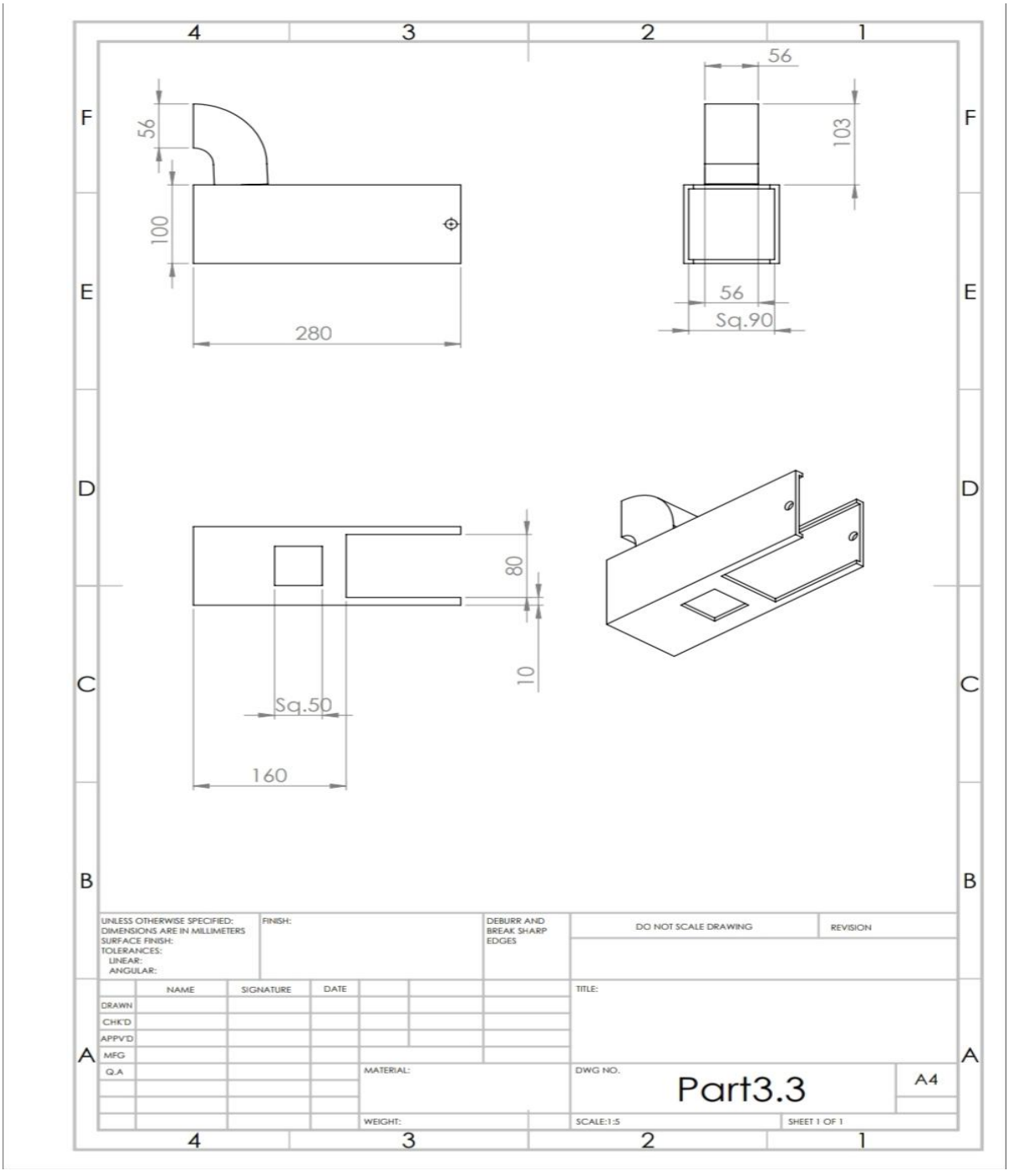
SHEET 1 OF 1

2D Drawing 6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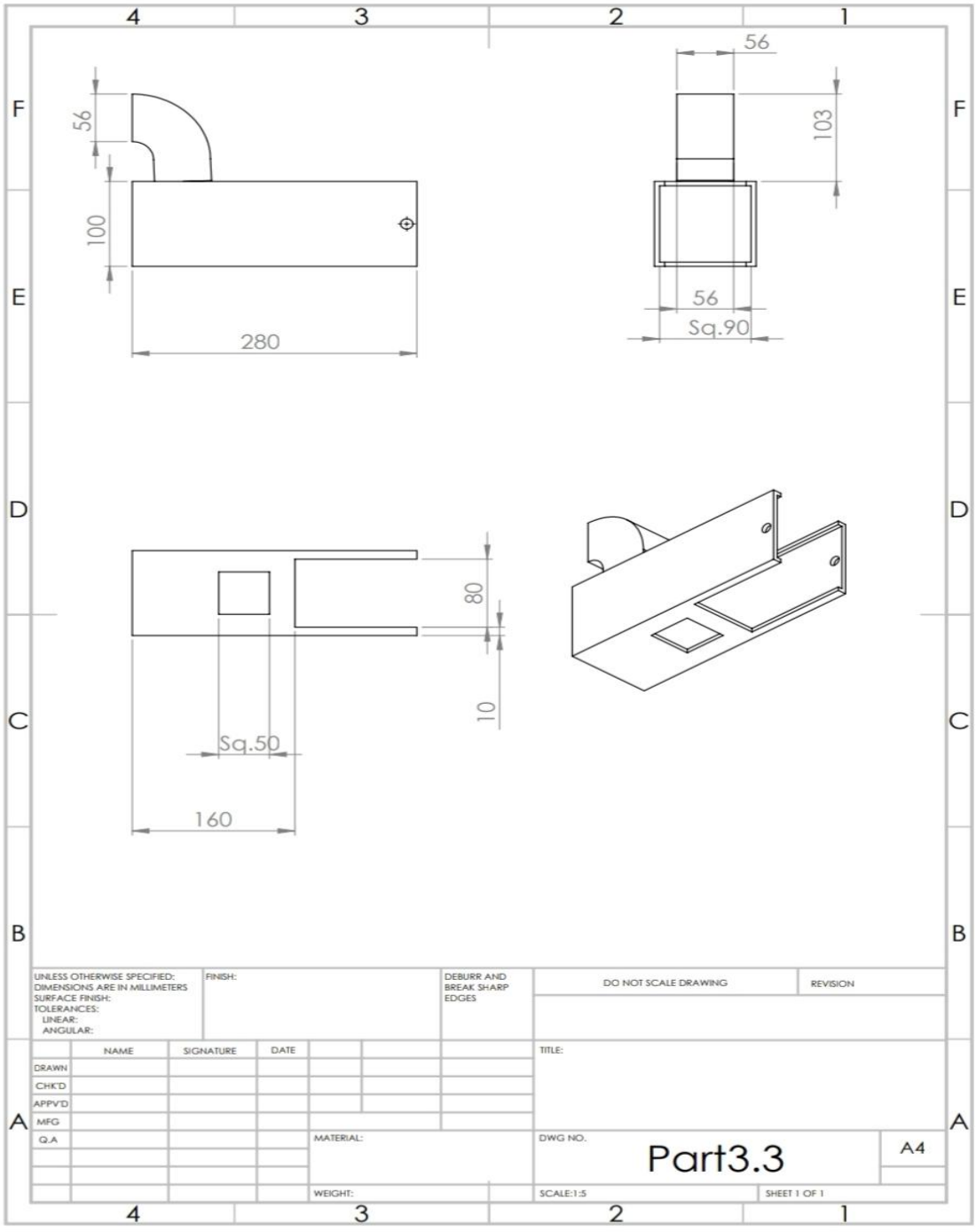
56
103
100
280
56
Sq.90
80
10
Sq.50
160
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH:
TOLERANCES:
LINEAR:
ANGULAR:
FINISH:
DEBURR AND BREAK SHARP EDGES
DO NOT SCALE DRAWING
REVISION
NAME
SIGNATURE
DATE
DRAWN
CHK'D
APPV'D
MFG
Q.A
TITLE:
MATERIAL:
DWG NO.
Part3.3
A4
WEIGHT:
SCALE:1:5
SHEET 1 OF 1

2D Drawing 7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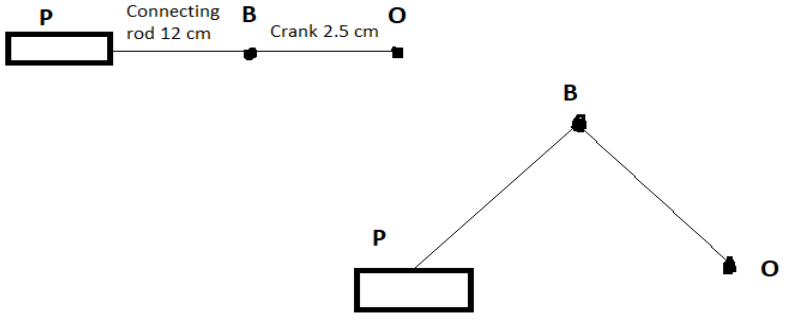
280
56
Sq.90
80
10
Sq.50
160
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH:
TOLERANCES:
LINEAR:
ANGULAR:
FINISH:
DEBURR AND BREAK SHARP EDGES
DO NOT SCALE DRAWING
REVISION
NAME
SIGNATURE
DATE
DRAWN
CHK'D
APPV'D
MFG
Q.A
TITLE:
MATERIAL:
DWG NO.
Part3.3
A4
WEIGHT:
SCALE:1:5
SHEET 1 OF 1

5.4 Bought out and Manufactured Parts

Bought out parts	Manufactured Parts
1. DC motors 2. Hinges 3. Nuts and Bolts 4. Wheels for carrier	(1) Carrier (2) linkage (3) Storage (4) outer frame (5) Chassis (6) Carrier box with attached Chute

5.5 Design Calculations

Design Calculations



N=60rpm
$W_{OB}=2\times\pi\times(60\div60)=6.28$
Crank length OB=0.025m
Linear velocity B w.r.t O=$W_{OB}\times OB$
=6.28×0.025
=0.157m/s

Velocity of piston:
V_p=3.5cm
$W_{BP}=\frac{Vpb}{PB}=\frac{0.095}{0.12}$
=0.6025 rad/s

Velocity of rubbing at crank shaft:

d_o =8 mm=0.008m

d_B =10 mm=0.01m

d_c =10 mm=0.01m

Velocity of rubbing:

1.Crank shaft = $\frac{do}{2} \times Wob$

$= \frac{0.008}{2} \times 6.25$

=0.025 m/s

2.Pin of crank = $\frac{d}{2} \times (Wbo \times Wpb)$

$= \frac{0.01}{2}(6.28 + 0.625)$

=0.0345 m/s

3.Piston –connecting rod = $\frac{dc}{2} \times Wpb$

$= \frac{0.01}{2} \times 0.625$

=0.00312 m/s

Power Calculation:

Mass = 1 kg n=0.5 v = 4cm N=60rpm

W = mass × 0.5

= 1 × 0.5 =0.5

= 0.5 × 4 =2kg/cm

Torque = 0.02 kg/m

Power =P= V × I

P=12 × 0.060

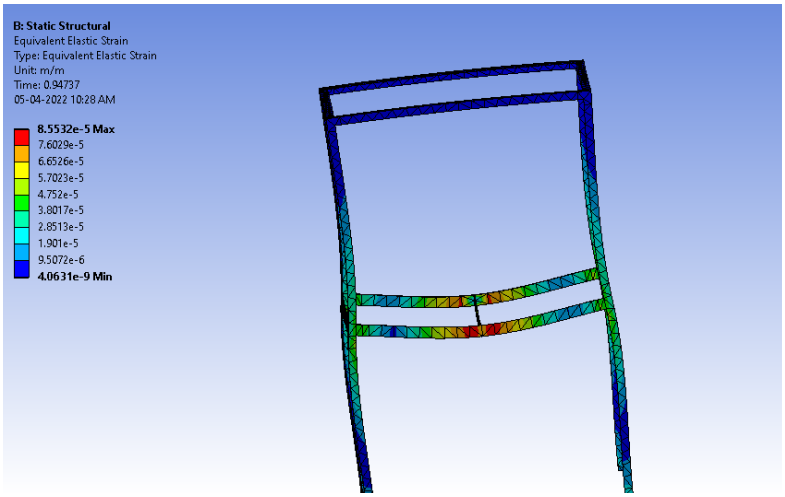
P=0.72 watts

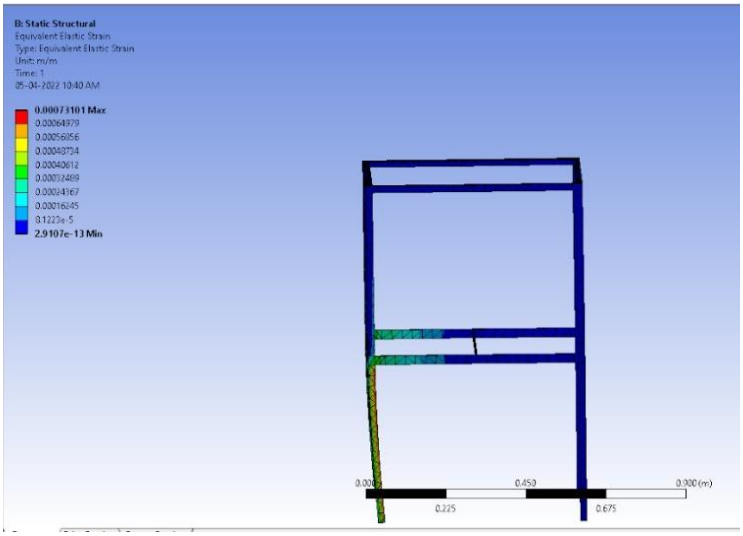
5.6 Bill of Materials

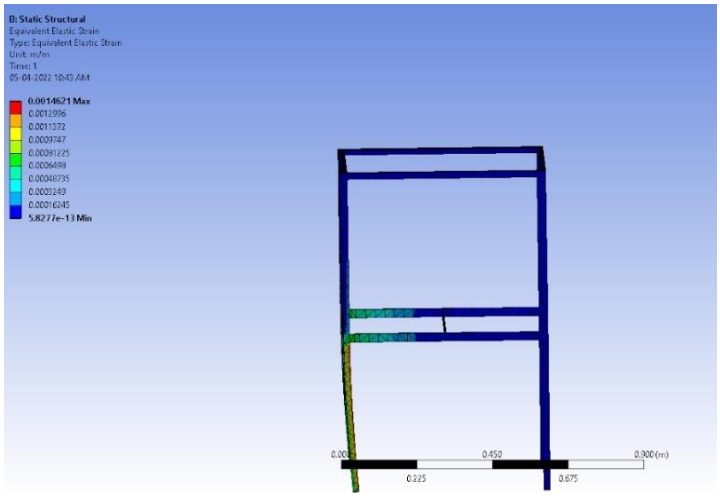
Sl No	Part material	Quantity	Material Specification
1	MS sheet metal (0.8mm thickness)	3200*330 2700*500 (both in mm)	Storage
2	MS strips 20ft length L-angle 10 feet length flat strip	6024 mm 2730mm	chassis
3	Acrylic sheet 5mm thick	62225mm x 622.25mm	Carrier, 3 linkage and carrier holder
4	Foam sheet (collected from scrap)	250mmx180mm	Cylindrical passage

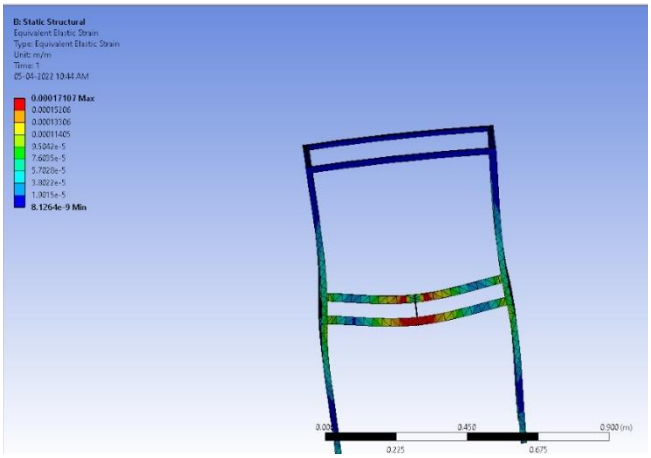
6. Structural Analysis and Mechanisms

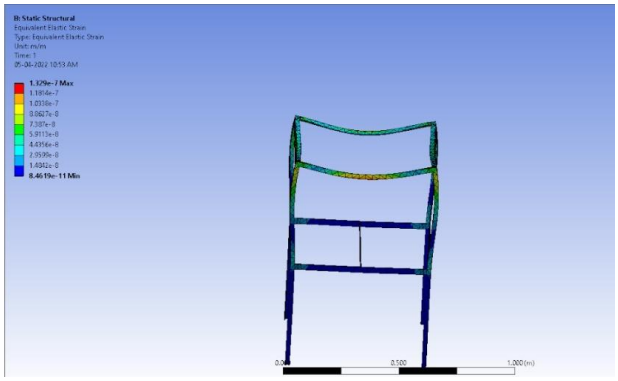
6.1 Type of FEM Analysis and Justification











6.2 FE Analysis Details

Mesh type - medium

Element type-

BOUNDARY CONDITIONS

case 1-4 fixed supports

Case 2.2 fixed supports(legs)

Material chosen -mild steel

Properties of mild steel

young's modulus =200GPa

Poisson's Ratio=0.3

CASE 1.1207N

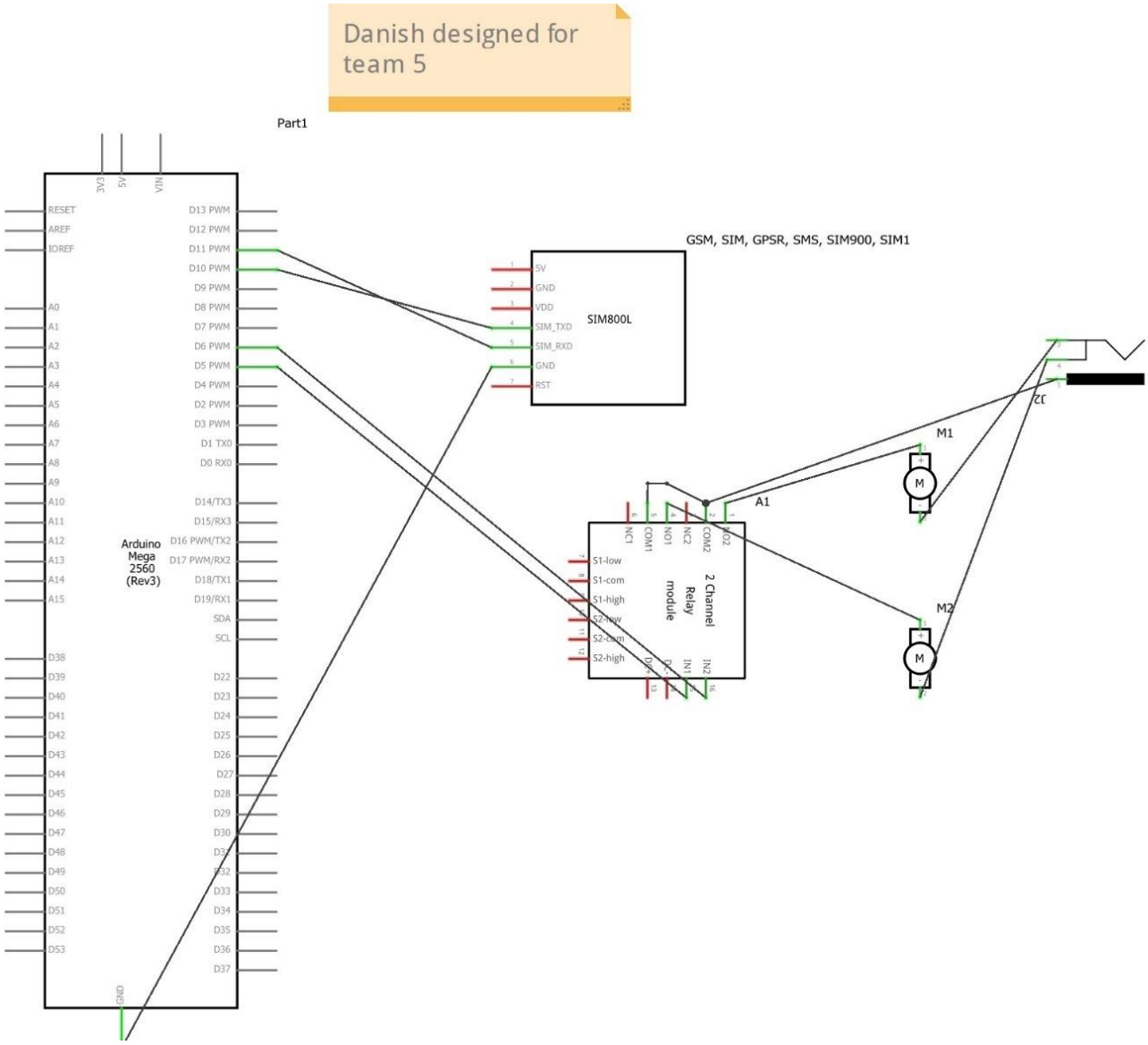
CASE.2 415.77N

6.3. Results and Discussions

As the loads were applied to the chassis, we found that the stresses are within the limit of 200 Gpa and Hence it's the safe design. It Fails when the stress limits crosses the limit more than 200 Gpa

7. Electronic Circuit and IoT details

7.1 Circuit Diagram



Final Assembled version of Iteration 1

8. Conclusions and Future Scope

8.1 Conclusions

We started off with an aim to make a general vending machine and as we progressed, we narrowed down a particular customer for our product, 'ISKCON' temple. Our main motive was to design a product that makes the whole prasad selling process hassle free. We shortlisted the factors that make it inconvenient to distribute the prasad and tried to overcome them by permissible solutions.

We learned new things as we moved forward. We even had to change the whole mechanism twice for the product to match the user's expectations. Experimenting through it all, we finalized the mechanism and started to work on it by dividing the various jobs among ourselves. This project has helped us to learn various walks of a professional environment.

8.2 Future Scope

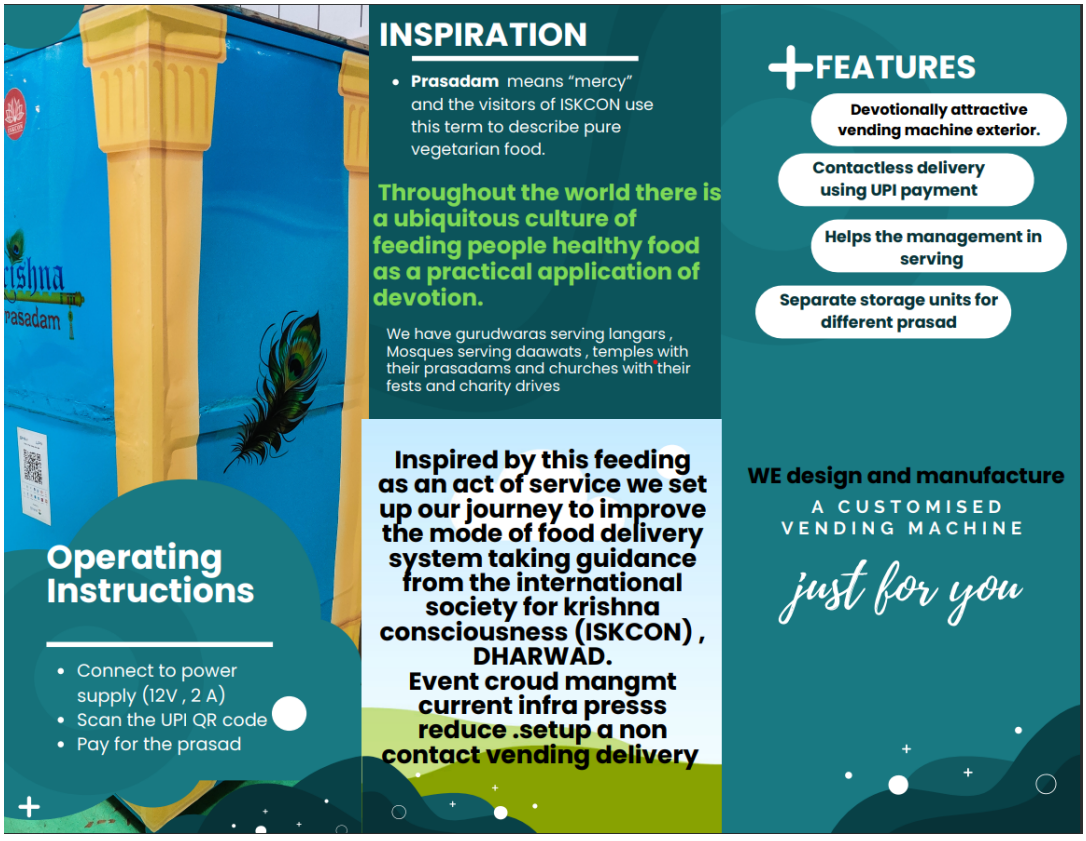
Prior indication is given before the vending machine runs out of prasad
We have to keep an account of prasad sold

LED light indicates storage empty

Indicating when the money has been credited

9. Catalog


About Us. the team
Aditya
Sam
Danish
vidushi
kumar
vinay
MINOR PROJECT
TEAM 5
COURSE GUIDES
Prof Nagaraj Ekbote
Prof Shridhar M
EVEN Cycle
2022
Team 5 C division
Krishna Prasadam
UPI enabled vending machine for ISKCON
KLE Technological University
School of Mechanical Engineering KLETECH


INSPIRATION
Prasadam means "mercy" and the visitors of ISKCON use this term to describe pure vegetarian food.
Throughout the world there is a ubiquitous culture of feeding people healthy food as a practical application of devotion.
We have gurudwaras serving langars , Mosques serving daawats , temples with their prasadams and churches with their fests and charity drives
FEATURES
Devotionally attractive vending machine exterior.
Contactless delivery using UPI payment
Helps the management in serving
Separate storage units for different prasad
Operating Instructions
Connect to power supply (12V , 2 A)
Scan the UPI QR code
Pay for the prasad
Inspired by this feeding as an act of service we set up our journey to improve the mode of food delivery system taking guidance from the international society for krishna consciousness (ISKCON) , DHARWAD.
Event croud mangmt current infra presss reduce .setup a non contact vending delivery
WE design and manufacture
A CUSTOMISED VENDING MACHINE
just for you

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KLE TECH.

Senior Design Project 2021-22

The following table shows the details of the project and team details.

Sl No	Team Code	Senior Design Project - Problem Statement	Student Name	SRN
1	M13	Trash Skimmer for cleaning the Lake/Rivers	Pavan Vijay Revannavar	01FE18BME117
			Abhishek R Patil	01FE19BME404
			Harshit Kamakar	01FE19BME405
			Darshan Surywanshi	01FE19BME409
			Javeed Khanwale	01FE19BME406
			Godwin J Halli	01FE19BME424
			Pavan Vijay Revannavar	01FE19BME421
2	M16	Real-time driver drowsiness detector with alarm	Rahul Harlapur	01FE18BME352
			Sushant Hegde	01FE18BME149
			Sachin U S	01FE18BME177
			Vinay Kumar	01FE17BME218
			Mallana Bhairamatti	01FE18BME067
			Amogh B Agadi	01FE17BME020
			Akhil Salimath	01FE18BME180
3	M30	Covid gateway kit	Aditya Lengade	01FE18BME006
			Anish V Gurav	01FE18BME025
			Anukrat Gurondia	01FE18BME026
			Asnan A Khan	01FE18BME030
			Eshaan P Kamat	01FE18BME049
			Vedant Kabra	01FE18BME154
4	M21	Energy performance optimization of domestic buildings	Venkanagouda Patil	01FE18BME191
			Charles S Swaris	01FE18BME231
			Vishal M Mathapati	01FE18BME208
			Siddalinganagouda Patil	01FE18BME222
			Sharat Ambrad	01FE18BME205
			Praveen S Sanal	01FE18BME198

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Senior Design Project 2021-22

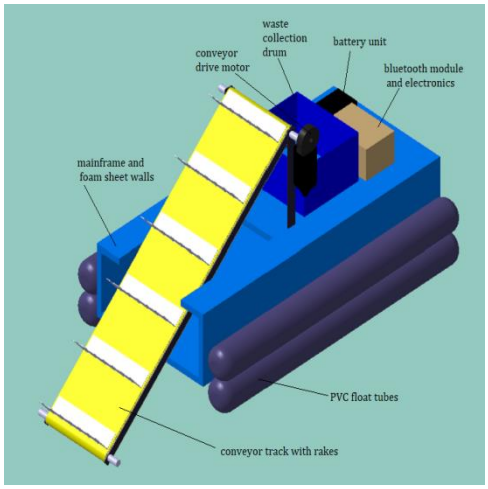
Trash Skimmer for cleaning the Lake/Rivers

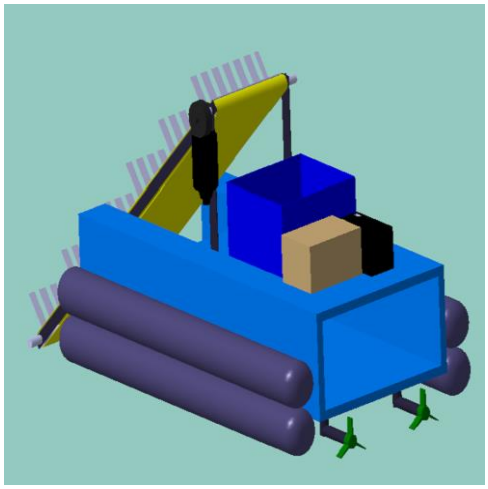
Guide: **Dr. Veeresh G Balikai**

No of students: 06

The skimmer boats, i.e., work boats for collecting and disposing of floating solid waste materials in harbors and waterways. The skimmer is more specifically directed to highly maneuverable vessels equipped with means for picking up floating debris. Many work boats and vessels have been proposed for collection of floating solid waste and other debris. When the storage conveyor is completely loaded, the boat is taken to a discharge position where the debris can be transferred to a truck or barge or other facility. The skimmer pulls growing lake weeds including roots and seed pods and collects floating algae and other organic matter that accumulates in shallow, flow areas of the Lakes. Since skimming operations began in spring of 2016, over 1,925 cubic yards or roughly 500,000 pounds of organic matter has been removed from the Lakes. In volume, that's equivalent to about 160 dump truck loads. The collected material is composted and recycled as fertile planting mulch.

- The project is quite cheap, efficient and easy to operate.
- This trash boat requires no skilled operator to control the boat. Thus, the cost of this invention will be lesser than the other models present in the market.
- This innovation is easy to control and has lot of room to grow more economic and helpful or maintaining cleanliness of lake and Pond.



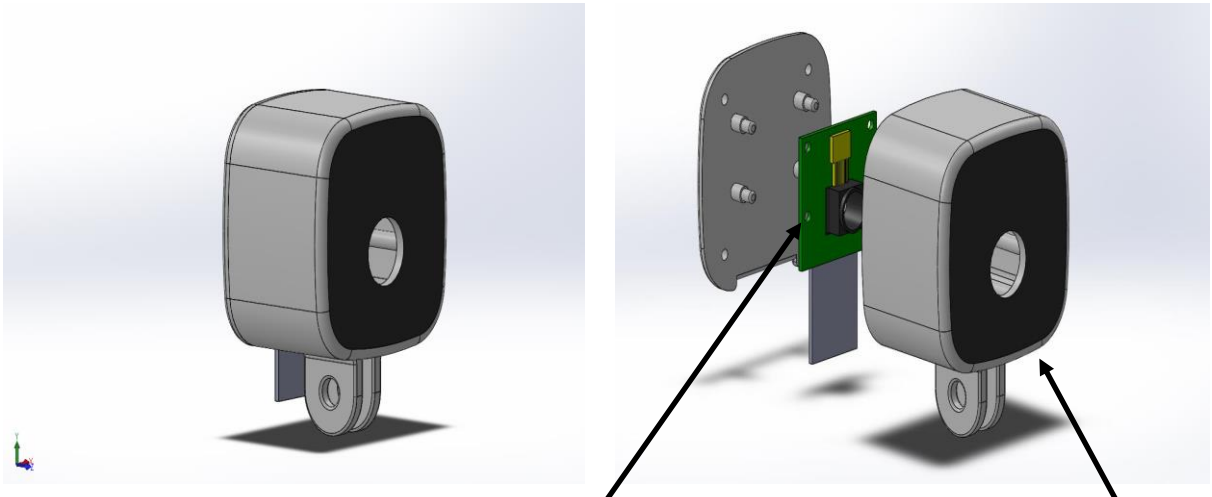


Real-time driver drowsiness detector with alarm

Guide: Mr. Gururaj F

No of students: 07

21 percent of all fatal accidents are due to drowsy driving. 4 percent or approximately eleven million drivers admit they have had an accident or near accident because they dozed off or were too tired to drive. In order to minimize the number of accidents occurring due to driver drowsiness, we have designed and fabricated a device that alerts the driver if he falls asleep. The product's end users can be truck drivers, cab drivers, long-distance travelers or people suffering from narcolepsy.
The device that has been designed is a standalone device with precision sensor and analysis technology that can accurately detect the fatigue state of the driver, and notify him/her by sending alarms in real time to ensure his/her safety during potentially dangerous driving situations. The device is automated and makes use of latest technologies like Artificial Intelligence and Machine Learning. This device has wide applications. It can also be used for vigilance and surveillance purposes other than ensuring driver's safety.



In a country where traffic decency is a huge problem and driving conditions are not suitable to standards, a driver has to bear a lot of stress during his driving hours. Thus, making him/her tired and exhausted mentally and physically. Sleep seems inevitable to them but the pressure of completing the delivery is monumental. Hence, we have come up with a device to help them stay awake and be safe and keep others safe in this process.

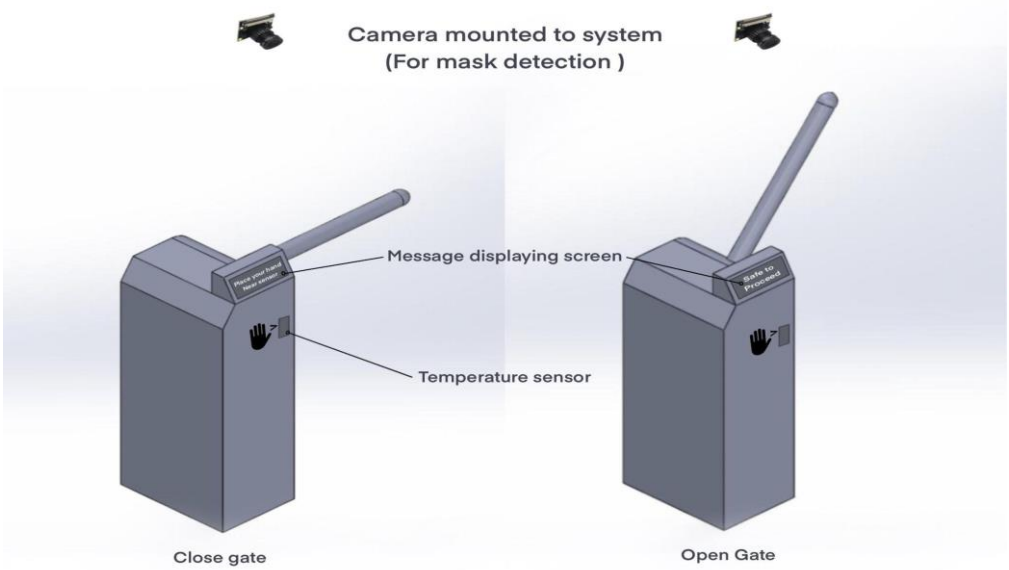
Covid gateway kit

Guide**: Mr. Shivaprasad M**

No of students: 06

The covid pandemic is coming to an end, but that doesn't mean covid cases will come to a total of complete zero. A few have even called for a zero COVID approach, attempting to eliminate the virus rather than contain its spread. New Zealand almost succeeded but, after 100 days without a case, new infections emerged from international travel and other unknown sources. While it's possible to flatten the curve using control measures, getting to zero COVID-19 with them is nearly impossible. It might be possible for some island countries, but New Zealand's example shows that it's then necessary to prevent the virus from being re-imported. This would probably require prolonged and severe travel restrictions and rigorous testing of passengers pre and post travel. Given there's little appetite for prolonged closure of borders, and community control measures alone aren't enough to eliminate the virus, getting to zero isn't currently possible.

In this project, an IoT-enabled smart door that uses a machine learning model for monitoring body temperature and face mask detection. The proposed model can be used for any shopping mall, hotel, apartment entrance, etc. As an outcome a cost-effective and reliable method of using AI and sensors to build a healthy environment. Evaluation of the proposed framework is done by the Face Mask Detection algorithm using the Tensor Flow software library. Besides, the body temperature of the individual is monitored using a non-contact temperature sensor. This proposed system can detect the users from COVID 19 by enabling the Internet of Things (IoT) technology. Virtual Simulation of the model is carried out in Proteus 8.9 with a Solid Works Cad model of the end system.

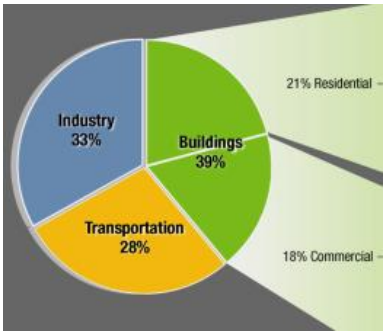


Energy performance optimization of domestic buildings

Guide: Dr . M B Gorwar

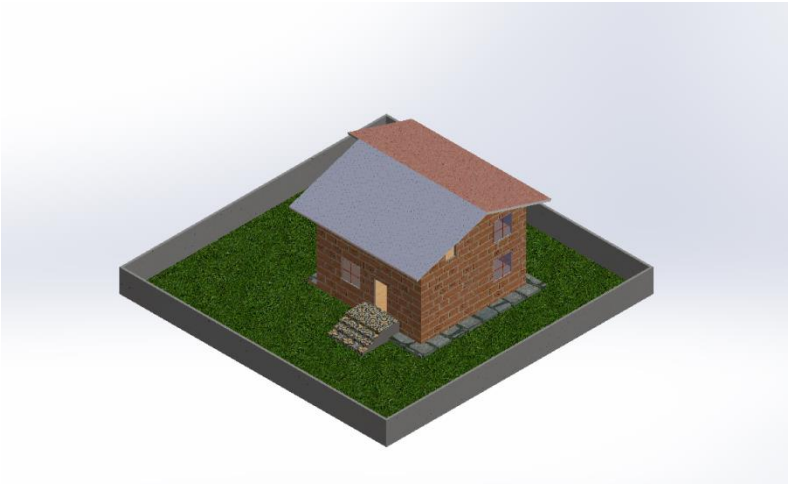
No of students: 06

Today, buildings are responsible for about 30% - 40% of the global final energy consumption.

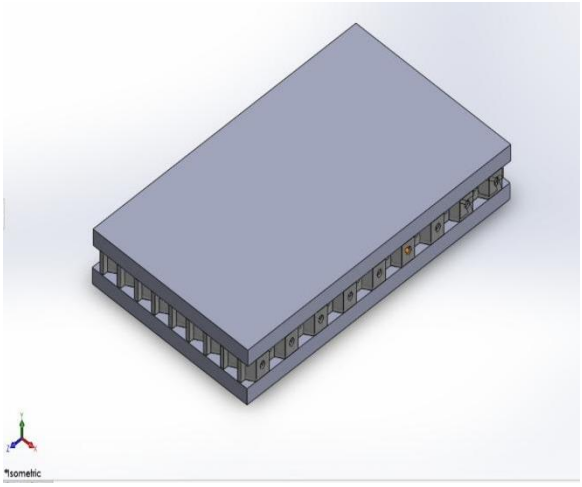


In the future, the building sector - energy consumption because of population growth. Building services, like heating, ventilation, and air conditioning (HVAC) systems, are supposed to improve living comfort, but they violate comfort conditions and waste large amounts of energy when they are poorly operated.

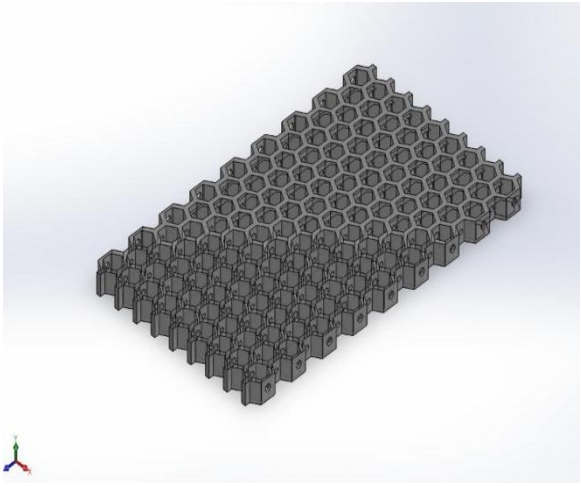
Sensor data collected from buildings offer the potential to operate buildings highly efficiently and thus limit energy wastage & at the same time, indoor comfort is maintained



Neopor insulation on the roof



Top layer (Hexagonal (honey comb) cinder blocks)



Middle layer (Hexagonal (honey comb) cinder blocks)

Due to the roof insulation the temperature in the room is comparatively reduced (i.e. reduced by 0.7 degree Centigrade). For 10m/s velocity of inlet air the outlet air velocity is 15.3m/s An initial velocity is applied to the wind at that inlet. During summer the air outside the room is hot and because of the rooftop insulation the air inside room is comparatively cooler. Since the density of hot air is less than cold air, the circulation of air keeps happening at a faster rate keeping the temperature of air moderate and the windows and doors are placed in such a way that it assists air circulation. Thus the room temperature is kept moderate i.e. thermal comfort is attained

|| OM SHRI MANJUNATHAYA NAMAHA ||

JANAJAGRUTHI VEDIKE REGIONAL OFFICE BELTHANGADY D.K.-574214

SKDRDP B.C.TRUST(R.) DHARMASTHALA
JANA JAGRUTHI REGIONAL OFFICE

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Ph: 08256-232133(O), Mob:9448468332, 9611581332 Email: janajagruthi@skdrdpindia.org
Website: http//dharmasthaladrc.com

PRESIDENT
Dr. D. VEERENDRA HEGGADE

Date: 20/04/22
Ref.No. 000701/2223

To,

Dr. P.G Sunitha Hiremath,
Professor,
School of Computer Science and Technology,
KLE Technological University,
Hubbali-580031

Dear Madam,

Sub: Letter of Appreciation.

I take this opportunity to thank and appreciate the mobile application developed by you and titled as "A Sobriety Assistance Tool". This application serves the purpose and helps the rural people to use as it has support of Multilanguage. This application is aid to help the people to lead a sober life, who would take treatment in Alcohol De addiction camps run by SKDRDP's Jana Jagruthi Vedike . I appreciate the efforts put by you in collecting views of Alcoholic patients and their family members, sober people, Psychiatrists, Jana Jagruthi Vedike employees and poojya Dr. D. Veerendra Heggade .

Thanking you,

Yours sincerely,

Sri Vivek V. Pais
Regional director/secretary
Janajagruthi vedike Regional office Belthangady,

|| OM SHRI MANJUNATHAYA NAMAHA ||

SKDRDP B.C.TRUST(R.) DHARMASTHALA

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Website: http//dharmasthaladrc.com

PRESIDENT

Dr. D. VEERENDRA HEGGADE

Date: 20/04/22

Ref.No. 000701/22-23

TO WHOMSOEVER IT MAY CONCERN

Dear Sir/Madam,

This is to certify that Dr.P.G Sunitha Hiremath had a visit to Shatadinotsava Programme held at Dharmastala for the launching of Mobile Application "A Sobriety Assistance Tool" by poojya Dr. D. Veerendra Heggade on 5th April 2022. She also attended alcohol de addiction camp at Ujire dated from 06/4/22 to 07/4/22 for counseling the patients and taking up a session on "Quality of Life" . She has also motivated the patients to lead a good quality of life by explaining the factors that influence Quality of Life.

Thanking you,

Yours sincerely,

Sri Vivek V Pais

Regional director/secretary

Janajagruthi vedike Regional office, Belthangady.


ಶ್ರೀ ಕ್ಷೇತ್ರ ಧರ್ಮಸ್ಥಳ ಗ್ರಾಮಾಭಿವೃದ್ಧಿ
22ನೇ ಸಾಲಿನಲ್ಲಿ ನಡೆ
ನವಜೀವನ ಸ
ಶತ
ಸಾಧಕರ


॥ ಓಂ ಶ್ರೀ ಮಂಜುನಾಥಾಯ ನಮಃ ॥
ಅಖಿಲ ಕರ್ನಾಟಕ ಜನಜಾಗೃತಿ ವೇದಿಕೆ, ಬೆಳ್ತಂಗಡಿ
ಶ್ರೀ ಕ್ಷೇತ್ರ ಧರ್ಮಸ್ಥಳ ಗ್ರಾಮಾಭಿವೃದ್ಧಿ ಯೋಜನೆ ಜಿ.ಸಿ. ಟ್ರಸ್ಟ್ (ರಿ.), ಧರ್ಮಸ್ಥಳ
2021-22ನೇ ಸಾಲಿನಲ್ಲಿ ನಡೆಸಲಾದ ಮದ್ಯವರ್ಜನ ಶಿಬಿರಗಳ
ನವಜೀವನ ಸಮಿತಿ ಸದಸ್ಯರ
ಶತದಿನೋತ್ಸವ ಮತ್ತು ಸಾಧಕರ ಅಭಿನಂದನಾ ಕಾರ್ಯಕ್ರಮ
ದಿನಾಂಕ : 05-04-2022, ಮಂಗಳವಾರ
ಸ್ಥಳ: ಅಮೃತವರ್ಷಿಣಿ ಸಭಾಭವನ, ಶ್ರೀ ಕ್ಷೇತ್ರ ಧರ್ಮಸ್ಥಳ