Materials, Manufacturing Process and Tools to Fabricate the Prototype

MEDICARE ROBOT (MBOT)

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CERTIFICATE

This is to certify that the project work entitled "Medicare Robot" submitted by Mridul Goyal (2020BTechCSE051), Minal Pandey (2020BTechCSE048), 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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We are very thankful to our Professor Bhargav Prajwal sir, Tanmoy Kumar Deb sir, Dhruv Saxena sir for his valuable time and guidance that made the project work a success. and all the people who contributed to the successful completion of this report.

Sincerely yours:-

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OBJECTIVE

To identify the tools, materials, and manufacturing process required to build our M-BOT.

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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. In this pandemic, we are going to help doctors, nurses, patients, and all healthcare workers. So our group comes up with an idea of robot name "Medicare Robot"(MBOT). It can distribute food and medicine to corona patients 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 the patient and being exposed to the virus. The robot can connect to a smartphone so that doctors and other staff members can easily video chat with a patient through a camera fixed on the top of the robot, 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 the feature of touchless hand sanitizer so that they can sanitize themselves before collecting anything. Hospitals can be divided into GREEN ZONE (for doctors, other staff, and Non-Covid positive people) and RED ZONE (for corona patients). Because of this robot doctors and health staff can concentrate on caring for the patient, rather than worrying about missing medicine and supplies.

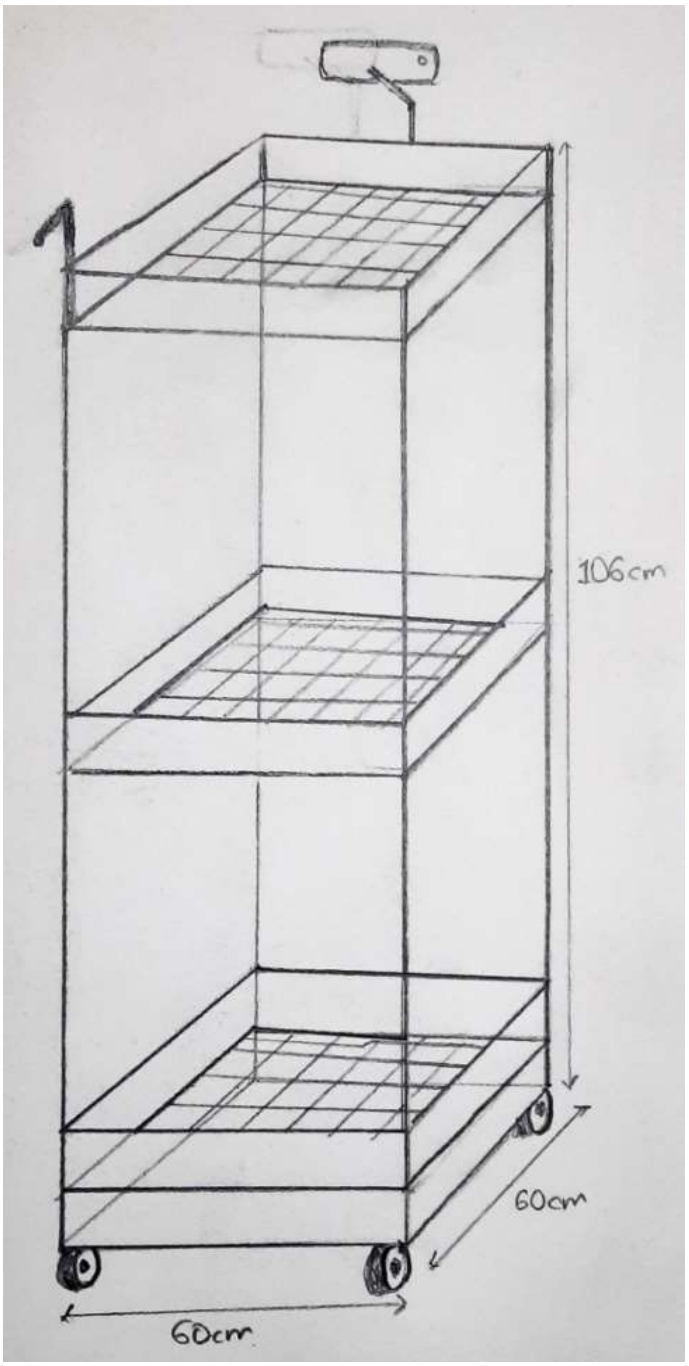

Figure - 1

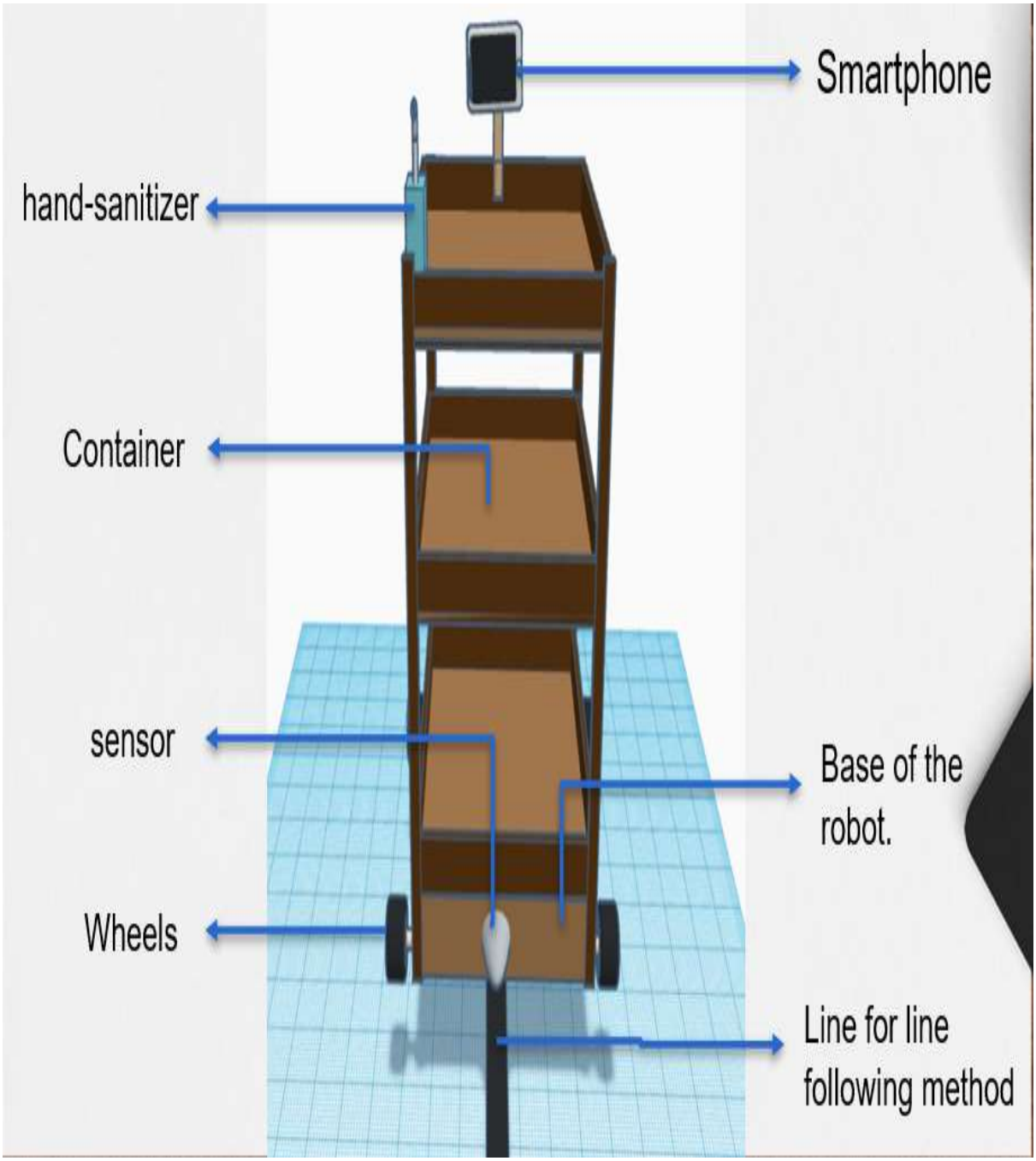
Smartphone
hand-sanitizer
Container
sensor
Base of the robot.
Wheels
Line for line following method

Figure - 2

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.

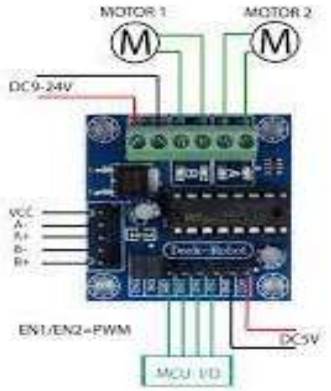

Figure – 5

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.

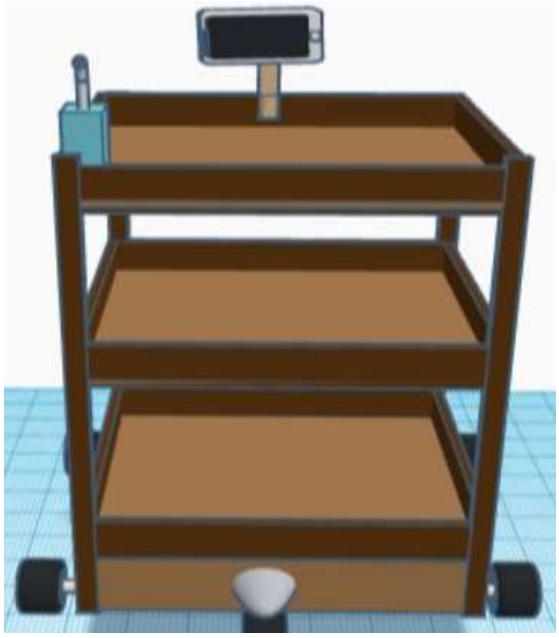

Figure – 6

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

CONTRIBUTION OF EACH GROUP MEMBERS

Group Members	Contribution
Minal Pandey	• Research and Analysis • Tools used for manufacturing of M-Bot • Draft/written work of report.
Mridul Goyal	• Research and Analysis • Material selection for individual components. • Final Formatting of the report.
Mohammad Asad	• Research and Analysis • The manufacturing process of all the components • Analysis of electronic devices
Mitapally Sai Charan	• Sketch of M-Bot • Description of components
Mridul Gupta	• Description of components • List of figures

CONCLUSION

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

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