

“ DESIGN & DEVELOPMENT OF CORONA WARRIOR ROBOT ”

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ABSTRACT

Automation is a need of time. Automation makes task easier and reliable. The advancement in the technology has brought a revolutionary change in the field of robotics especially in automation sector. Robot is a reprogrammable, multifunctional gadget which is basically intended to work like human being, for example, pick and place an object, stacking and emptying, observation, social insurance, and widely used in modern and aviation application. Robots can perform in hazardous environment and possesses precise work to build the profitability as it can work 24 hours without rest.

Keywords: Iot, robotics, robotics, corona, covid19

INTRODUCTION

The Internet of Things (IoT) and robotics communities have so far been driven by different yet highly complementary objectives, the first focused on supporting information services for pervasive sensing, tracking and monitoring; the latter producing action, interaction and autonomous behaviour. Development of new laboratory prototypes of intelligent service robots, intended for applications in indoor environment, was designated as one of the main project objectives. For this reason, it is increasingly claimed that the creation of an internet of robotic things (IoT) combining the results from the two communities will bring a strong added value. The main objective of this project is to fabricate a robotic trolley for material handling in industries. The trolley controlled by a microcontroller module unit. It can stop, turn right, turn left, forward and backward. It can follow wherever they go, during they were in range. The designed robot can be easily controlled by sending the commands to the micro controller from anywhere from the world. These commands can be observed by using Attention commands and acceptable action is taken.

In this project, we will mainly focus on the issues of patients as well as safety and security, specifically the effect of medical device regulation and data protection laws on robots in healthcare. To overcome the issues like direct contact with patients in Covid-19 wards, we will develop a robot i.e., corona warrior robot which will be used to provide medicines to patients and sanitize the person when any person comes in front of the robot. Artificial intelligence technique is used in this system. Proximity sensor is used to sensor the obstacle and stop robot automatically.

Problem Statement :

Now-a-days, in the period of Covid-19, corona virus is spreading basically through the direct contact as it is infectious disease. In hospitals, doctor and nurses get direct contact with the active corona patients, thus there are more chances of spreading the virus in huge amount. To have control over this, we can develop a robot which will be on duty in replacement of nurses and will provide all essentials such as medicine, fruits, etc. to patients.

Objectives :

1. To design and build a corona warrior robot which will help doctors and nurses to avoid direct-contact with corona patient in the hospital.
2. To maintain the health security of patients & hospital staff.
3. To follow the rules & regulations of covid-19 among the patients & hospital staff.
4. We can move & rotate our corona warrior robot through 360 Degree rotation via motor easily.

Scope of The Project :

1. Monitoring: To monitor the parameters like suspicious movement or motions of robot.
2. Communication: By using Arduino monitored data will transmit through wifi.
3. Security: Security against spread of COVID-19 in hospital. Used to give the medicine.
4. Wireless: This system is depending on wireless communication.
5. Artificial intelligence: Proximity sensor is used to sensor the obstacle and stop robot automatically.
6. Pulse Oximeter : To track oxygen level & heartbeat of patients.

Methodology :

We all know, that the Whole World is giving a fight to the COVID-19 or a new corona virus that is currently called SARS-COV-2 (Severe acute respiratory syndrome corona virus) and previously named COV-19 was revealed in Wuhan, China at the end of 2019 and is presently resulting in the pandemic and we know the transmission of the infection is seen as spread through Human-To-Human that makes it effectively diffuse. The Transmission originated from the infected droplets when Coughing or Sneezing.

We started working on project with some literature review, need or to gather all information related with this project. Find the type, design and the system used on the development of machine, also including the differences for each stage in the market. All the information was collected from internet, journal, reference book and people. We learnt that there are Robots in the markets which can move Automatically. So, we Decided to give more features. From our study we found that surveillance is also necessary. So we decided to put camera on our robot.. Also, we wanted that our Robot should stop automatically when obstacles come in front of Robot. So, we decided to install Proximity Sensors for that purpose. We figured out that there was a need for checking Oxygen level and Heart Beat of patient. So, we are now trying to figure out how to achieve that.

Literature Review :

1. **G. BalaKrishnan & etal (Students and Professors from Department of Automobile Engineering, Bist, Biher, Bharath University, Chennai) (2018)** described in the research paper “Design and Fabrication of Robotic Trolley for Material Handling”, that it is very much economical and help full to many industries, hospitals and workshops. This work had also reduced the cost involved in the concern and also it had been designed to perform the entire requirement task which had also been provided. They briefly gave the working Principle, Merits & Demerits, Components that used, Design and Calculations. They said that a robotic vehicle is fabricated which runs like a car by carrying tools from place to another. The motor is connected with the wheel arrangement with the help of speed reduction gear box. When the trolley is loaded with a tool or some other goods it can be easily move to the place as per need by means of wireless remote controller. They also studied the cost as the direct cost of material handling cannot be measured, the main factor attributing to material handling costs are wasted time. An idle machine operate essentially being paid while not producing value and the second main cost associated with material handling is labour costs. The transportation of the materials is essential, but it does not directly add to the finished product ^[4].

2. **Pieter Simoens, Mauro Dragone and Alessandro Saffiotti (2018)** had published a paper titled “The Internet of Robotic Things: A review of concept, added value and applications”. In that they examined how the merger of robotic and Internet of Things technologies will advance the abilities of both the current Internet of Things and the current robotic systems, thus enabling the creation of new, potentially disruptive services. They discussed some of the new technological challenges created by this merger and concluded that a truly holistic view is needed but currently lacking. The Internet of Things (IoT) and robotics communities have so far been driven by different yet highly complementary objectives, the first focused on supporting information services for pervasive sensing, tracking and monitoring; the latter on producing action, interaction and autonomous behaviour. For this reason, it is increasingly claimed that the creation of an internet of robotic things (IoRT) combining the results from the two communities will bring a strong added value. They said that in this cyber-physical perspective of the IoRT, sensor and data analytics technologies from the IoT are used to give robots a wider situational awareness that leads to better task execution. They also explained various abilities of IOT like Perception ability, Manipulation ability, Motion ability, Decisional autonomy, Interaction ability, Cognitive ability, Configurability, Adaptability, Dependability briefly at different levels as basic ability, High level ability, Interaction ability and System level ability, etc.. Finally they concluded that Current IoRT incarnations are almost uniquely found in vertical application domains, notably AAL, 4 precision agriculture and Industry 4.0. Their conviction was the IoRT should go beyond the readings of „IoT-aided robots” or „Robot-enhanced IoT” ^[3].

3. **N Eka Dodi Suryanto & etal (Faculty of Technology and Computer Science, Universitas Prima Indonesia.) (2018)** had published the paper titled “Design of automatic mobile trolley using ultrasonic sensors”. They designed an automatic mobile trolley using ultrasonic sensors of type HCSR04 which had applied the principle of 'time of flight' (TOF) to measure distance, which computed the travel time of ultrasonic echo reflected from the target, and it detects the distance as well as the direction of user movement and location. They proposed that an automatic mobile trolley was a prototype of wheel robot that serves as a trolley or shopping cart. It did not need to be encouraged or withdrawn. It would make an easier shopping for people as customers. The trolley controlled by a microcontroller module unit. It can stop, turn right, turn left, forward and backward. It can follow wherever they go, during they were in range. It had been need a trolley that can follow automatically human movement. The direction could be detected using transducers, sensors or other detector. They divided design into several parts namely the design of hardware, hardware relationships, the initialization of sensors and auxiliaries, and software design. The technology represents to retailers opportunity to reduce costs and to improve services, allowing to attend clients quickly, precisely and supplying personalised services. They used sensors to control 7 the distance and direction of user movement and location. They assumed that the user will walk in front of the trolley, so that the sensors will detect the user and follow them wherever they go. They had designed system in such a way that the trolley can move forward based on the distance data from the sensor results.

4. **Cheng Siong Lim & etal (Faculty of Electrical Engineering, University Teknologi Malaysia) (2015)** suggested in their research paper “Automatic Human Guided Shopping Trolley with Smart Shopping System” that A shopping trolley is a necessary tool for shopping in supermarkets or grocery stores. Therefore, an automatic human and line following shopping trolley with a smart shopping system is developed to solve these problems. A line following portable robot is installed under the trolley to lead the users to the items” location that they plan to purchase in the supermarket. The robot can carry heavy loads for people in hospitals, airports and shopping centers. The robot can provide services to humans as an assistant in different kinds of situations. The paper presented the hardware and software design of the portable robot & the result of the

testing on the used sensors like ultrasonic and line sensors. They highlighted the research background on the problems 3 related to shopping trolleys. They explained in detail both the hardware and software design for the developed portable robot. The software design approach in this project involved the Intel board DE2i-150 as a database server and Java programming language based Android application as a client. The main algorithm of the software design for the client is to utilize the Android application because the user interface has to organize the shopping list and to show the grocery items in the respective locations on the shopping map [2] .

System Development :

Design :

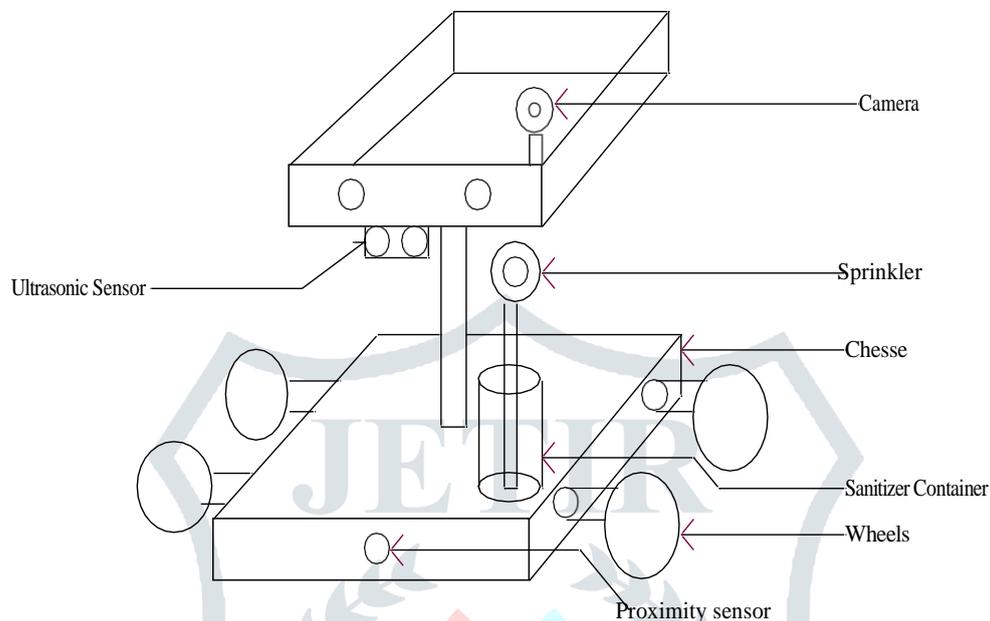


Fig. System Design

Firstly, we develop the Chassis in rectangle shape using the MS material. Thickness of material is 1 mm. As shown in the figure, it is clearly indicated the wheel position of shaft, the sensor position as well as the tray we providing. The tray placed on the top of the Robot will be used for putting the food, medicine and drinking water in it. The shape of tray is also rectangle. We will provide a stand using the square pipe which also supports to the tray. The material of pipe is also MS. For motor wheel, diameter of the wheel is 10 centimetre and the material of wheel is PVC and Outer body's material is rubber for gripping the surface. We use a 10 kg torque motor for carrying the heavy load. The Motor RPM is 60 revolutions per minute and it requires 200 mAmp current and it operates on 12 volt DC voltage. For circuitry, the place of Chassis basically be on bottom side also we provide two eyes to the robot with the help of LED.

In this project we will provide power supply using 12 Volt battery 1.4 Amp. Output of the battery is connected to power supply block. In this power supply block, we will generate two different voltages one is a 12 volt for DC motor and one is a 5 volt for sensors and NODE MCU microcontroller. For detecting the obstacle we are using proximity sensor. Output of proximity sensor is connected to the NODE MCU. NODE MCU will continuously monitor the output of proximity sensor. If the obstacle is detected at that time output Voltage is 5 Volt and 5 Volt is received by the NODE MCU microcontroller. Output of the NODE MCU microcontroller is connected to the L298 motor driver IC module. After receiving 5V at the input of the motor driver driver IC, Robot will automatically stop. To control the system using Internet, we are going to develop an Android application. This application receives command from the Wi-Fi module. NODE MCU has in-built Wi-Fi module which will receive the command from the application over the internet so that's why this project is called as a IoT based project.



Fig. Our Design & Ready Model

Testing & Validation :

Testing & Trouble Shooting :

Testing :

Testing is nothing but the physical checking of the all components and all possible condition to avoid problem in the circuit functioning.

Testing done with so many checking instruments as per the circuit requirement and conditions.

Bare Board Testing :

In bare board testing we should have to check the following points

Continuity of the track

Over etching or under etching if any

Shorts if any

VCC and GND tracks.

Trouble Shooting :

After the PCB is prepared the conductivity test is carried out. First pin-to-pin conductivity is checked. The necessary IC interconnections are also checked. The resistance value of all the resistor are checked and then completed with the value denoted by color-coding is done.

The capacitors are also checked to see whether they are working or short or open. The diodes are tossed for priority. The diodes are cracked for their forward resistance and reverse resistance. After carrying out all the possible testing, the jumper wires are also tested for conductivity.

Expected Outcomes :

1. Secure and enhanced system.
2. Delivers essentials to patients.
3. Direct contact with corona patient is avoided.
4. Wireless remote control operation.
5. Compact design.
6. Battery life expectancy- OneYear
7. Automatic sanitization whenever patient touches the essentials placed in the tray of robot.
8. Using Proximity sensor, obstacle is sensed and robot will stop at that moment.

Conclusion :

By successful implementation of such project, essentials such as food and medicine will be delivered to patients on time and Direct contact with corona patient is avoided using Robot. Have, Wireless remote control operation as well as compact design Visual inspection is possible with IP camera mounted on the top of the Robot.

Automatic sanitization whenever patient touches the essentials put in the tray of Robot. Also, By Using Proximity sensor, obstacle will be sensed and any of the command given to robot will be denied and Robot will stop automatically.

References :

1. G. BalaKrishnan¹, D Mohan Kumar², C. Jagadeesh Vikram³, P.Naveenchandran M.Tech student, Assistant Professor, Professor , Department of Automobile Engineering, BIST,BIHER, Bharath University, Chennai “Design And Fabrication Of Robotic Trolley For Material Handling” pdf International Journal of Pure and Applied Mathematics ISSN: 1314-3395 2018.
2. Pieter Simoens , Mauro Dragone and Alessandro Saffiotti “The Internet of Robotic Things: A review of concept, added value and applications” 10 International Journal of Advanced Robotic Systems January-February 2018:
3. Eka Dodi Suryanto*, Hendrik Siagian, Despaleri Perangin-Angin, Rahayu Sashanti, Suthes Yogen Faculty of Technology and Computer Science, Universitas Prima Indonesia. “Design of automatic mobile trolley using ultrasonic sensors” pdf Journal of Physics 2018.
4. Cheng Siong Lim, Michael Loong Peng Tan, Kumeresan A. Danapalasingam, Chee Wei Tan Faculty of Electrical Engineering, Universiti Teknologi Malaysia “Automatic Human Guided Shopping Trolley with Smart Shopping System” Guided_Shopping_Trolley_with_Smart_Shopping_System March 2015.

