FINAL REPORT

MEDICARE ROBOT (MBOT)

PREPARED BY:-

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FACULTY GUIDES *:-*

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Institute of Engineering and Technology (IET)

JK Lakshmipat University

JUNE 2021

CERTIFICATE

This is to certify that the project work entitled "Medicare Robot" submitted by Minal Pandey (2020BTechCSE048), Mridul Goyal (2020BTechCSE051), Mohammad Asad (2020BTechCSE050), Mittapally Sai Charan (2020BTechCSE091) and Mridul Gupta (2020BTechCSE052), towards the partial fulfillment of the requirements for the degree of Bachelor of Technology in Engineering of JK Lakshmipat University Jaipur is the record of work carried out by them under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted.

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ACKNOWLEDGEMENTS: -

We are very thankful to our teachers Bhargav Prajwal sir and Tanmoy kumar Deb sir, and all the people who contributed in successfully completion of this report.

Sincerely yours :-

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OBJECTIVE: -

- To help frontline COVID-19 Warriors (Doctor, Nurses and other healthcare workers).
- To deliver food and medicine to Corona affected patients.
- To provide video calling facilities to the healthcare workers so that they can easily communicate with the COVID affected patients without being exposed to corona virus.

TABLE OF CONTENTS: -

INTRODUCTION: -

The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing pandemic of coronavirus disease 2019 caused by severe acute respiratory syndrome coronavirus. Doctors and health care workers are working hard to cure the affected patient. So after seeing that doctors, nurses and other healthcare workers are getting infected due to Corona Positive patients while treating them. Our group M6 come up with an idea of robot name "Medicare Robot" (MBOT).

Medicare Robot or MBOT is a robot which can distribute food and medicine to corona patient inside a COVID ward. This robot can help frontline COVID -19 warriors like doctors, nurses and other health care staff to avoid direct contact with patient and being exposed to the virus.

The robot can connects to a smart phone so that doctors and other staff members can easily video chat with a patient through a camera fixed on the top of the robot, in order to monitor their health. All the electronics will be contained in the base so that other things can be carried as well. It will also provide with the feature of touchless hand sanitizer, so that they can sanitize themselves before collecting anything. Hospital can be divided in GREEN ZONE (for doctors, other staff and Non-COVID positive people) and RED ZONE (for corona patient). Because of this robot doctors and health staff can concentrate on caring of patient, rather than worrying about missing medicine and supplies.

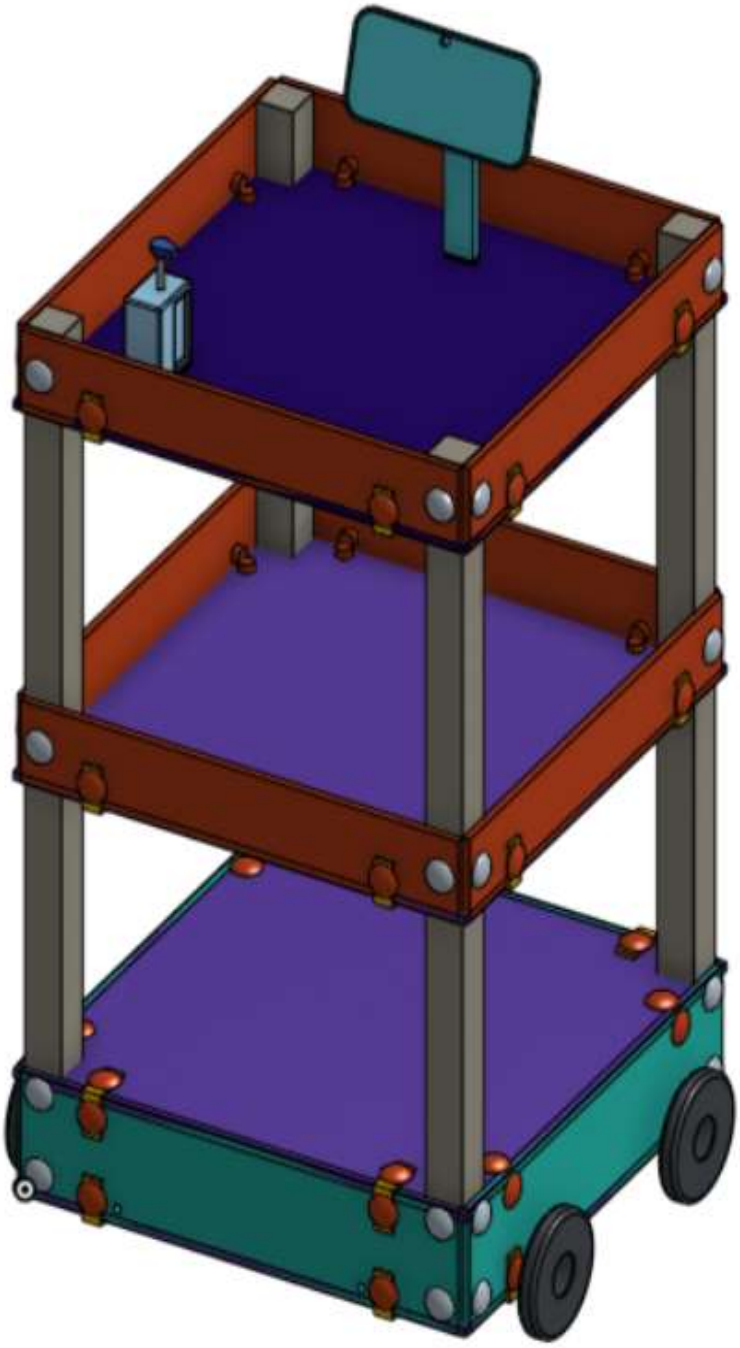


Fig 1 :- this is the 3d diagram of our "Medicare robot" (MBOT).

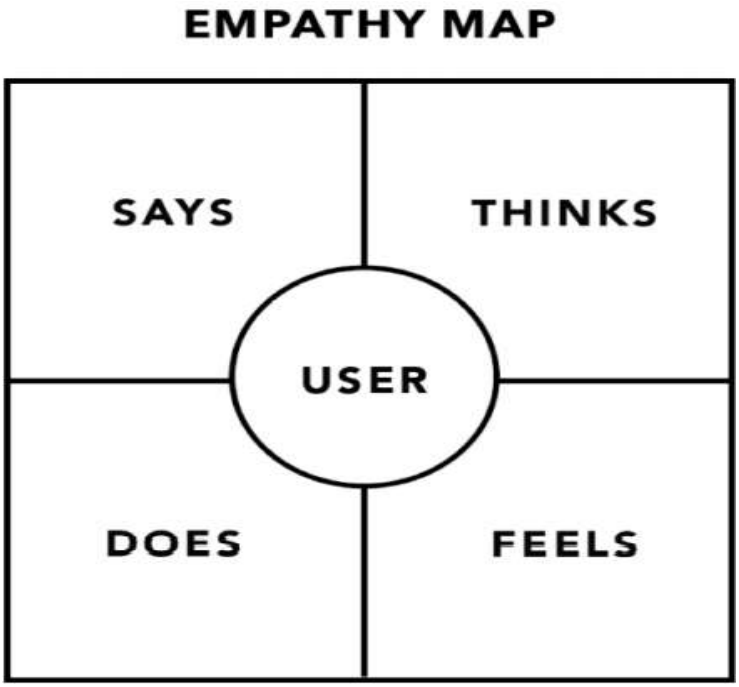
Design Thinking And Product Ideation:

Design Thinking

Design thinking originally came about as a way of teaching engineers how to approach problems creatively, like designers do. Design thinking is both and ideology and a process that seeks to solve complex problems in a user-centric way.

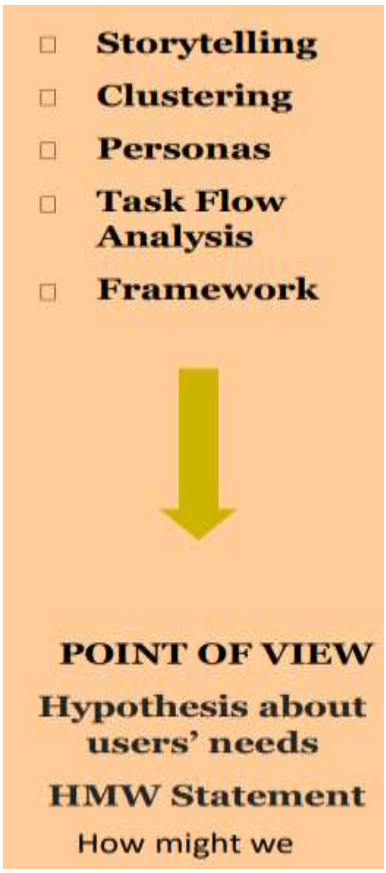
It is a 5 step process to come up with meaningful ideas for a particular group of people.

Empathize



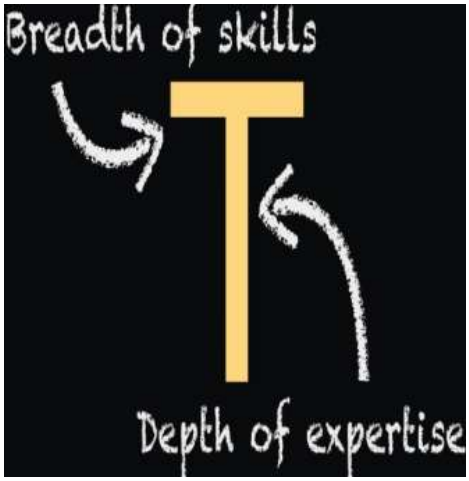
- The central element is to put oneself in the position of the customer/user and to observe him in detail.
- Identify who the users/target audience are
- Identify the challenges the user is facing
- What they need

Define Problem



Ideate The Problem

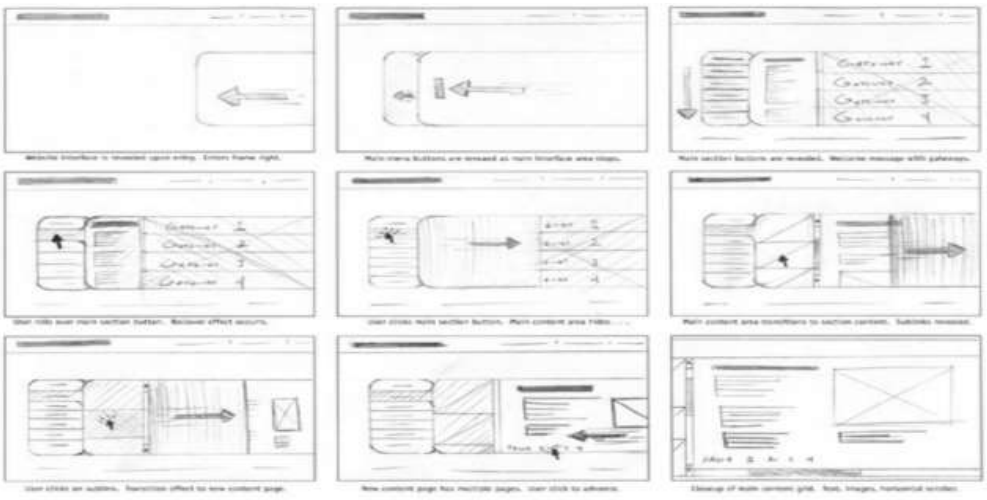
- Be Visual
- Defer Judgment
- Encourage Wild Ideas
- Build on the Ideas of Others
- Go for Wild Ideas
- Go for Quantity
- One Conversation at a time θ
- Stay Focused on topic



Prototype

- Physical
- Wireframes
- Interaction
- Storyboards
- Acting
- Prototyping

Physical Prototype



Story board prototype

Acting / Role Play Prototype

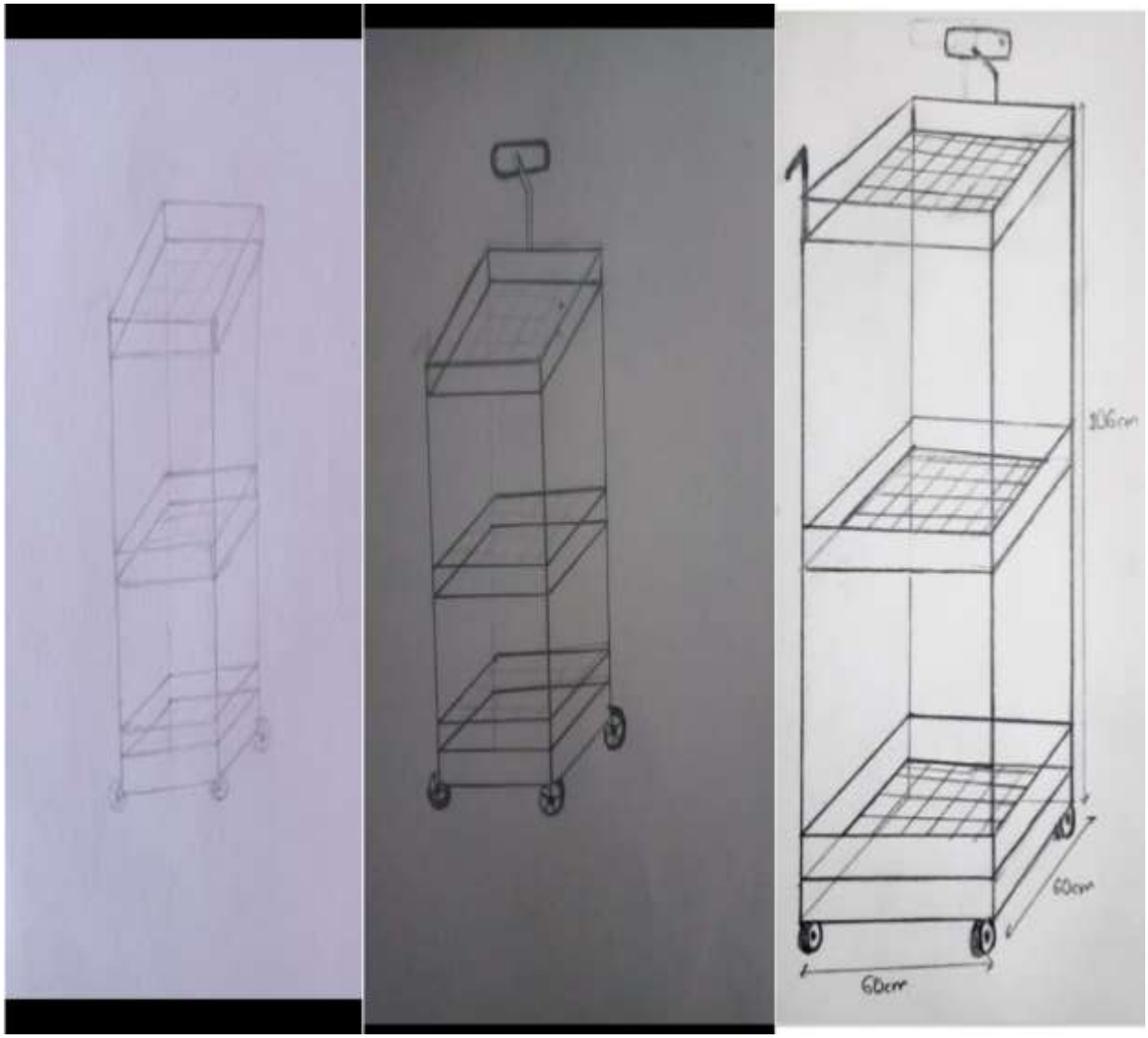
IDEATION

In starting, we get some initial ideas like:

- A device attached in the hand of patient if he want anything patient have to move his hand. The device send call message to doctor or patient.
- A idea of door guard. It is a type of a door which detects the temperature of any person who is entering in any room. If the person entering the room have the symptoms of coronavirus like high temperature then door will click the photograph of that person and siren rings so that he or she will stop entering that room.
- Making a robot type structure which helps in delivering food, medicines etc to coronavirus affected patients inside a COVID ward. So the doctors and nurses don't go in that ward again and again.

Then, at last we select and modified our third idea which was of making a robot and named it as M-Bot

Here, are some initial or Free hand sketches of our robot:



DATA FROM REPORT -1

MATERIALS FOR INDIVIDUAL COMPONENTS

There are so many types of materials used for the various components in the fabrication of our product.

Example- wood, aluminum, etc.

List of Components And Materials with their Specification.

Components	Materials and Specifications
Body	The body will mainly be made of plywood with some use of aluminum.
Motor	Geared Motor 6V -12V Torque – 5Kg-cm 500rpm DC power
Arduino UNO	It has 14 digital input/output pins. 6 analog inputs. A 16 MHz ceramic resonator. A USB connection. A power jack. An ICSP header. A reset button.

IR Sensor * 2 & Female jumper wire	detects a distance of 2 ~ 10cm. detection angle 35 °. Board size: 3.1CM x 1.5CM.
Wheels * 4	Diameter = 8 cm
Motor Driver	Generic 0826U40KLRA Q L293D
Li-ion battery	Amptek 12v 1.3Ah 12 Volts 550 g
Wires	Simple connection wires.
Smartphone	A simple smartphone with a good quality camera.

DESCRIPTION OF COMPONENTS

1. Wheels

For the movement of the M-Bot, we are using 4 wheels i.e., 2 driven wheels + two idler wheels.

The two drive wheels are used to propel and turn the robot (skid steering) and the two idler wheels to prevent the robot from falling forward or backward. The "idler" wheel can be a caster, a ball, or omniwheel.

Figure – 3

2. Motor

Motors and actuators are the devices that make the robot movable. Motors and actuators convert electrical energy into physical motion. The vast majority of actuators produce either rotational or linear motion.

For our robot, we are using a DC motor because DC motor works well in robotics because they allow the robot to be battery-powered, which offers great advantages for a variety of robotic applications, particularly mobile and collaborative robots.

Figure – 4

3. Motor Driver

Motor drivers act as an interface between the motors and the control circuits. Motor requires a high amount of current whereas the controller circuit works on low current signals. So the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor.

It is the most important part of the line follower robot. It reads the sensor's output and based on it, drives the motor's motion.

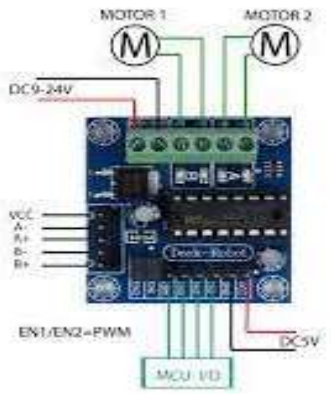


Figure – 5

4. Body

The body of our robot will be made up of mainly plywood with some use of aluminum. The basic structure looks like a table.

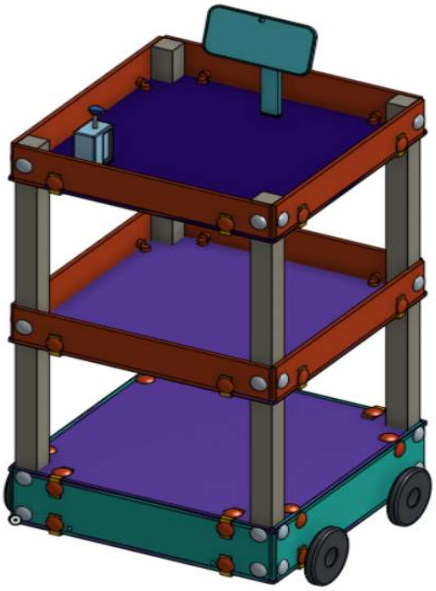


Figure – 6

5. Arduino UNO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards can read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

Figure – 7

6. IR Sensor * 2 & Female jumper wire

An IR receiver captures the reflected light and the voltage are measured based on the amount of light received. Infrared sensors are used in a wide range of applications including here proximity robotic applications for distance and object detection, or color detection and tracking.

Figure – 8

7. Li-ion battery

We have used a Li-ion battery that can hold 30% more capacity and are much lighter than the NiMH battery. Li-ion also suffers from a lower discharge compared to NiMH battery. The disadvantage of the NiMh battery is including a high self-discharge (around 50% greater than NiCd) and degradation of performance if stored at high temperatures. The battery is quite heavy. The weight of the battery is around 250g.

Figure – 9

8. Phone

In our robot, we are using a smartphone so that, The doctors and other staff can also video chat with the patient through a camera fixed on the top of the robot, in order to monitor their health.

Figure – 10

9. Wires

A wire is a single usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. The wire is commonly formed by drawing the metal through a hole in a die or draw plate.

Figure - 11

MANUFACTURING PROCESS OF ALL THE COMPONENTS

The main and important components of our robot are Aurdino, Motor driver, motor, Batteries, and sensors.

The manufacturing process starts by installing Aurdino with a motor driver and then attached all 4 motors with a motor driver and sensors with Aurdino. Then we connect batteries to Aurdino. After attaching and all the soldering process we fix it in our rectangular robot base. Then we go ahead with the manufacturing body of our robot.

In our product that is “Medicare Robot” (MBOT), only the main component is the body of our robot which is of wood. We have to manufacture that only. Except for the body of our robot every component we need to buy from the market, like battery, motor, wires, sensors, etc. We don’t need any manufacturing process in that.

The body of MBOT is made up of plywood. we first cut the ply in the required dimension then we assemble it to the required shape and fit it with a steel screw. And at last, we install inner components in the body. and then external components ie sanitizer and smartphone.

The body of our MBOT is of wood. We need a carpentry shop to manufacture the body of our robot.

TOOLS USED AND DETAILED DESCRIPTION OF COMPONENTS

List of tools used for manufacturing the body of our robot-

Work holding tools: -

A full range of well-designed, work holding tools used to provide powerful clamping and positioning force to every type of manufacturing process. Global distribution yet local technical support ensures that your application needs to be solved successfully.

1. **Carpenters Vice**

   A woodworking vice is a type of vice primarily designed to solidly clamp wood without damaging the surface. Wood often needs to be clamped when completing tasks such as sawing, drilling, or carpentry.

Figure - 12

2. **Bar Clamp**

   A bar clamp is typically used for woodworking applications, such as carpentry and joinery, although they can also be used for metalworking. It is the ideal clamp to use for making furniture pieces, including doors, cabinets, and tabletops.

Figure – 13

Marking and measuring gauge: -

A marking gauge, also known as a scratch gauge, is used in woodworking and metalworking to mark outlines for cutting or other operations. The purpose of the gauge is to scribe a line parallel to a reference edge or surface. It is used in joinery and sheet metal operations.

1. Try-Square

A try square or try-square is a woodworking tool used for marking and checking 90° angles on pieces of wood. Though woodworkers use many different types of squares, the try square is considered one of the essential tools for woodworking. The square in the name refers to the 90 angles. To try a piece of wood is to check if the edges and faces are straight, flat, and square to one another. A try square is so-called because it is used to try how to square the workpiece is.

Figure - 14

2. Steel rule

The steel rule is a basic measuring tool. When used correctly, a good steel rule is a surprisingly accurate measuring device. A scale is a measuring device used by architects and engineers that assists them in making drawings to a scale other than full size. A rule is used to measure actual size.

Figure - 15

Cutting Tools: -

The cutting tool is a wedge-shaped and sharp-edged device that is used to remove the excess layer of material from the workpiece by shearing during machining to obtain the desired shape, size, and accuracy. It is rigidly mounted on the machine tool.

1. **Hand saw or crosscut saw**

   It is used to cut across the grains of the stock. The teeth are so set that the saw kerf will be wider than the blade thickness.

Figure - 16

2. **Rip saw**

   It is used for cutting the stock along the grain. The cutting edge of this saw makes a steeper angle, whereas that of the cross-cut saw makes an angle of 45 degrees with the surface of the stock.

Figure - 17

3. **Tenon saw**

   It is used for cutting tenons and in fine cabinet work. The blade of this saw is very thin and so it is stiffened with a thick back strip, this is sometimes called a backsaw. The teeth' shape is similar to a cross-cut saw.

Figure - 18

4. Coping saw

It has a very small blade used for cutting small and intricate parts with curves.

Figure - 19

5. Compass saw

It has a narrow blade of 250mm long which can enter confined spaces for cutting.

Figure - 20

6. Firmer chisel

Chisels are used for cutting and shaping wood accurately. Wood chisels are made in various blade widths, ranging from 3 to 50 mm. They are also made in different lengths.

Figure - 21

7. Mortise chisel

These are used for cutting mortises. The cross-section of the mortise chisel is proportioned to withstand heavy blows during mortising. The cross-section is also made stronger near the shank.

Figure - 22

Drilling and boring tools: -

Drilling tools are end-cutting tools designed for producing holes in a workpiece.

1. Auger bit

It is the most common tool used for making holes in the wood. During drilling, the lead screw of the bit guides into the wood necessitating only moderate pressure on the brace. The helical flutes on the surface carry the chips to the outer surface.

Figure - 23

2. Gimlet

It has cutting edges like a twist drill. It is used for drilling large diameter holes with hand pressure.

Figure - 24

3. Carpenters brace

It is used for rotating auger bits, twist drills, etc., to produce holes in the wood.

Figure - 25

4. Hand drill

Carpenters brace is used to make relatively large size holes; whereas hand drill is used for drilling small holes. A straight shank drill is used with this tool. It is small, light in weight, and maybe conveniently used than the brace.

Figure - 26

Miscellaneous tools: -

Chisels and Gouges Cutlery Files Hammers & Mallets Hand Planes Hand Saws Miscellaneous Hand Tools Pliers & Snips Sharpening Stones.

1. Screwdriver

It is used for driving wood screws into wood or unscrewing them. The length of a screwdriver is determined by the length of the blade. As the length of the blade increases, the width and thickness of the tip also increase.

Figure - 27

2. Mallet

This is a wooden-headed hammer of a round or rectangular section. The striking face is made flat. Mallet is used for cutting tools and has a wooden handle.

Figure – 28

3. **Wood rasp file**

   It is a finishing tool used to make the wood surface smooth, remove sharp edges and finish fillets and other interior surfaces. Sharp cutting teeth are provided on its surface for the purpose.

Figure - 29

Planning tools: -

Planning Tools are instruments that help guide organizational action steps related to the implementation of an initiative, program, or intervention. Planning Tools are likely to be initiative-specific and may include: Organizational timelines. Action item checklists.

1) Wooden jack plane

This is the most commonly used plane in the carpentry shop. The main part of a wooden jack plane is a wooden block called the sole, in which a steel blade having a knife-edge is fixed at an angle with the help of a wooden edge.

Figure - 30

2) Metal jack plane

It severs the same purpose as the wooden jack plane but facilitates smoother operations and a better finish. The body of a metal jack plane is made up of grey iron casting with the side and sole machined and ground to better finish.

Figure - 31

Cost of Materials: -

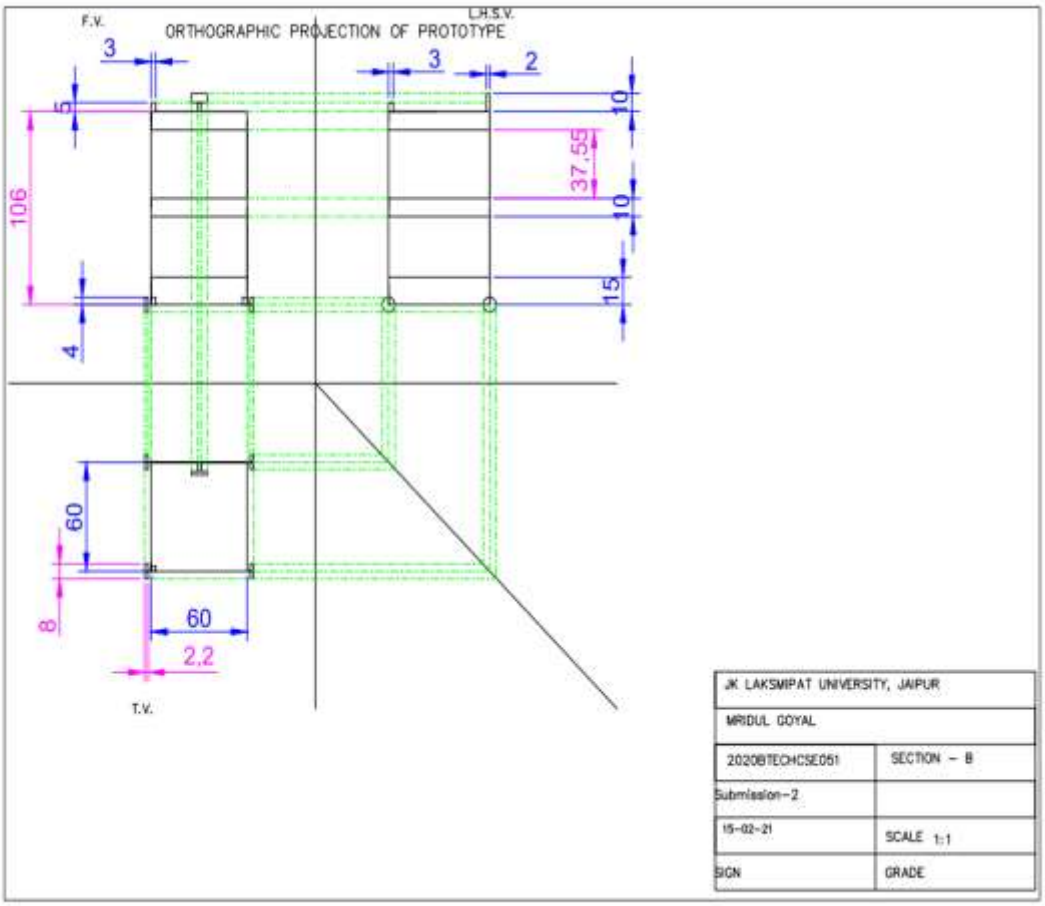
MATERIALS	COST
Motor x 4	1000 Rs.
Arduino UNO	577 Rs.
IR Sensor x 2 & Female jumper wire	199 Rs.
Wheels x 4	300 Rs.
Motor Driver L239D	110 Rs.
Wires	100 Rs.
Li-on battery	850 Rs.
Body	500 Rs.
Phone	1300 Rs.
TOTAL	5000 Rs.

2D DRAWING USING AUTOCAD:

AutoCAD is software for 2D and 3D computer-aided design. We had learned too much about this software that how we have to use this software, how we have to make our drawings, orthographic projections and many more things. Here are the few applications of the AutoCAD:

- Architectural drawing of all kinds.
- Work-flow charts and organizational diagrams.
- Graphs of all kinds.
- Drawings for electronic, chemical, civil, mechanical, automotive and aerospace engineering applications.

We had also made some AutoCAD drawings which are as follows:



3D Model Of The Individual Components: -

For 3D model of the individual components, we are using a free open source software “Onshape”.

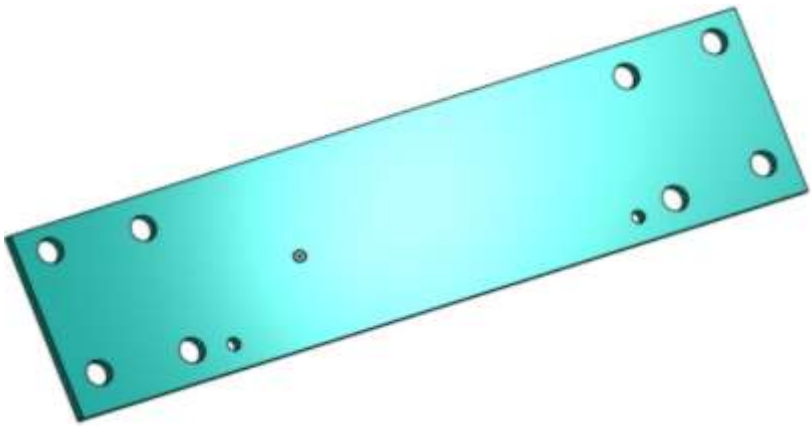
Onshape is the only Software-as-a-Service (SaaS) product development platform that combines CAD, built-in data management, real-time collaboration tools, and business analytics. Onshape Free extends fully capable modern CAD tools to non-professional designers. At no cost, hobbyists, makers, and others who are willing to freely share their designs can pursue their projects without the hassles commonly found in old CAD systems.

There are total 10 individual components in our robot.

1. Wheels

2. Wooden Plates

A.



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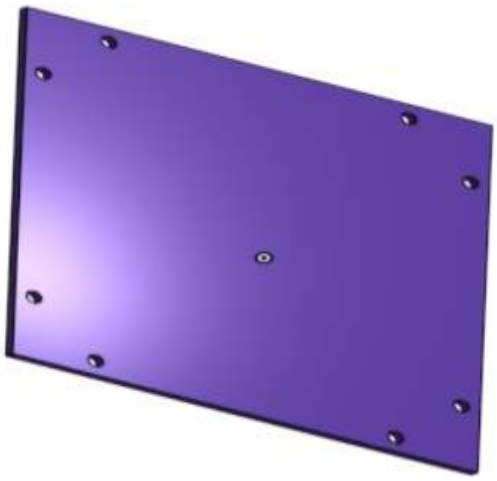

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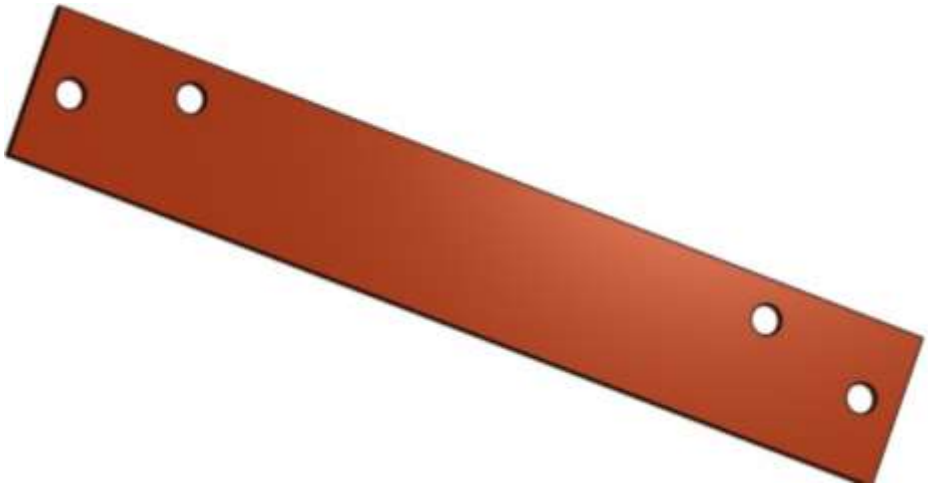
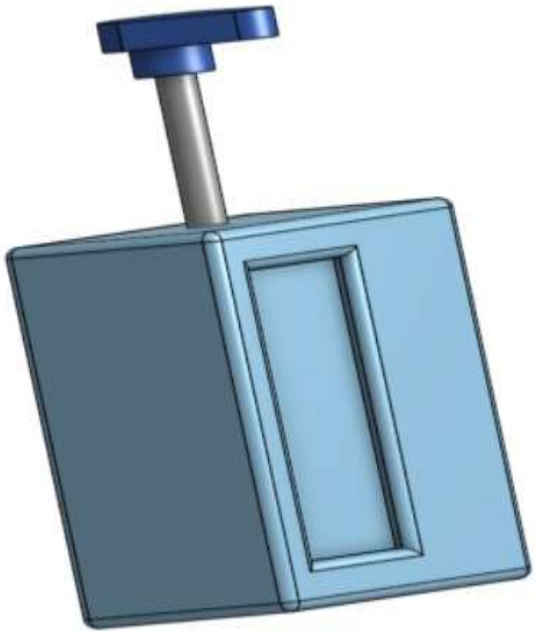


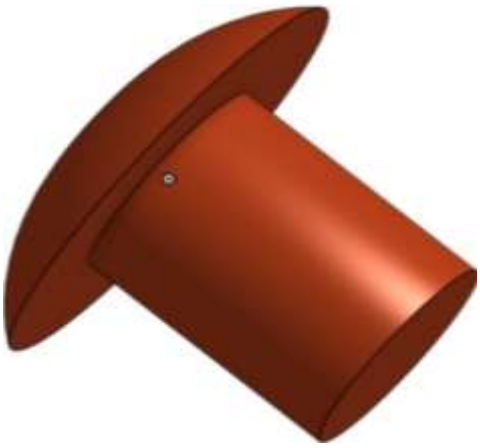
D.

3. Touchless Hand Sanitizer

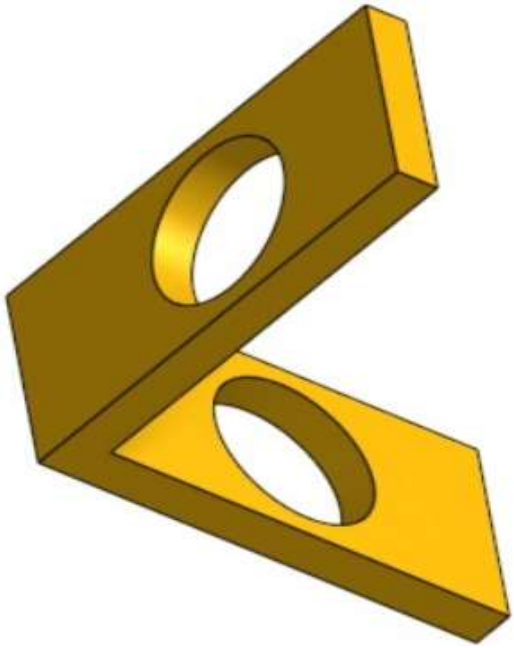


4. Smartphone & Stand

5. Screw

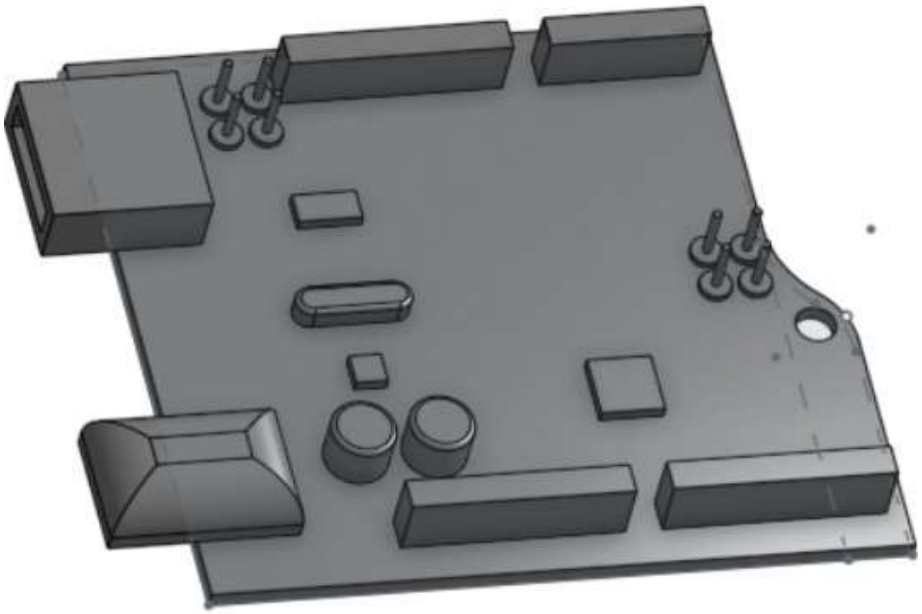


6. Connecter

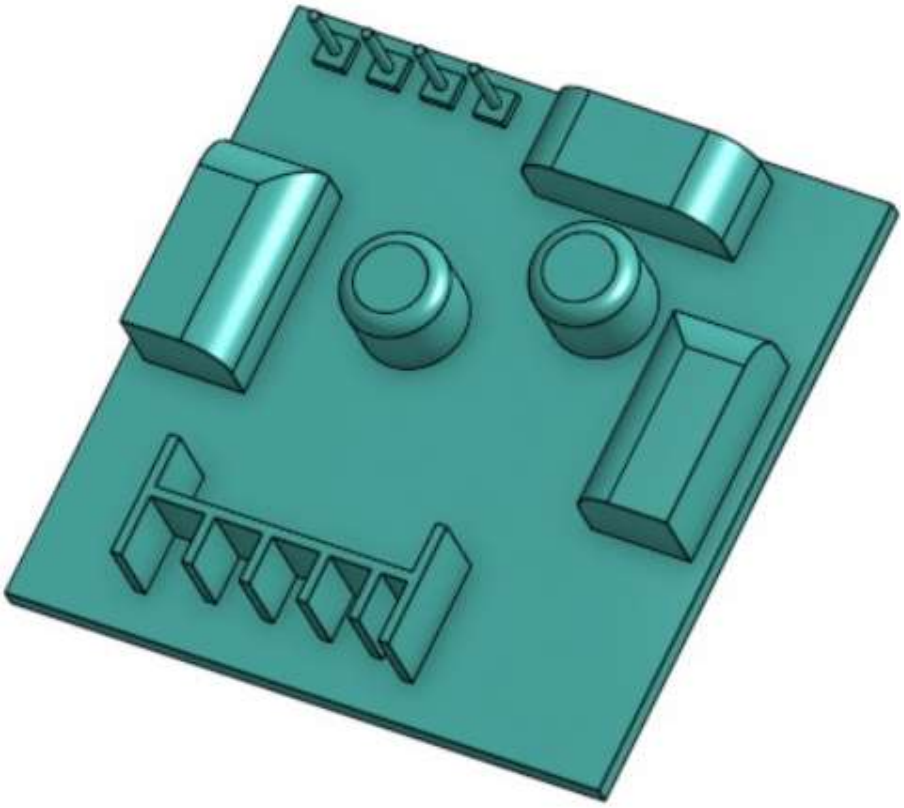


7. Wooden Legs

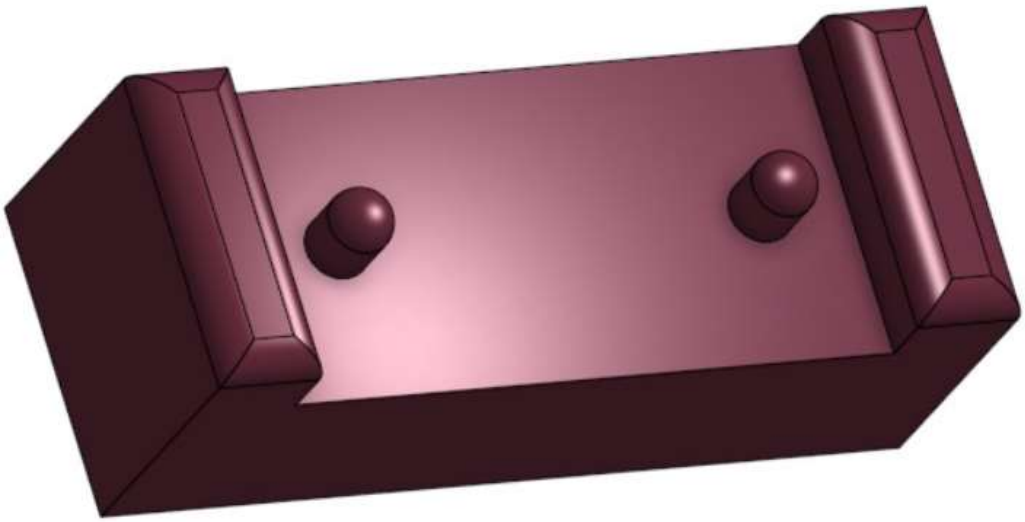
8. Arduino



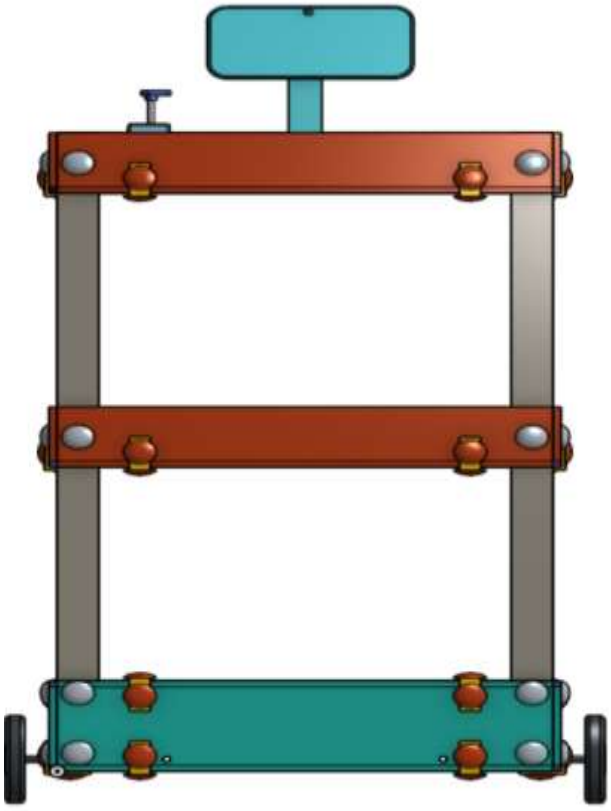
9. Motor Driver

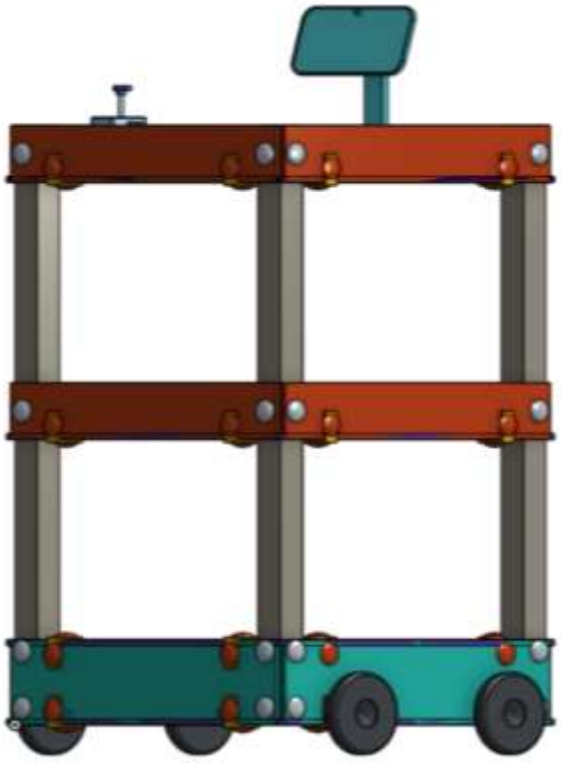


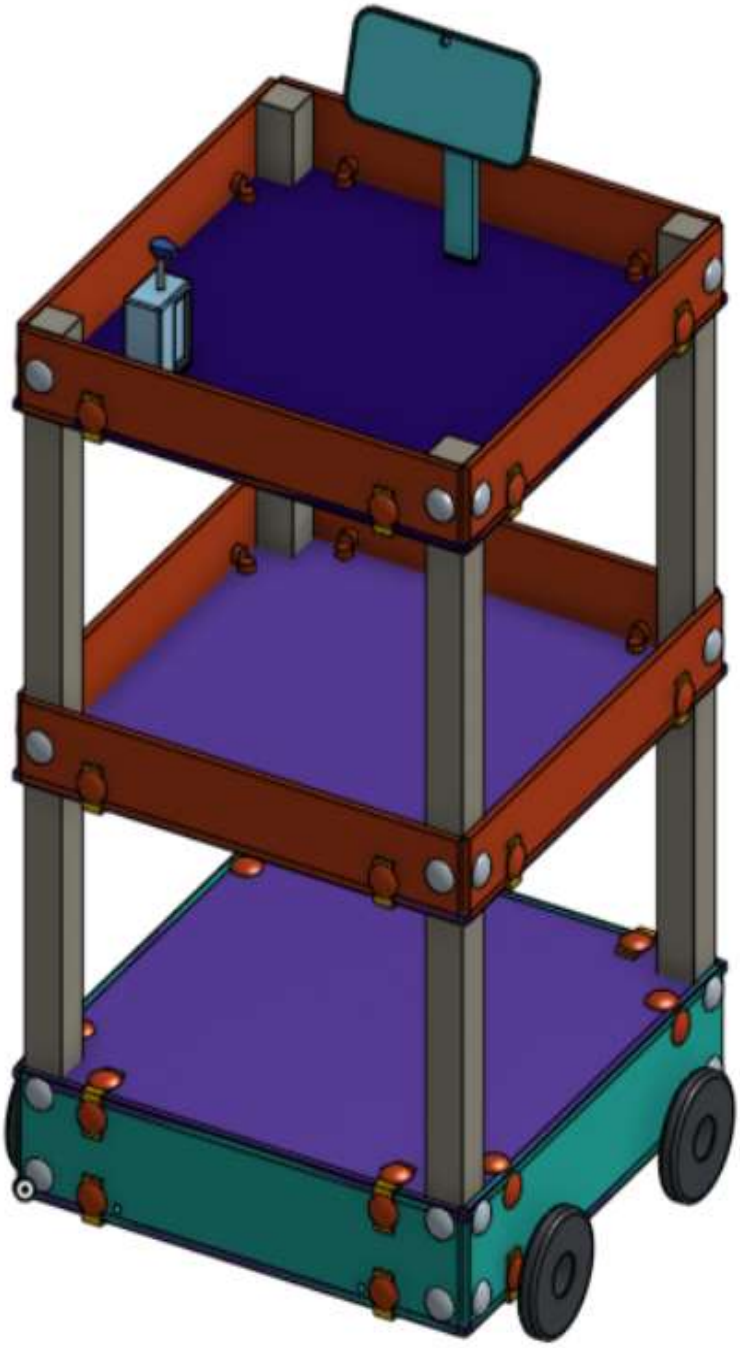
10. Battery



Assembly of components (Final Product)

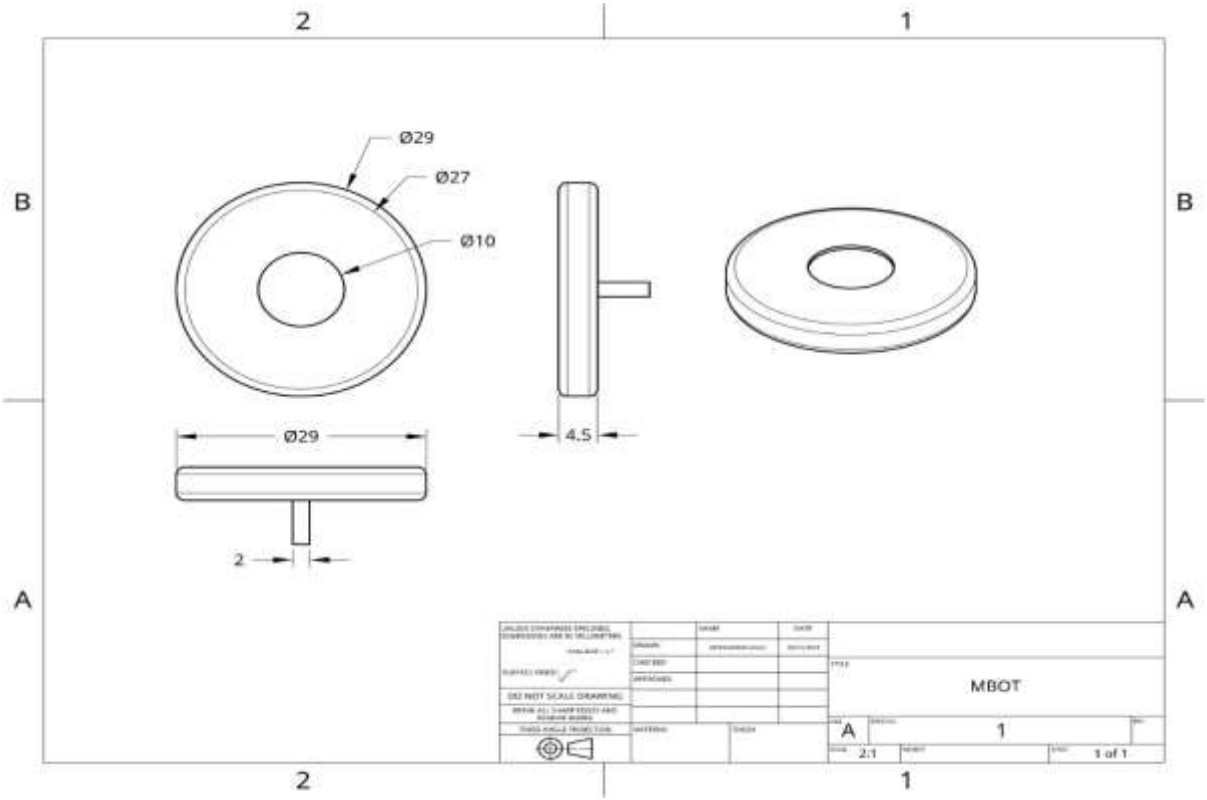






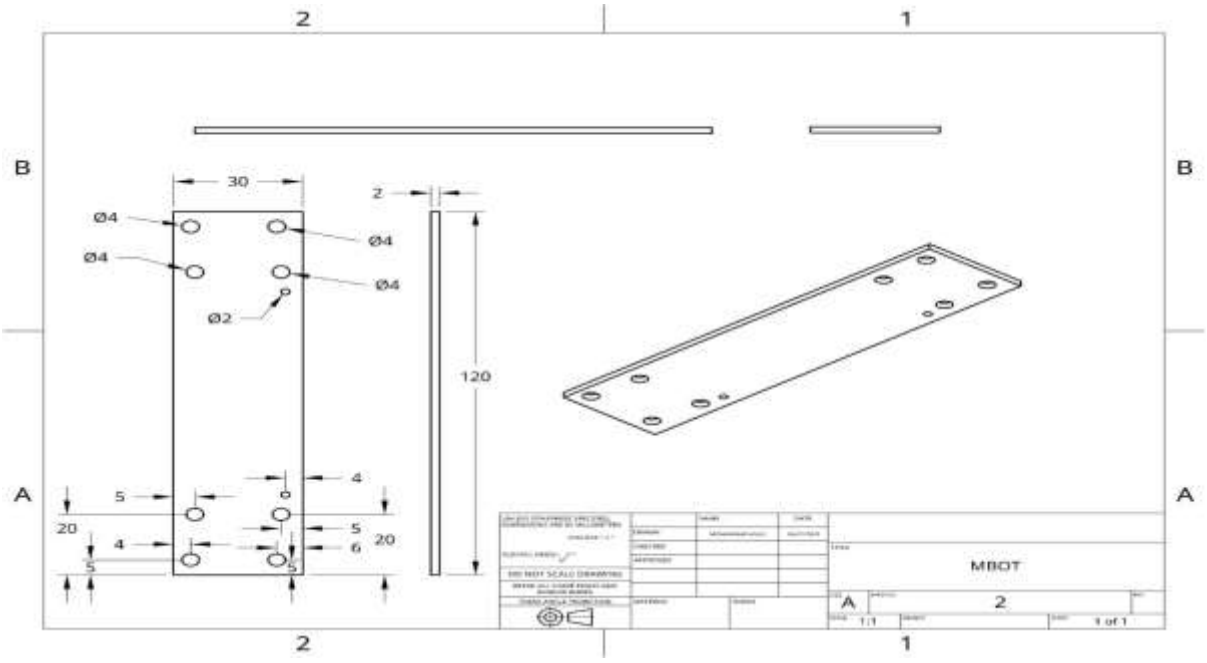
Drafting of the individual components

1. Wheels



2. Wooden Plates

A.



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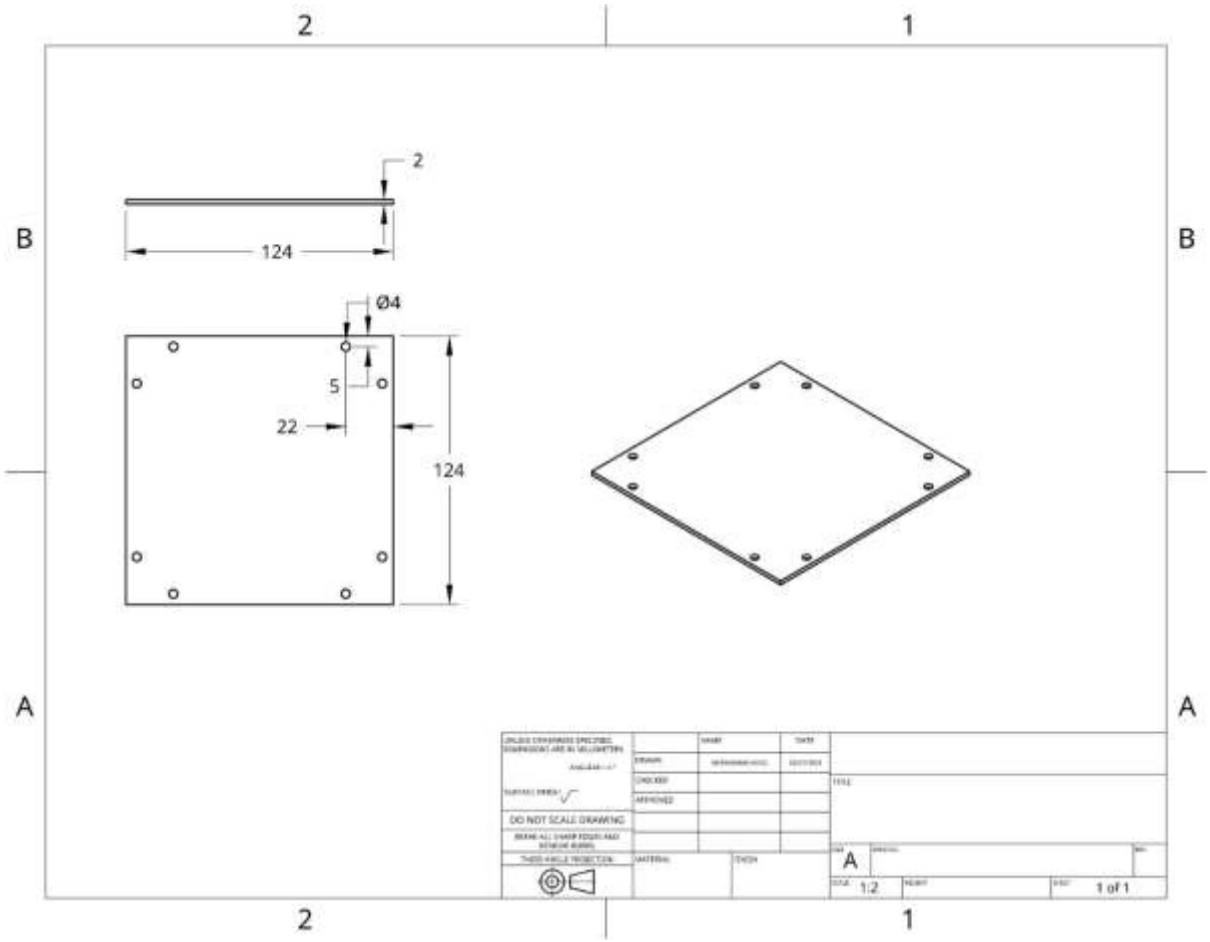
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124
DO NOT SCALE DRAWING
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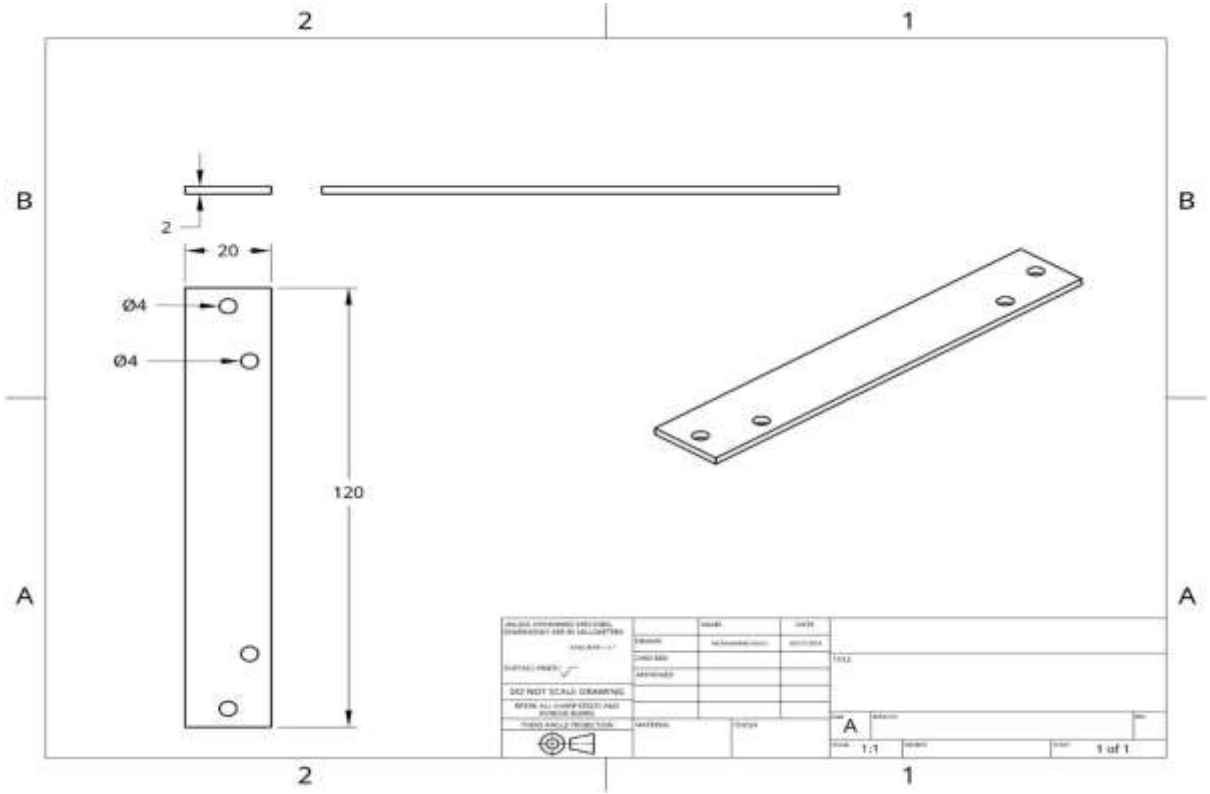
1 of 1

C.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1 of 1

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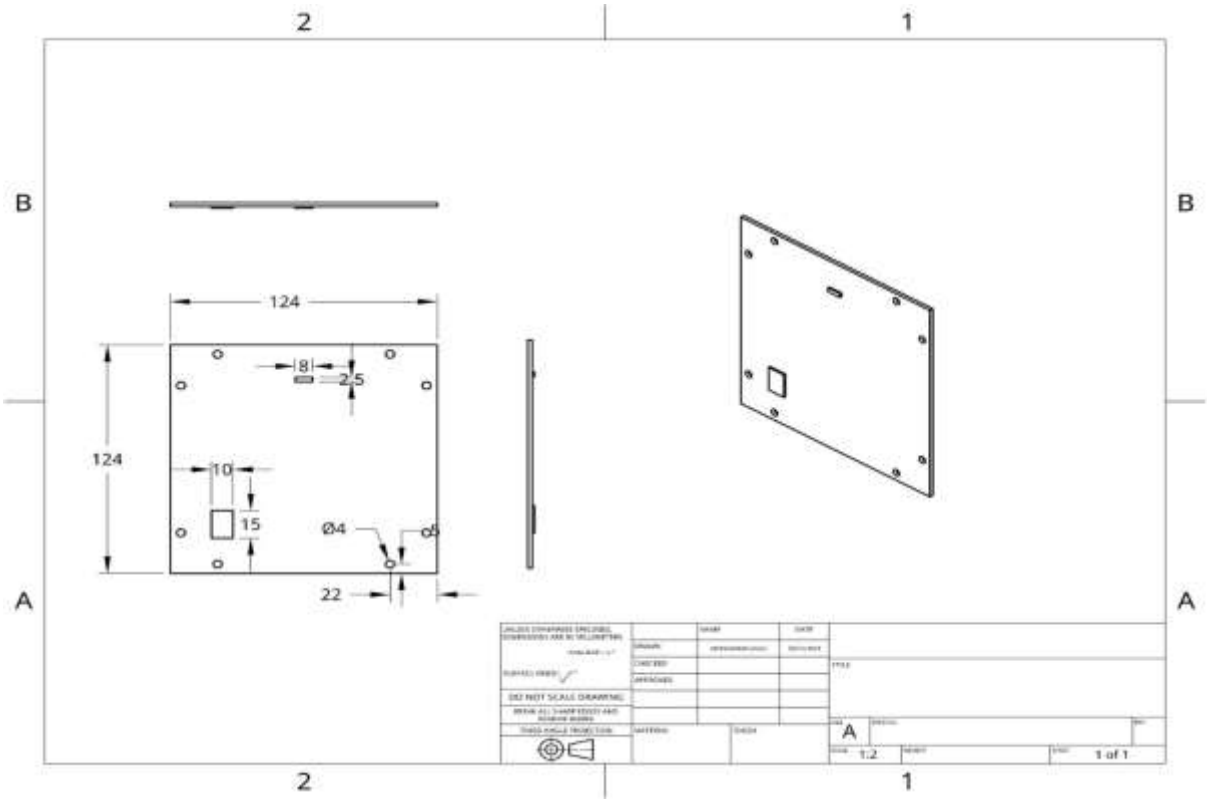
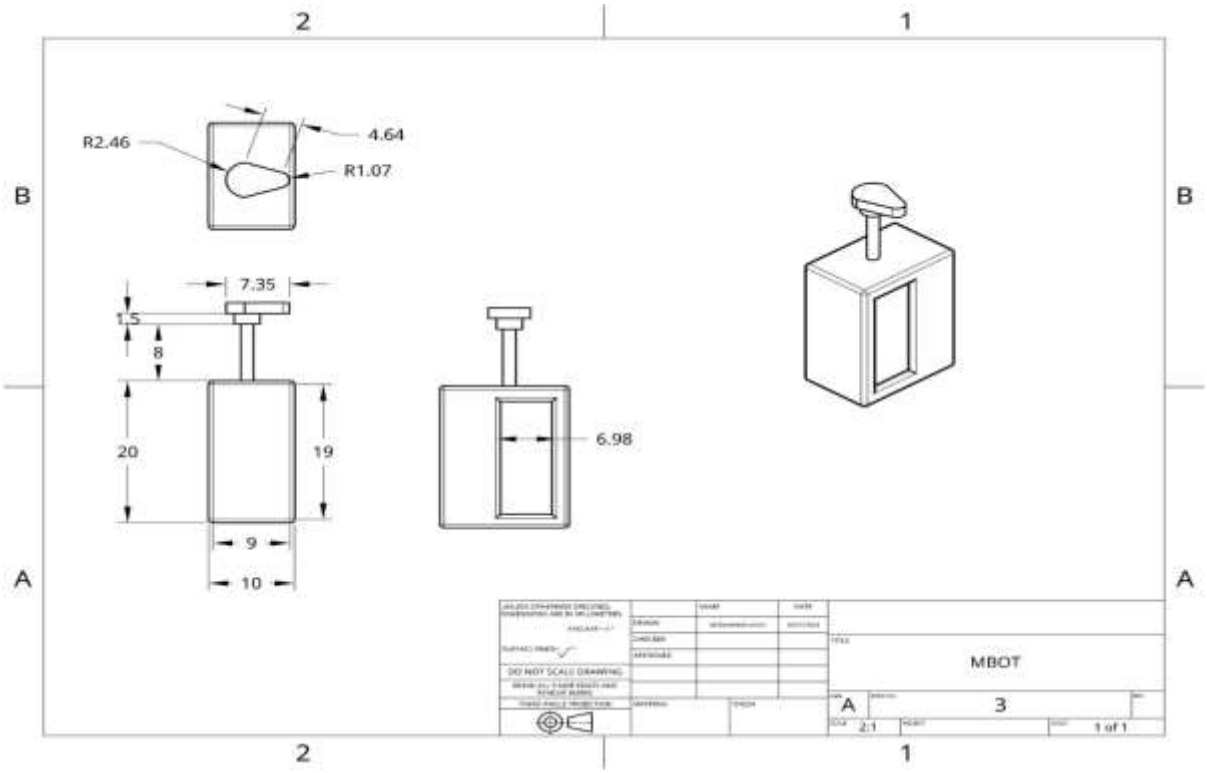
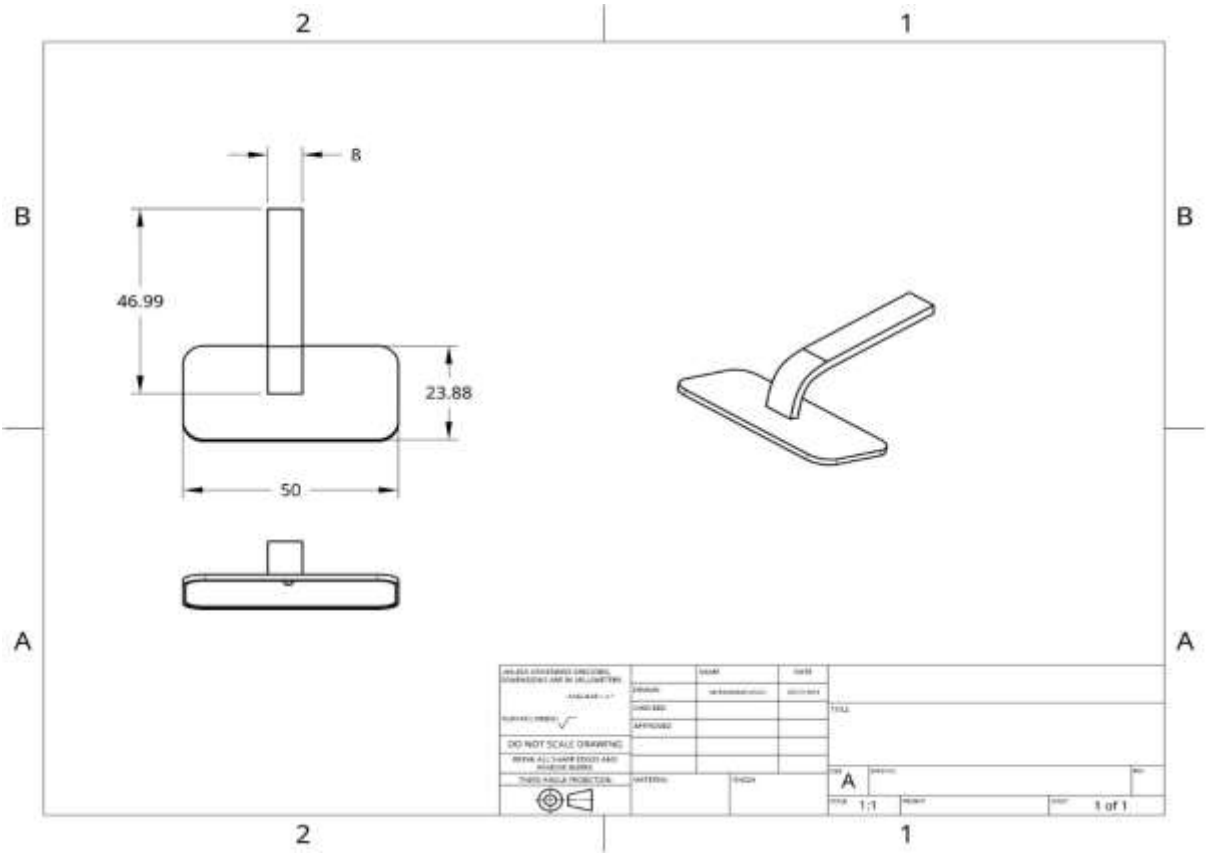


3. Touchless Hand Sanitizer

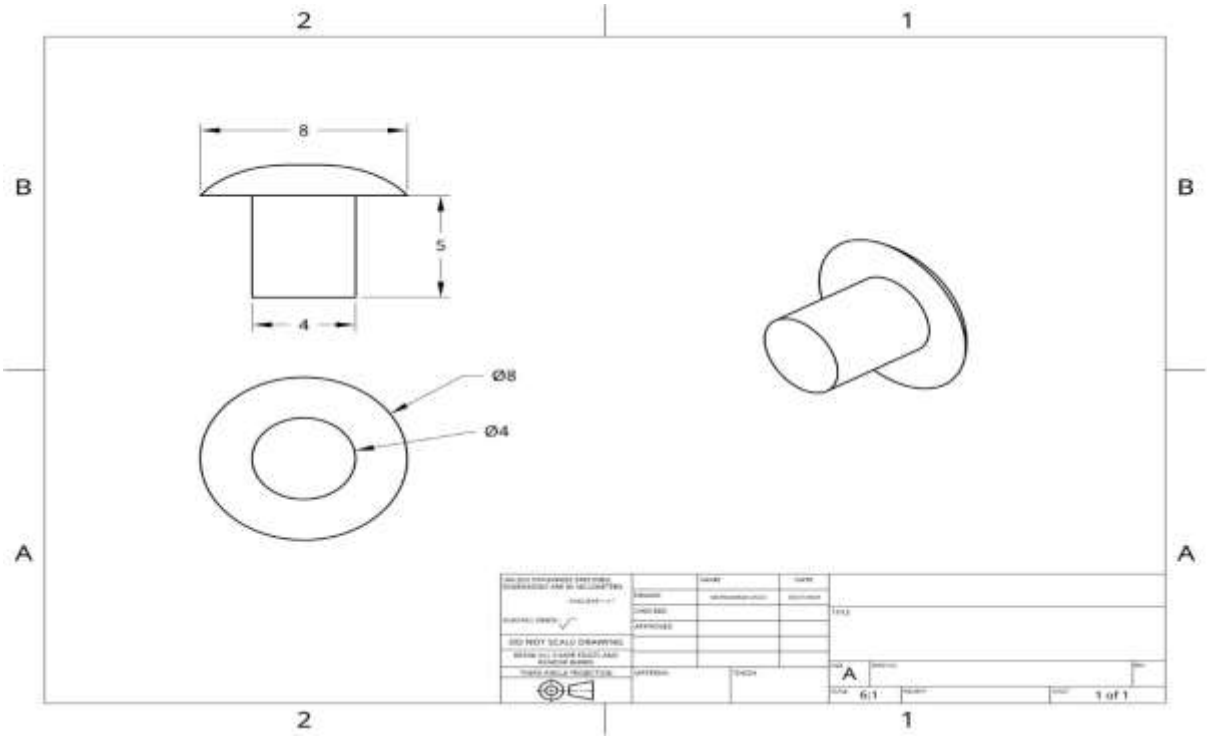


4. Smartphone & Stand

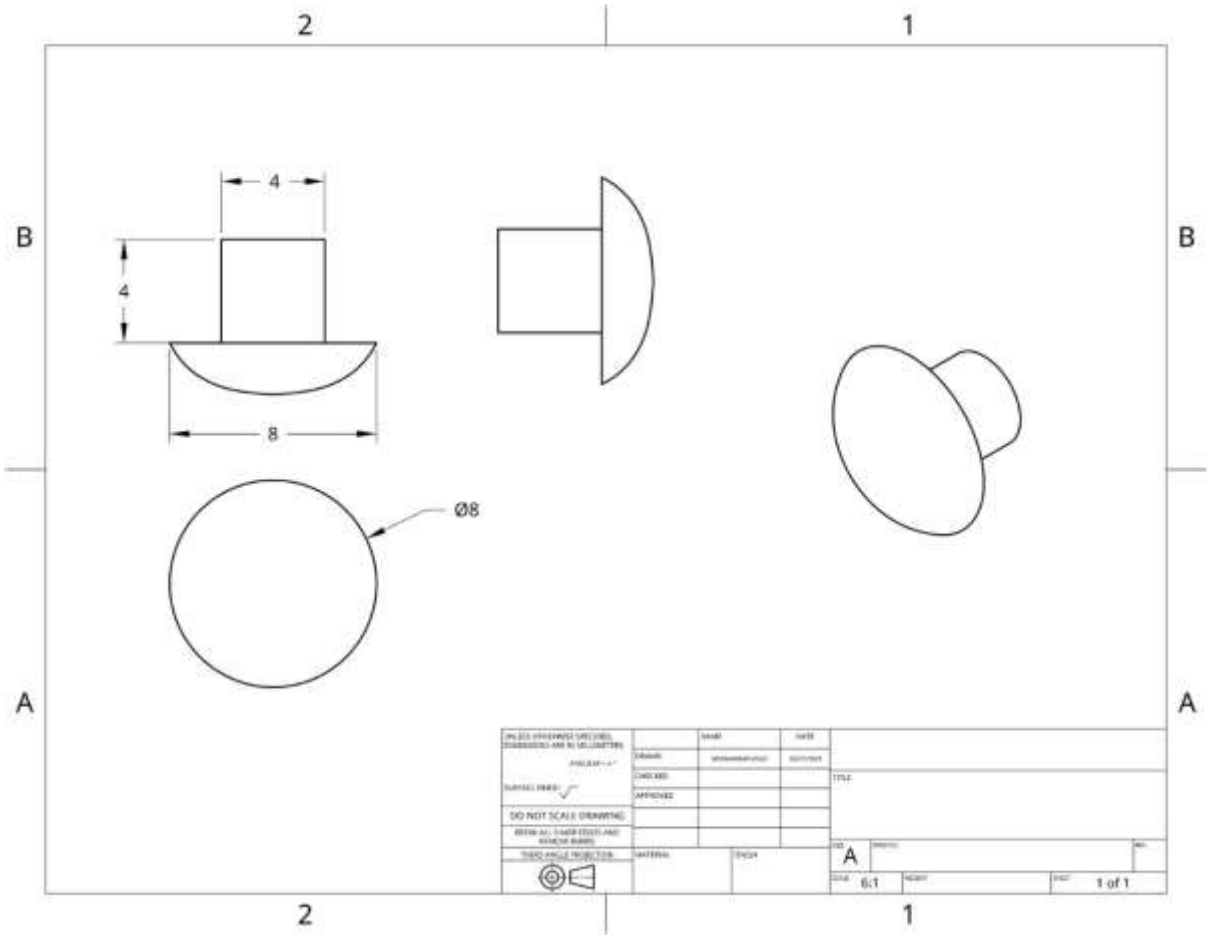


5. Screw

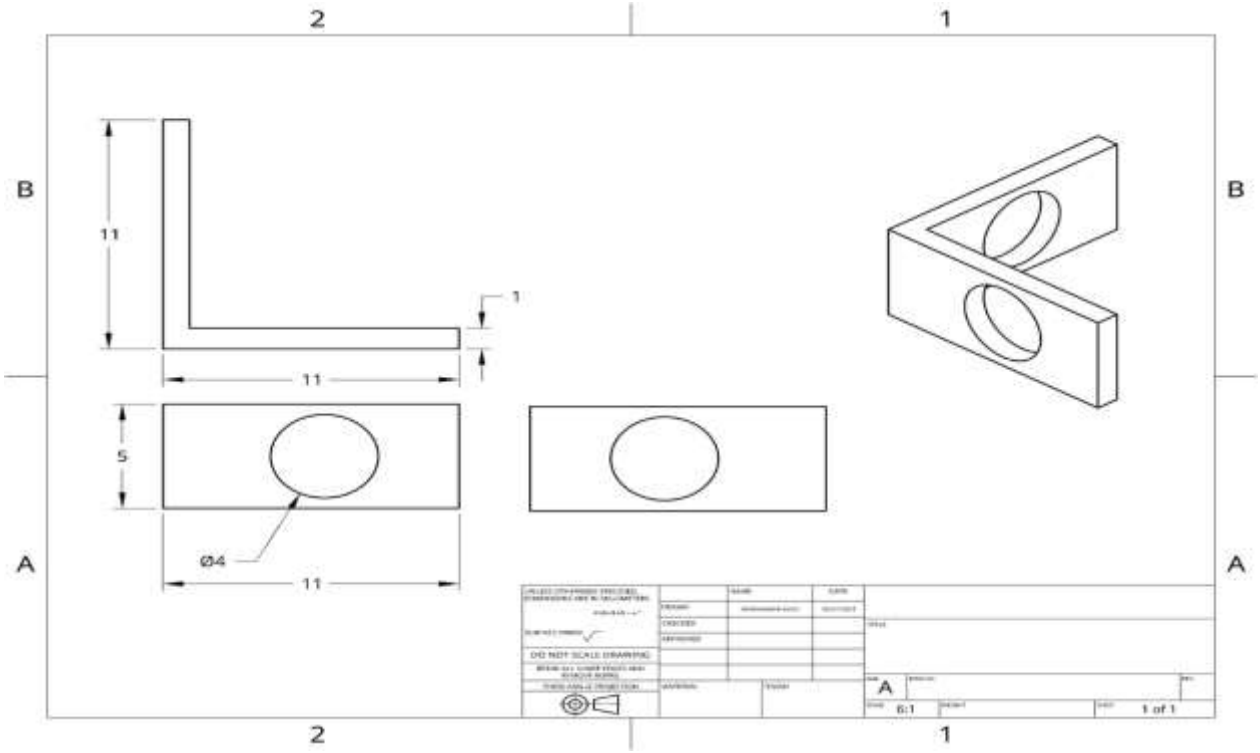
A.



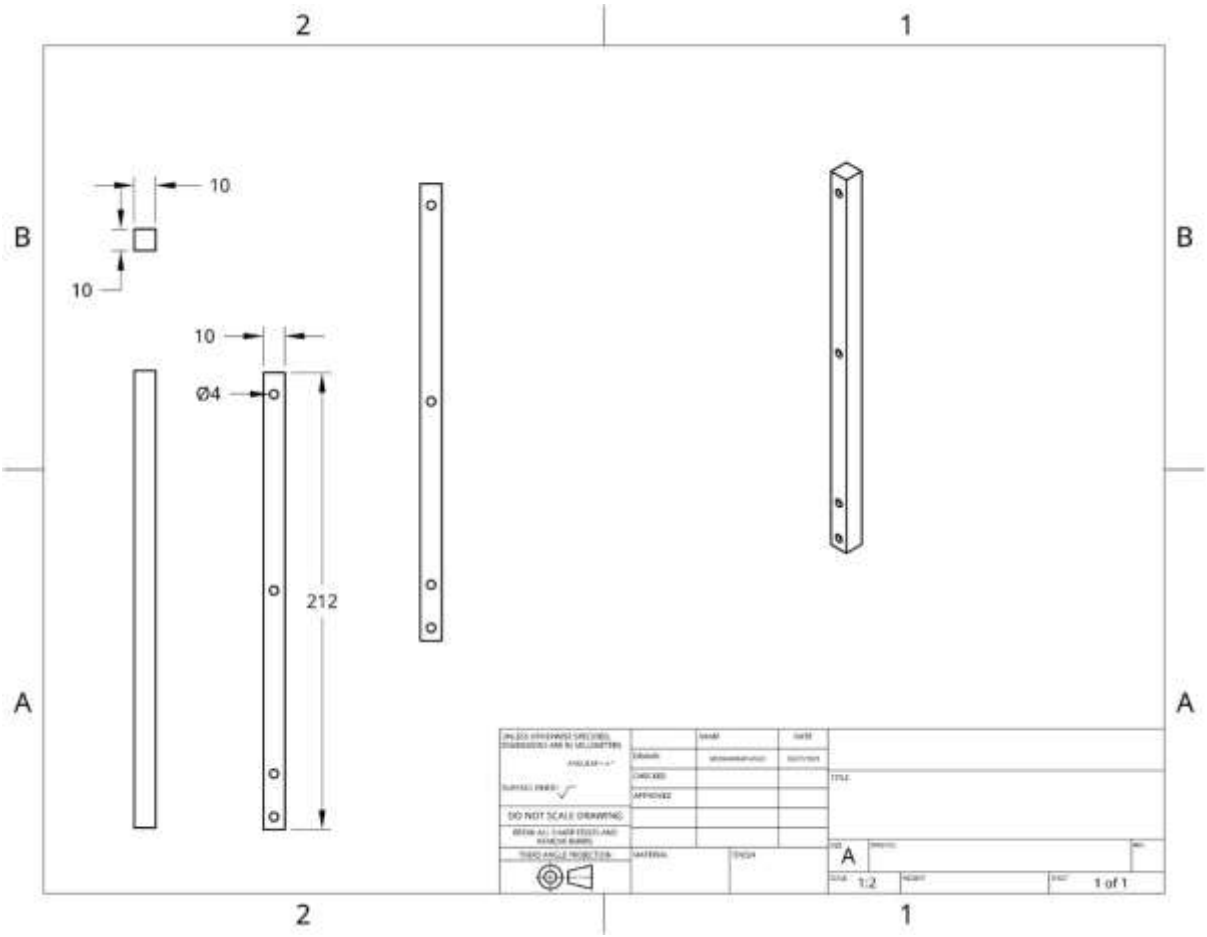
B.



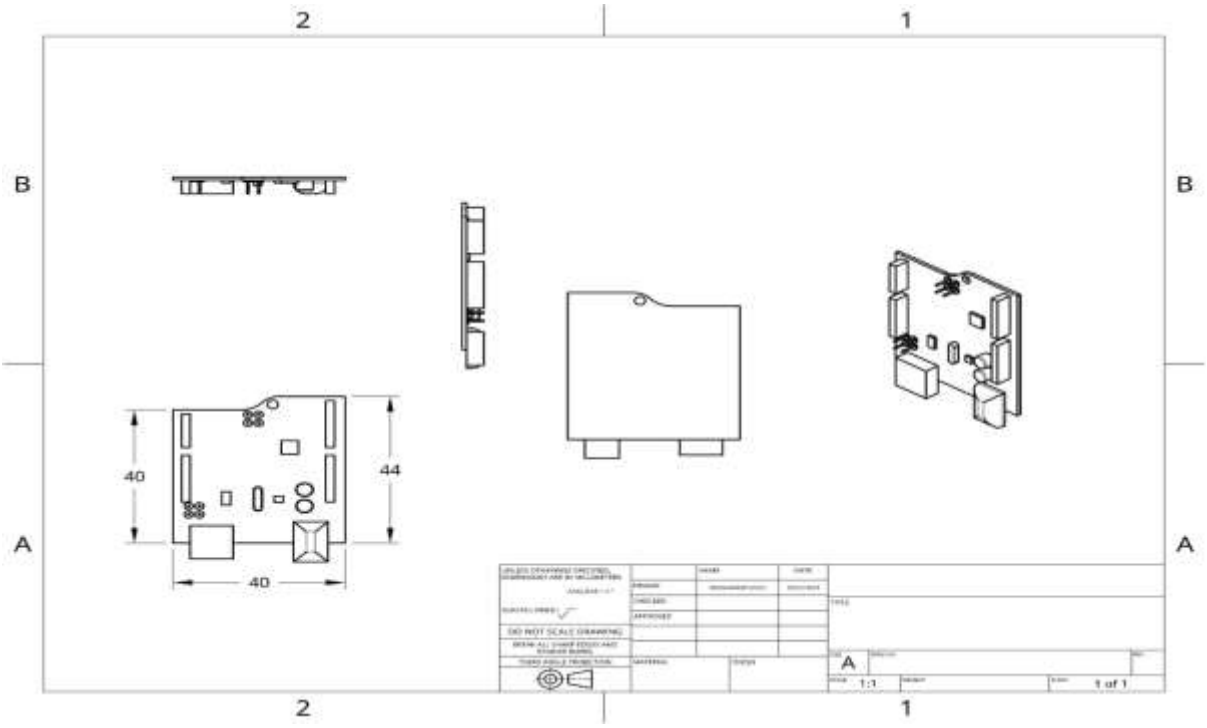
6. Connecter



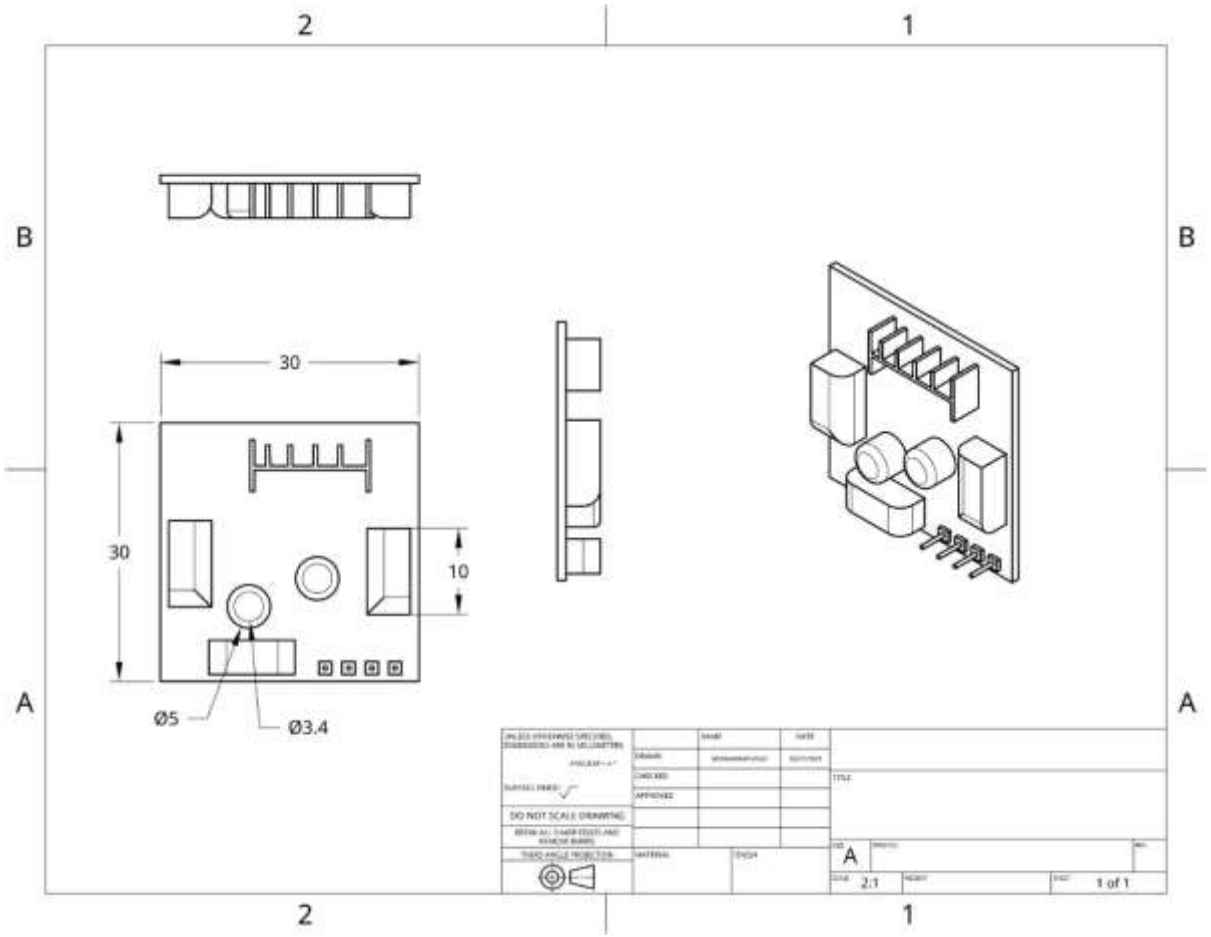
7. Wooden Legs



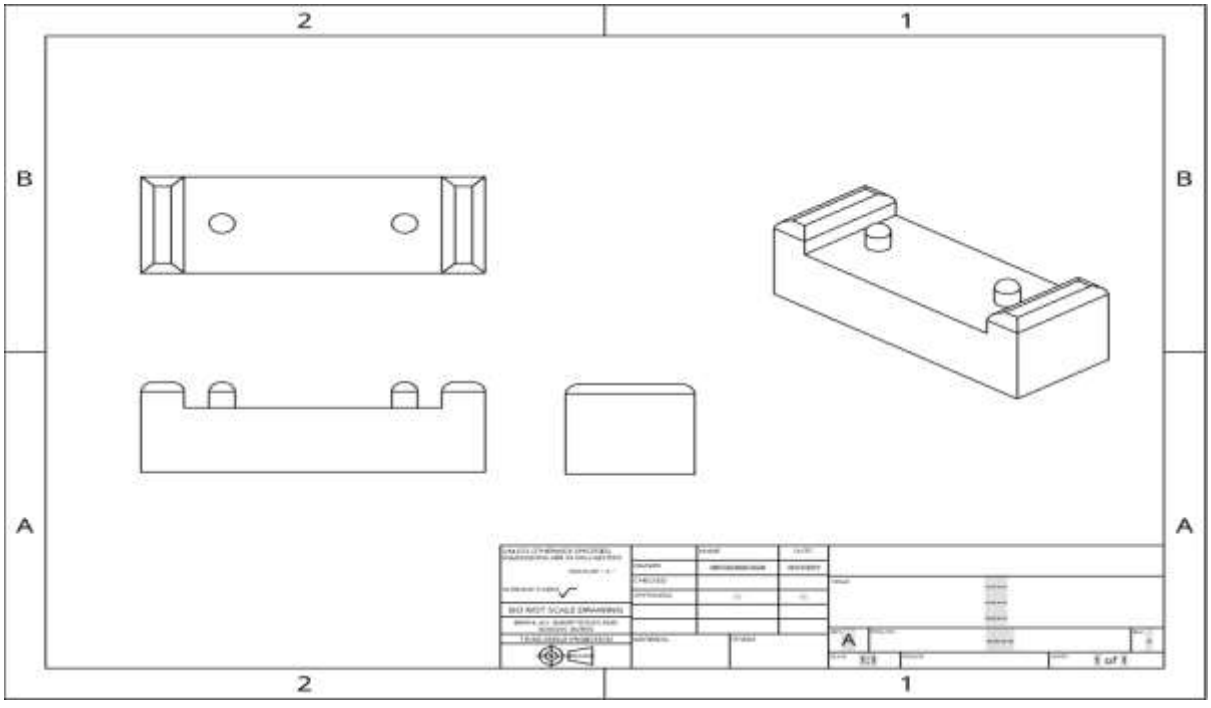
8. Arduino



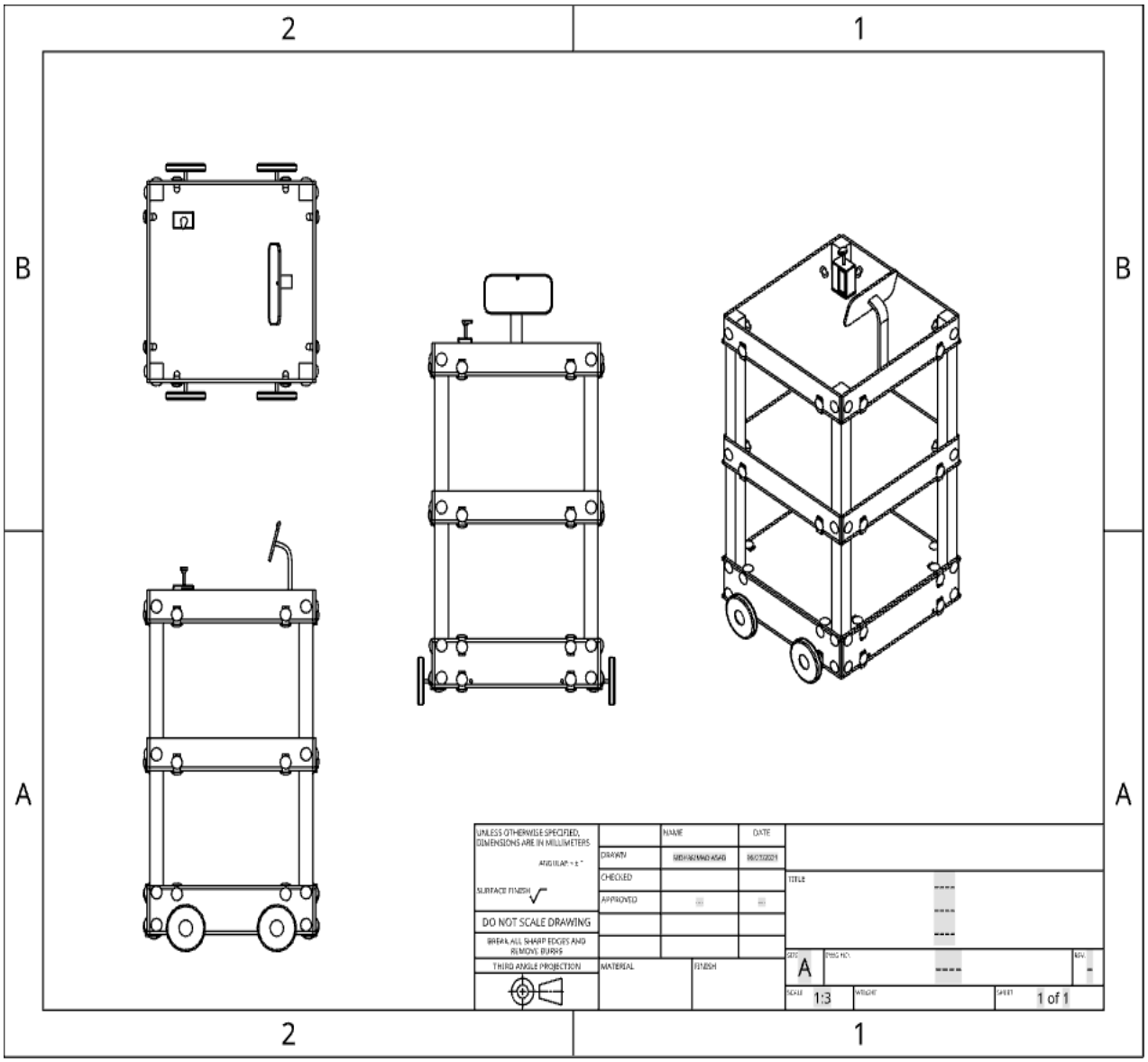
9. Motor Driver



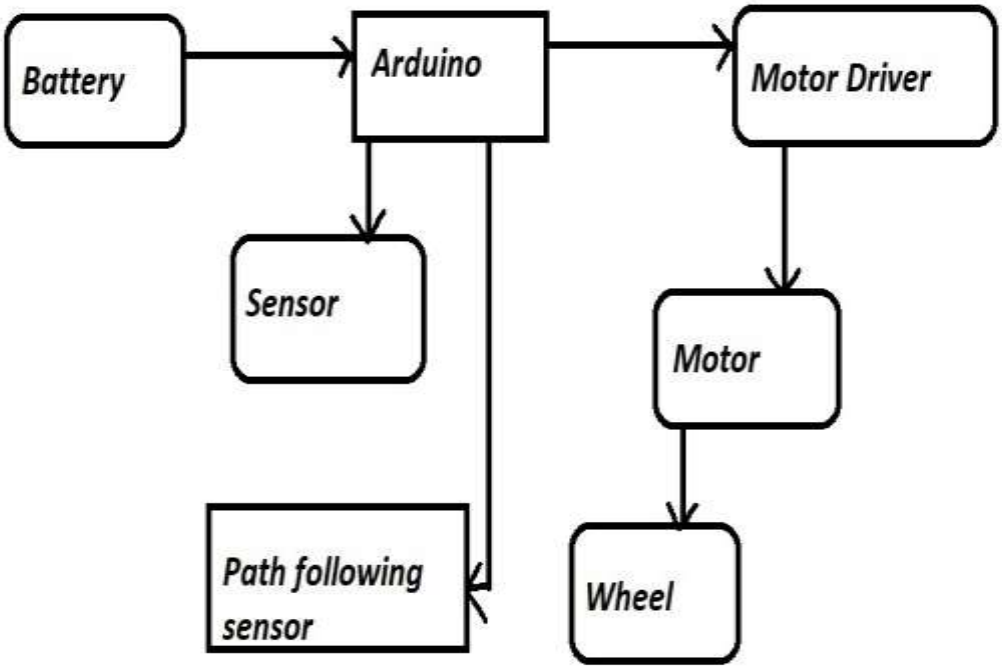
10. Battery



Drafting of the assembled components



Circuit Diagram



Result & Discussion

In this project we have successfully done Ideation, Design thinking, material selection, AutoCAD Drawing, 3D Modeling and Drafting of components.

Learnings

We had learned so much from this report. Here is the list of what we have learned in this whole project:

- We learned how to work in a team.
- We learned the software AutoCAD.
- We learned the software Onshape.
- We learned deeply about Covid-19.
- We learned that to how to make orthographic projections of anything.
- We learned about different electronic materials like motor, batteries, sensors, etc.
- We also learned about the Design Thinking.
- We learned about different types of sensors and their works.

Conclusion

We are making and automated robot which is very much useful for a Doctors , Nurses , COVID-19 -19 affected patient and all health care workers. It make their work easy and also decrease risk of life . We hope that by this robot the death of health care workers and Doctors decreases. We design the product in such way that any hospital in India or world can use this Robot they can make it by self even the hospital is not so much hi-tech. We also take care of the cost of our project (Nera Rs. 5000) so any hospital or NGOs can also use this in their Health Camps. Body design of our product is so simple that it can be transport easily.

Future Scope

Healthcare robots don't only exist in sci-fi movies, they are coming to healthcare. Robots can support, assist and extend the service health workers are offering. In jobs with repetitive and monotonous functions they could even obtain the capacity to completely replace humans, freeing up healthcare professionals for other tasks. If medical professionals want to utilize them successfully. There are some robots of similar type which we are designing but they have only the facility of moving here and there in hospitals and helping doctors and nurses.

Our project focuses on Medical care which will be helpful for Healthcare workers in this coronavirus pandemic but the use is not limited till pandemic only, the divers' features of M-Bot like, Video chatting, automatic food and medicine delivery system, etc. make this robot very useful even after pandemic. Because of this robot doctors and health staff can concentrate on caring of patient, rather than worrying about missing medicine and supplies

In future we can make this robot, self-sanitizing by using fogging method. Self-disinfecting means it can disinfect it-self before returning to heath care workers staying within green zone by fogging method.

CONTRIBUTION OF EACH GROUP MEMBERS

Group Members	Contribution
Minal Pandey	• Research and Analysis • Free Hand Sketches • Tools used for manufacturing of M-Bot • Draft/written work of report. • 3D modeling in Onshape • Drafting of Individual Components
Mridul Goyal	• Research and Analysis • Material selection for individual components. • Final Formatting of the report. • 3D modeling in Onshape • Drafting of Individual Components • Conclusion & Learnings
Mohammad Asad	• Research and Analysis • The manufacturing process of all the components • Analysis of electronic devices • 3D modeling in Onshape • Drafting of Individual Components • Circuit Diagram
Mitapally Sai Charan	• Sketch of M-Bot • Description of components
Mridul Gupta	• Description of components • List of figures

Links Of Onshape

1) https://cad.onshape.com/documents/a6cf3f2d6900dbad0d48187f/w/9528e71ae483ddc438ec2c0d/e/4bb9b9fc527b067f35bf725a

2) https://cad.onshape.com/documents/d16817557663457f88498388/w/8f87fff0c0723b233f7d117e/e/bf17cfff9ff90401a1e4dab3

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13) https://cad.onshape.com/documents/f1ffd8e757ae37a4626525eb/w/4bdcbd32229cbc23726820ea/e/fec4f847c5bc0ea056c5253a

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