GUJARAT COUNCIL ON SCIENCE AND TECHNOLOGY

Block B, 7th Floor, M. S. Building, Nr. Pathikashram, Sector 11, Gandhinagar-382011

Robofest Application

Application Number :- R420240464

Date : 15-Apr-2024

Mentor Name :- Vijay Dubey

Mentor Email Id:- vijay.dubey@marwadieducation.edu.in

Institution Name :- Marwadi University

Complete Postal Address :- Marwadi University Rajkot-Morbi Road, Rajkot Gujarat, India

Name of Affiliated University/Board Name :- Marwadi University

Experience Of Mentor/Coach/Faculty In Years :- 12 years

Robot Making Capability :- Marwadi University, located in Rajkot, Gujarat, is well-known for its emphasis on technological education and innovation. The university's Robotics Lab is a key facility that supports students in pursuing their interests and projects in robotics. Here’s a brief overview of the lab and its offerings: Facilities and Equipment The Robotics Lab at Marwadi University is equipped with state-of-the-art technology and tools essential for robotics and automation projects. This includes: Robotic Arms and Manipulators: For learning about and implementing industrial automation tasks. Microcontrollers and Development Boards: Such as Arduino, Raspberry Pi, and other specialized boards for prototyping and programming. Sensors and Actuators: A wide range of sensors (e.g., proximity, ultrasonic, infrared) and actuators for building responsive and interactive robots. 3D Printers: For creating custom components and rapid prototyping. Simulation Software: For designing, testing, and simulating robotic systems before physical implementation. Educational Support The lab provides extensive support for students through: Workshops and Training Programs: Regularly conducted sessions on various aspects of robotics, from basic programming to advanced mechatronics. Project Guidance: Expert faculty members and lab assistants guide students through their projects, offering technical assistance and mentorship. Collaboration Opportunities: The lab encourages teamwork and interdisciplinary projects, allowing students from different engineering streams to collaborate on complex robotics projects.

Mentor Expertise :- I have expertise in the domains of embedded software, wireless sensor network, Internet of Things.

Mentor Mobile Number :- 9723265278

Type of Institution :- Private-Unaided

Proposal Submitted For Robot :- Application Based Robot

Pin Code :- 360003

Office No :-

Participation List :- SSIP Hackathon , Intellify Hackathon and other state level hackathons

Proposed Team of Making robot :

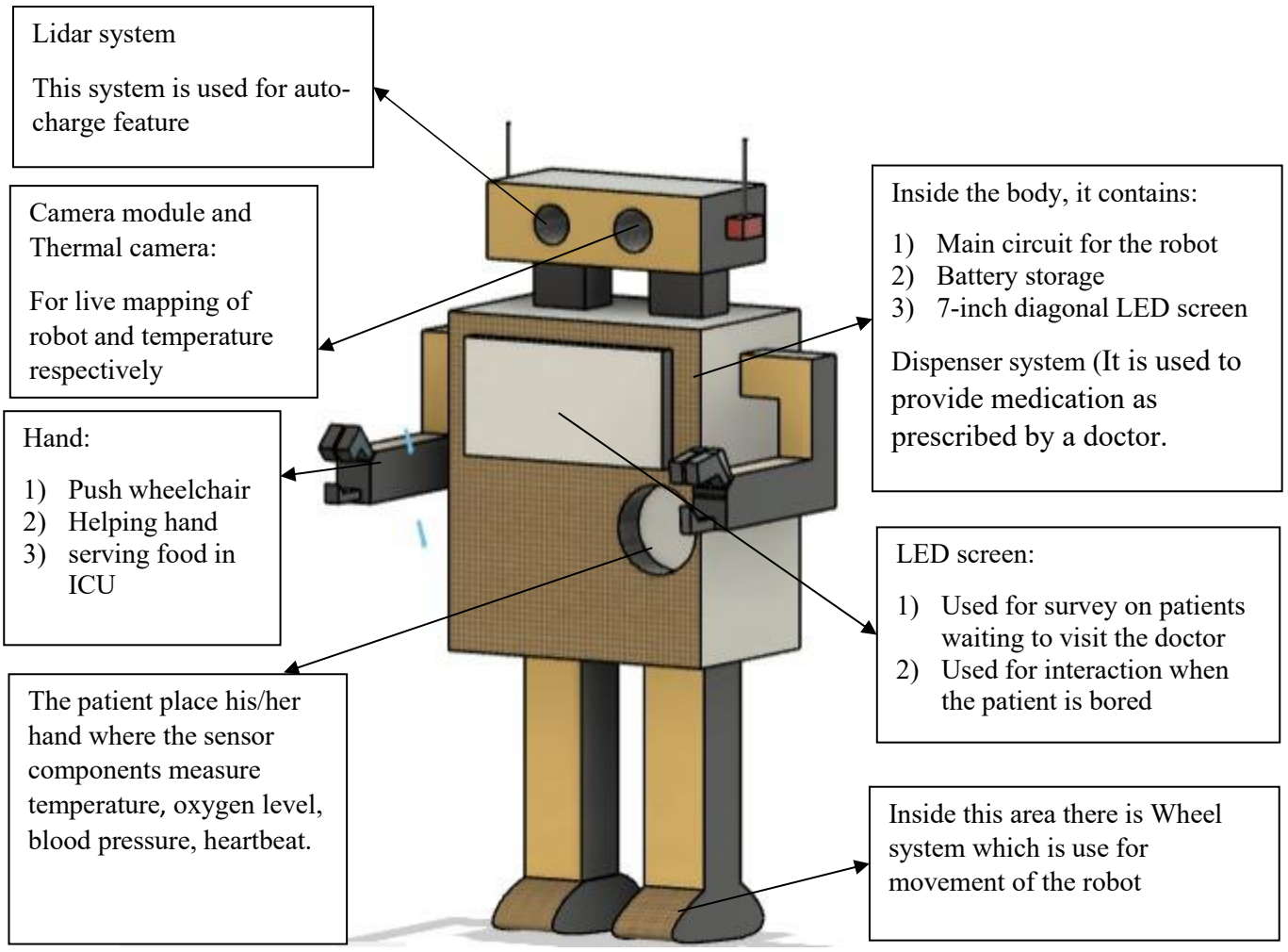
Name Of Student/Research Scholar	Institute Name	Department Name	Programme Enrolled	Year	Mobile No
George Thomas	Marwadi University	Information and Communication Technology	B.tech	2023	8733855881
Mit Solanki	Marwadi University	Information and Communication Technology	B.tech	2023	9909112530
Bhatt Shivam	Marwadi University	Information and Communication Technology	B.tech	2023	7016981083
Kathan Kansagara	Marwadi University	Information and Communication Technology	B.tech	2023	9725371464
Raj Tala	Marwadi University	Information and Communication Technology	B.tech	2023	6354610747

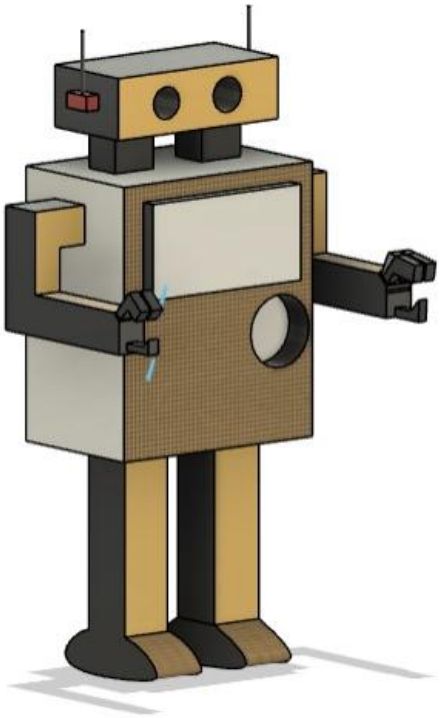
Document (Technical Details for Proposed Robot)

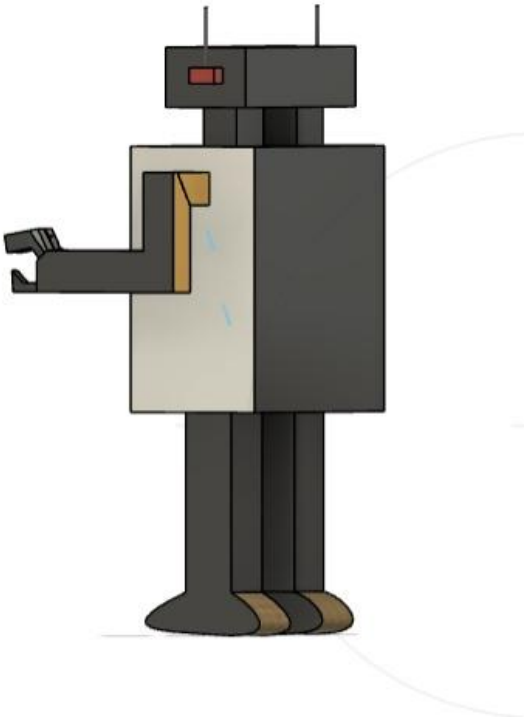
Wherever necessary separate sheet/page is allowed to attach; Institute may submit extra details if find necessary

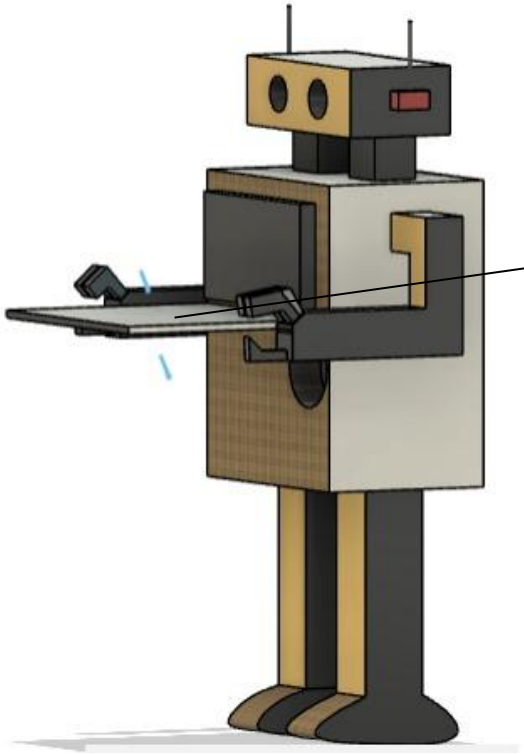
1. **APPLICATICATION BASED ROBOT**

2. **Robot Assembly Design (Proposed Diagram): Drawings each part of the robot is preferred as an attachment. (CAD drawings are preferred).**





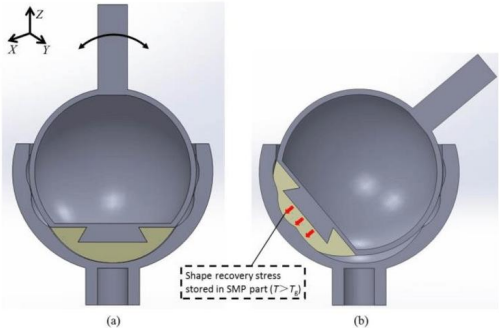




This robot carries a tray which is use to serve medicine (injections ,saline bottle), food, etc to the patient who has no bystanders.

3. **Components to be used: Enlist all the components with their make/company in four groups as enlisted in the following**

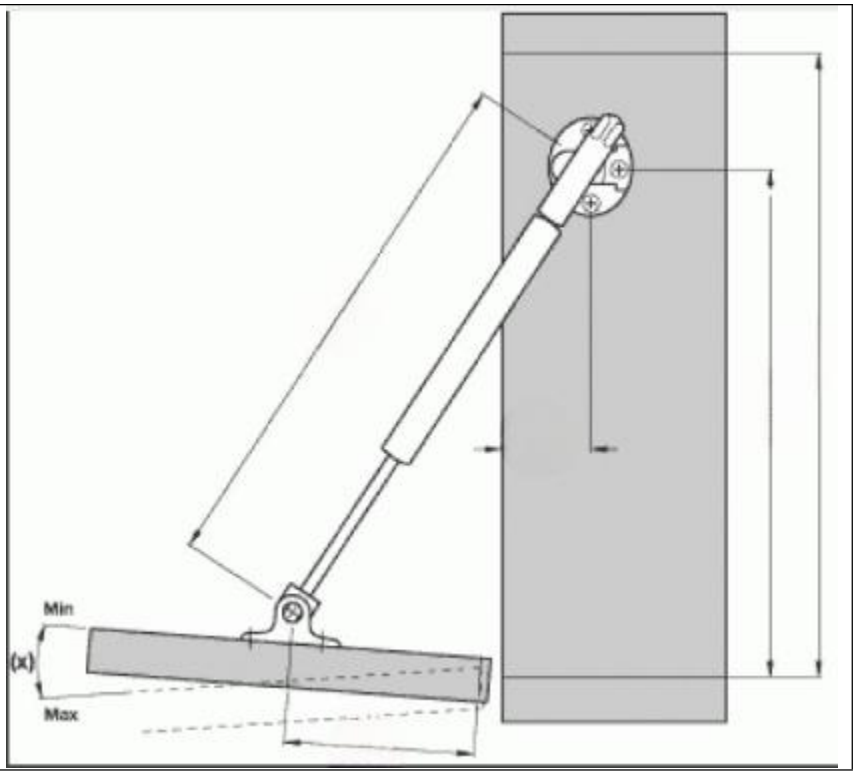
   I. List of Structure components: like beams, bushes, shafts, belts, plates, pins, pulleys, wheel, connectors, batteries, motors etc.

Shaft: In an electric motor, the shaft is the part that rotates when electrical energy is converted into mechanical energy. It's usually a cylindrical rod made of high-strength materials such as steel or aluminum. The shaft is connected to the rotor of the motor, which is the rotating part.	
Gear system: Gear motor systems combine the functionality of a motor with a gearbox to achieve specific torque, speed, and power requirements for various applications.	
Ball and sock system: The ball and socket system, also known as a ball joint, is a mechanical joint that allows rotational movement in all directions. It consists of a spherical component (the ball) and a socket, which accommodates the ball, providing a wide range of motion.	

Conveyor belt System It is used to move objects from one location to another and to equally distribute weight.	
Wheels: Its used to providing mobility and enabling robots to move efficiently in various environments.	

II. list of Motion Components: like chain, sprockets, flaps etc.

Chain It is used for same movement speed of all tires.	

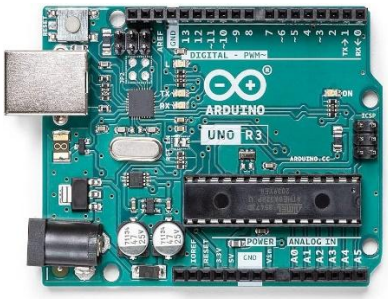
Flaps It is used to open and close shutter to prevent dust and particles from entering the robot	

III. List of electronics components like smart pods, switches, joysticks, controllers, LED/LCD screen, power supply, programming components etc.

LI-PO BATTERY Capacity - 22000mAh Voltage(v) - 22.2 Discharge Rate(C) - 30 Length(±5mm) -190 Width(±2mm) -75 Height(±2mm) - 63	

ARDUINO UNO

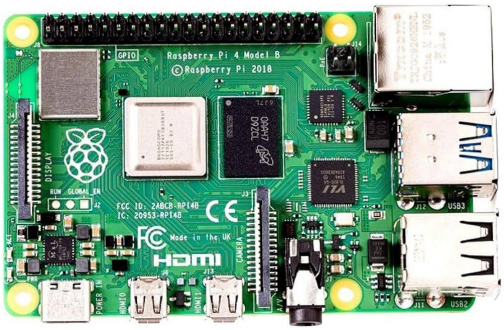
Arduino UNO is a micro-controller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the micro controller;

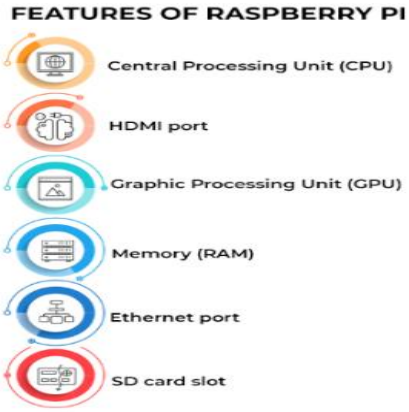


RASPBERRY PI

The Raspberry Pi packs a powerful punch in a small package with a 32-bit ARM processor, commonly used in mobile devices.

- This powerful processor runs at a clock speed of 1.2 GHz and is supported by a Broadcom BCM2835 System-on-Chip
- (SoC).
- Meanwhile, fans of graphics-intensive applications, such as video playback and gaming, include a powerful Video Core IV GPU that can decode 1080p video at 30 frames per second.





LiDAR

Essentially, LiDAR is a ranging device, which measures the distance to a target. The distance is measured by sending a short laser pulse and recording the time lapse between outgoing light pulse and the detection of the reflected (back-scattered) light pulse.

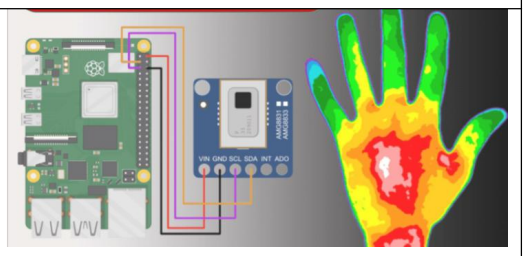
LED TOUCH SCREEN

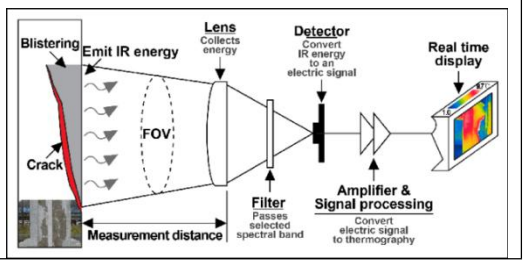
In this project we use Official Raspberry Pi 7-inch Touchscreen Display which is use for survey.

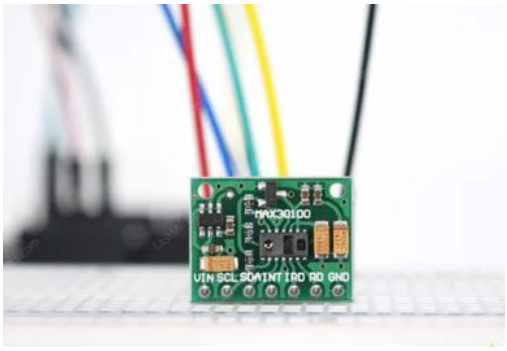
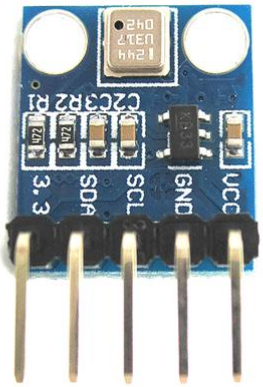
THERMAL CAMERA

In this project we use this thermal camera for measure body temperature.

An infrared camera (also known as a thermal imager) detects and measures the infrared energy of objects. The camera converts that infrared data into an electronic image that shows the apparent surface temperature of the object being measured.





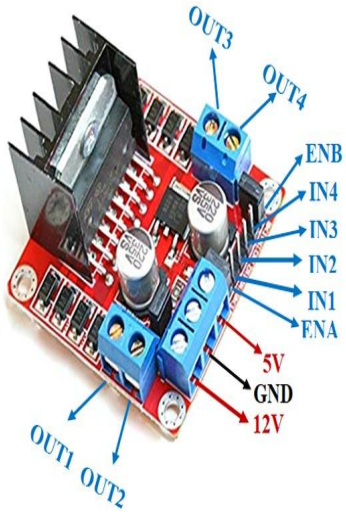
PULSEOXIMETER In this project we use pulse-oximeter for measure oxygen level of body and also measure heartbeat of the body. The pulse oximeter uses a cold light source that shines a light through the fingertip, making the tip appear to be red. By analyzing the light from the light source that passes through the finger, the device is able to determine the percentage of oxygen in the red blood cell.	
BLOOD PRESURE The Blood Pressure Sensor is a non-invasive sensor designed to measure human blood pressure. It measures systolic, diastolic and mean arterial pressure utilizing the Oscillo metric method.	
CAMERA MODULE The Raspberry Pi Camera Board is a custom designed add-on module for Raspberry Pi hardware. It attaches to Raspberry Pi hardware through a custom CSI interface. The sensor has 5 mega pixel native resolution in still capture mode. In video mode it supports capture resolutions up to 1080p at 30 frames per second.	

MOTOR DRIVER

L298N

This **L298N Motor Driver Module** is a high-power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. **L298N Module** can control up to 4 DC motors, or 2 DC motors with directional and speed control.

When the power supply is less than or equal to 12V, then the internal circuitry will be powered by the voltage regulator and the 5V pin can be used as an output pin to power the micro-controller.

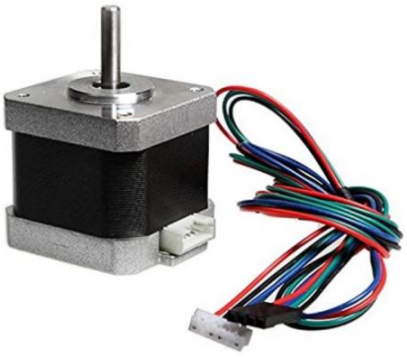


MOTORS

300RPM 12V DC Johnson high torque geared motors for robotics applications. It gives a massive torque of approx 120Kgcm. The motor comes with metal gearbox and off-centered shaft.

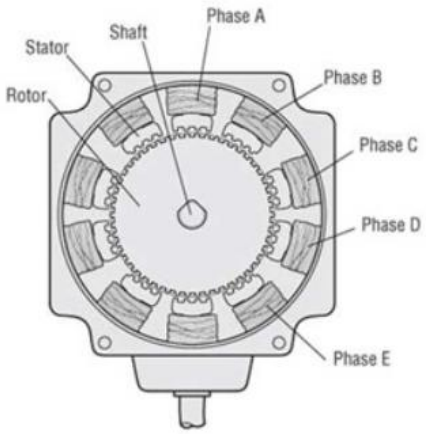
- 300RPM 12V DC motors with Metal Gearbox and Metal Gears
- 18000 RPM base motor
- 6mm Diameter shaft with M3 thread hole
- Gearbox diameter 37 mm.
- Motor Diameter 28.5 mm
- Length 63 mm without shaft
- Shaft length 30mm
- 180gm weight
- 120kgcm Holding Torque
- No-load current = 800 mA,
- Load current = upto 7.5 A(Max)
- Recommended to be used with Dual DC Motor Driver 20 OR Dual DC Motor Driver 20

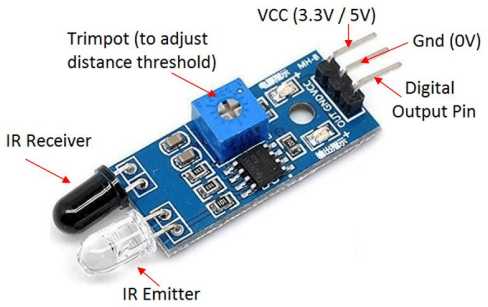
STEPPER MOTOR



Stepper motors convert electricity into rotation. Not only does a stepper motor convert electrical power into rotation, but it can be very accurately controlled in terms of how far it will rotate and how fast.

Stepper motors are so named because each pulse of electricity turns the motor one step. Stepper motors are controlled by a driver, which sends the pulses into the motor causing it to turn. The number of pulses the motor turns

is equal to the number of pulses fed into the driver. The motor will spin at a rate that is equal to the frequency of those same pulses. One of the most remarkable features of stepper motors is their ability to position very accurately. Stepper motors are not perfect, there are always some little inaccuracies. ORIENTAL MOTOR's standard stepper motors have an accuracy of ± 3 arc minutes (0.05°). The remarkable feature of steps motors, though, is that this error does not accumulate from step to step. When a standard stepper motor travels one step it will go 1.8° ± 0.05°. If the same motor travels one million steps, it will travel 1,800,000° ± 0.05°. The error does not accumulate. Stepper motors can respond and accelerate quickly. They have low rotor inertia that can get up to speed quickly. For this reason stepper motors are ideal for short, quick moves.	
<u>SERVO MOTOR:</u> A servomotor is a closed-loop servomechanism that uses position feedback (either linear or rotational position) to control its motion and final position. The input to its control is a signal (either analog or digital) representing the desired position of the output shaft.	

IR SENSOR: An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range 780 nm … 50 µm. IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests.	
ULTRASONIC SENSOR: An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.	

IV. List of other Accessories: clothes, plastic eyes/ear/feeling like real all external components which are for the look.

Use of paint to color the robot.

4. **The methodology of Making Robot: Please write technical specifications of proposed Robot with brief notes and diagrams**

The proposed healthcare robot is equipped with advanced hardware and software components tailored to meet the demands of modern healthcare environments. Its sophisticated sensor suite, including cameras, LiDAR, and

ultrasonic sensors, enables precise navigation and obstacle avoidance. Powered by a robust processing unit, the robot utilizes cutting-edge algorithms for mapping, path planning, and AI-driven medical data analysis. With a user-friendly interface and seamless connectivity options, it facilitates seamless interaction between healthcare staff and patients**.** **MEDIBOT** is durable in design, the robot is optimized for indoor mobility and constructed with stainless steel materials to ensure reliability.

Integration with healthcare systems through secure communication protocols ensures seamless information exchange while maintaining patient confidentiality. Finally, human-robot interaction capabilities, including speech recognition, natural language processing, and expressive displays, foster intuitive communication and empathy, enhancing the overall patient experience and clinical outcomes. Overall, these technical specifications combine to create a versatile and reliable healthcare robot capable of supporting medical staff and improving patient care.

MEDIBOT ensures the process of measuring general parameters like blood pressure, heart beat, temperature, oxygen and also monitoring the patient's behavior. It also ensures that whenever number of patients are more in the hospital **MEDIBOT** will take serve of patient in waiting area by asking basic details like name, surname, age, gender.

MEDIBOT will have screen interface in which it will ask patient for the basic symptoms like fever, cough and cold etc. This whole data will immediately transfer to the doctor's user interface so doctor can ensure the data of patient in advance this will reduce time taking process. So, this process helps us when there is turn of specific patient, doctor has overview of patient's health in advanced. Doctor does not need to ask all the details second time.

FEATURES

1) **Survey:**

There is a touch screen on the robot's chest (7 inch diameter). There the patients will select what his/her symptoms are and then confirm. Once the patient confirms, then the information will go to a database where the doctor in charge will be able to retrieve information about the patients making it easier to analyze and get to a solution faster rather than the patients come and tells about his/her symptoms

2) **Shifting patient from one ward to another in a wheelchair:**

Old people require assistance on support such as moving from one place to another. So, the robot helps by pushing the wheelchair of the old person to his/her location given.

3) **Medicine Dispensor:**

Sometimes the nurses are busy or they forget to give medicine to the patient, so the robot is given a time schedule where it goes to the patient and provides it with its medicine required.

4) **Patient Interaction:**

The robot is designed to interact with patients socially so that the patient does not feel lonely or board

Ex: play games like tic-tac-toe ,talk like their family member etc..

5) **Deliver food and some essential medicine:**

The robot is designed to deliver food and medicine(injection , liquid medicine) in special ward.

6) **Measuring parameters:**

There is one hollow sections in the robot where the patients can put his hands inside. There are sensor system inside to measure the patient's blood pressure, heart-beat ,oxygen level and also measure temperature using thermal camera.

7) **Report generator:**

It collect The result of survey and output of blood pressure sensor, oximeter, heart-beat sensor ,thermal camera then generate report of this and send to the respective doctors or nurse.

8) **Human detection:**

Visitors tend to come to visit in groups usually exceeding the limit for people to visit. So, when there is many visitors in a patients room, the robot will detect and will sent alert massage to hospital management and respective officer.

9) **Helping hand:**

By just pressing a button, the patient can use the robot as a stand support as needed. Consequently, the robot arm will lock in that position, aiding in the support to stand.

10) **Auto charge system:**

The robot can work continuously until the battery reaches a certain level, then the robot will start going to its station where it will charge by itself through magnetic connection without the help of people to connect the charge

11) Lidar system:

This system is basically used for auto-charge feature, lidar sensor give us a map of the particular place according to that we implement this feature.

5. **Application of proposed Robot in a societal context:**

In the bustling corridors of hospitals and clinics, a silent revolution unfolds with the introduction of the **MEDIBOT** a compact, unassuming marvel poised to redefine healthcare. Armed with advanced sensors, it monitors vital signs with unparalleled precision, freeing up time for personalized patient care. Its compact design seamlessly integrates into medical settings, streamlining processes from emergency rooms to bedside consultations. Beyond convenience, the **MEDIBOT'S** vigilance detects anomalies, preempting complications and enhancing outcomes. Its impact extends globally, providing vital monitoring in undeserved areas. With each measurement, the **MEDIBOT** symbolizes progress and compassion, ushering in a new era of medical excellence.

6. **Size of Robot proposed for Proof of Concept (Small Version):**

   a) Length in cm……20.....

   b) Width in cm……35…….

   c) Height in cm……90…….

7. **Size of Robot proposed as prototype (Actual Version):**

   a) Length in cm……....35.....

   b) Width in cm……50…….

   c) Height in cm……154…….

8. **Timeline for Robot Making with milestones. (Divided in activities Vs. no. of days)**

Phase 1	
LIST	**DAYS TAKEN**
Brain storm (features of robot)	7
Documentation (features and ideology)	7
Design (3d and 2d)	3
Draft (compilation of all information)	10
TOTAL DAYS	27

Phase 2		
Approximation for materials required(Time)		
LIST	**DAYS TAKEN**	
Gathering materials and components	4	
Making of the body	7	
Interfacing of sensors	4	
Combining (all sensors to single microprocessor)	4	
Circuit making (designing PCB for robot)	7	
Power Supply Control	4	
Trial and error	15	
Testing and debugging	10	
TOTAL DAYS	55	

9. **Please attach the proposed outline (photography) for understanding of the evaluation committee.**

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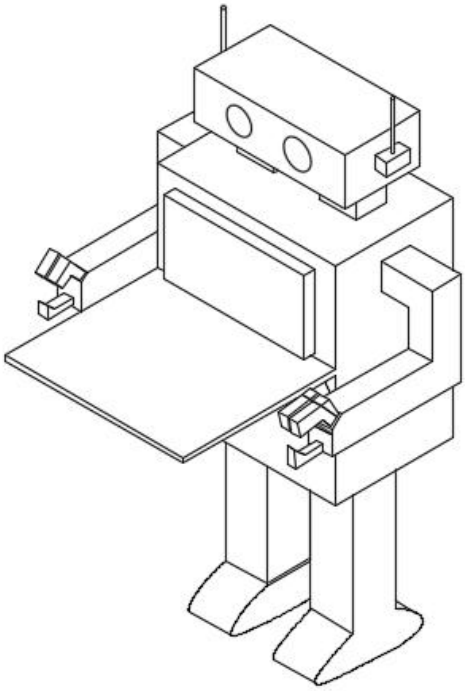

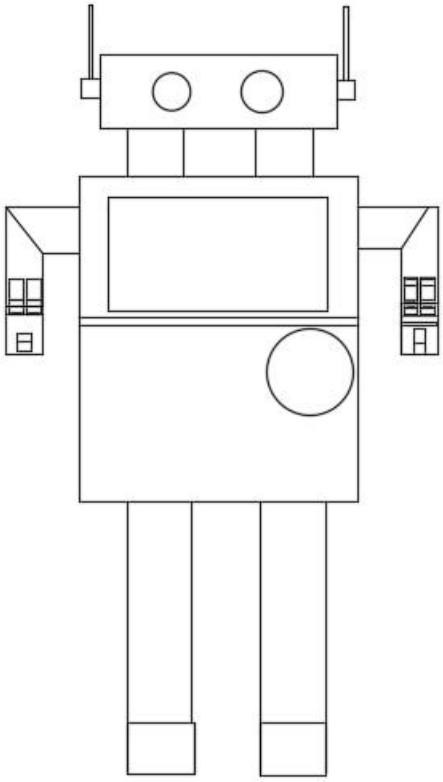

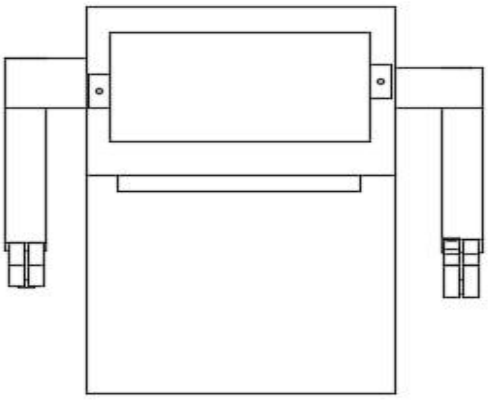

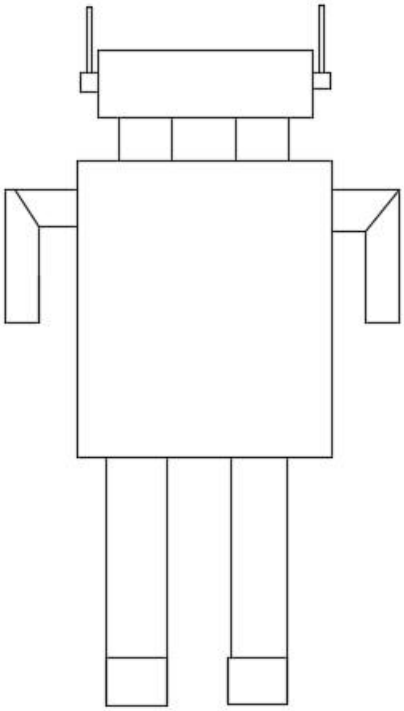

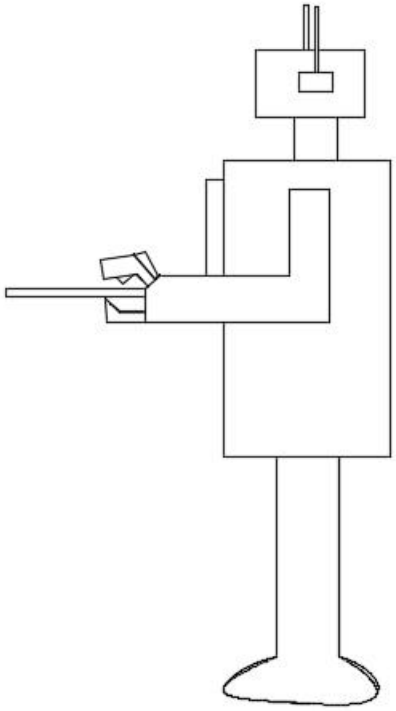

Mentor Undertaking Format

I, Prof. VIJAY DUBEY (Mentor) on behalf of my team authorized to give undertaking that on selection of our team at Level 1 (Ideation Stage), we assure and commit to participate in the subsequent levels and to submit Level 2 (Proof of Concept) and Level 3 (Proto type) robot as per guidelines of GUJCOST without fail, otherwise GUJCOST will take necessary action to recover the fund if disbursed for any stage.

Sign of Mentor

Sign of Director/Principal of Host Institute

Stamp of University

MARWADI UNIVERSITY * RAJKOT *

ENDORSEMENT FROM THE HEAD OF INSTITUTION

ROBOT CATEGORY:

1. Certified that the Institute welcomes participation of Prof. Vijay Dubey as the Mentor of the following students to participate in the ROBOFEST 4.0 Competition:

    1) BHATT SHIVAM
    2) GEORGE THOMAS
    3) KATHAN KANSAGARA
    4) MIT SOLANKI
    5) RAJ TALA

2. The basic facilities and such other Administrative facilities as per the need of the robot category, will be extended to the team throughout the duration of the project.

3. Institutes Assumes to undertake the financial and other management responsibilities of the project.

Date:14/06/2024

Place: MARWADI UNIVERSITY, RAJKOT- 360003

MARWADI UNIVERSITY * RAJKOT *

Signature and Seal of Head of Institute