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AUTOMATED MEDICARE TRANSFORMER

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Abstract - *This paper aims to give a fundamental yet comprehensive approach to medical robotics, which is an interdisciplinary topic concerned with the development of electro-mechanical devices for therapeutic applications. The purpose of this study is to reduce direct contact between affected individuals and healthcare workers. Using an efficient mask detection module and artificial intelligence to assess physical separation, this work solves the issues of the robotic industry to improve the delivery of health care services to patients and enable medical facilities perform better. The project's most essential component is contactless patient monitoring via an audio/video communication system that also allows hospitals to conduct video surveillance. This project comprises both hardware and software design for an assistance robot.*

Key Words: Sanitization, Mask Detection, Coronavirus, RFID Tag, Autonomous Robot.

1. INTRODUCTION

In this project, multiple ways and techniques are used to enhance the working of the robot. This Robot is basically design to reduce contact between patients and medical staff in covid situation.

In Covid situation we must try to avoid contact between people, and we must wear mask. Therefore, in order to use automation to manage all these, we designed a robot with many functions, such as automatic hand disinfection, room sanitization, mask detection, and commodity transportation. Using all of this we can maintain contact between patients and medical staff.

The project aims to build an inexpensive robot at a very low cost, while having multiple functions so that all hospitals can buy the robot.

1.1 LITERATURE REVIEW

[1] The Xenex, an automated and portable robot, uses pulsed, full-spectrum UV radiation to disinfect whole hospital rooms in minutes, killing a variety of harmful germs. The Xenex, an automated and portable robot, uses pulsed, full-spectrum UV radiation to disinfect whole hospital rooms in minutes, killing a variety of harmful germs. It works by eliminating the bacteria that cause HAIs such Methicillin-resistant Staphylococcus aureus (MRSA), which can be particularly resistant to therapy. Plus, the robot is cute—it resembles an R2-D2 that is meant to save lives.

[2] Transporting supplies, food, and other items around the hospital is inefficient, even if you don't realize it. According to one estimate, a typical 200-bed hospital transports the equivalent of 53 miles each day in meals, linens, test results, trash, and other goods. Enter TUG, an autonomous mobile robot built by Aethon Inc. to carry goods to where they're required, allowing workers to focus on patient care rather than heavy physical burdens. When the University of California, San Francisco Medical Center at Mission Bay was opened in 2015, it introduced 25 TUG robots to help with transportation. They're programmed with the hospital's floor layout and have a variety of sensors to guarantee they don't collide with anything on their trip to the lab. They also politely request that people shift to the side as they pass through packed corridors.

[3] The PARO Therapeutic Robot is intended to enhance quality of life for patients recovering from surgery or receiving therapy for depression or other mental illnesses. The PARO Therapeutic Robot is an interactive gadget that resembles a young harbour seal and is meant to give animal therapy advantages without the use of actual animals. Animal therapy is a frequent method for reducing patient stress, although trained animals are not always accessible to meet immediate needs. PARO is a friendly, animal-like character that meets the bill. PARO has been shown to relieve tension and offer comfort to nervous individuals and is commonly utilised with senior dementia patients. The fuzzy PARO responds to its name, likes being caressed, and develops a unique, pleasant personality over time as a result of its memories of prior interactions. PARO also takes sleeps, blinks, wiggles its flippers, and makes amusing noises, all for the benefit of its owner.

1.2. COMPONENTS

a. Bluetooth module HC-05
b. Motor driver l298
c. JONSON motors 4
d. Battery 12-volt 8 amp
e. Bakelite sheets
f. Steel rods
g. L clamps

i. RFID Module RC522

2. METHODOLOGY

1) Motor Driver

Fig 1: Motor Driver

Microprocessors work at low voltages and draw a tiny amount of current, whereas motors operate at higher voltages and draw a larger current. As a result, the Microprocessor is unable to supply current to the motors. Due to this the motor driver is used to run the 4 autonomous motors in the robot.

2) Arduino Uno

Fig 2: Arduino Uno

The Arduino Uno is a type of Arduino board that uses an ATmega328p microprocessor and is available as an open-source project. The Arduino Uno has a set of analogue and digital pins that serve as input and output points for connecting the board to external components. Inboard, there are a total of fourteen I/O pins, six of which are analogue input pins. The board contains a USB port that can be used to connect to a power supply and in this bot we have used Arduino to control the motors of the bot.

3) HC-05 Bluetooth module

HC 05 Bluetooth module is built on the BC417 Single Chip Bluetooth IC, which is Bluetooth v2.0 compliant and supports both UART and USB interfaces. In general, the BC417 IC and a flash memory are included in the HC-05 Bluetooth Module, or the HC-05 Sub Module, to be precise. Surface mount boards are available for such Modules, and some third-party manufacturers employ them to create more complex systems. We have used this Bluetooth module to established the contact between mobile app and the bot

Fig 3: HC 05 Bluetooth module

4) Johnson gear motor

Fig 4: Johnson Gear Motor

A Johnson geared motor is a basic DC motor with a gearbox connected to the shaft. It is a mechanically commutated direct current electric motor (DC). 12v DC geared motors with a 200 RPM for robotics applications. It generates a huge torque of 25kgcm. The motor has a metal gearbox and a shaft that is not centered. A metal bushing protects the shaft from wear. We have used this kind of motors to rotate the wheels accurately with precise degree of rotation in the bot.

5) RFID module

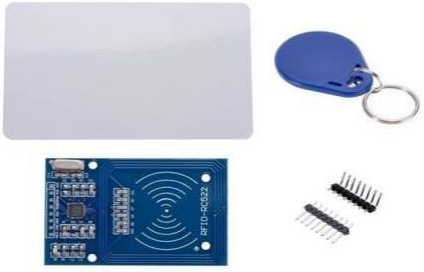

Fig 5: RFID Module

RFID stands for "radio-frequency identification," and it is a technique that uses radio waves to collect digital data contained in RFID tags or smart labels. Data from a tag or label is collected by a device, which then saves the information in a database, similar to barcoding. RFID, on the other hand, provides a number of benefits over barcode asset tracking solutions. Considering the case where the bot needs to enter a locked room of a patient, we need to keep in mind that the door needs to be open just when the bot arrives. To solve this, we used a RFID module such that as the bot arrives, the device reads the tag on the door and opens automatically.

6) Water Pump

Fig 6: Water Pump

Water pump has basically same function as that of motor. It has one inlet valve and one outlet valve. Inlet valve is connected to drum which has water and we can use outlet valve as per our requirement. This water pump operates on 12 volt and we have used this to spray sanitizer in the hospital.

2.1 SOLIDWORK DESIGN OF BOT

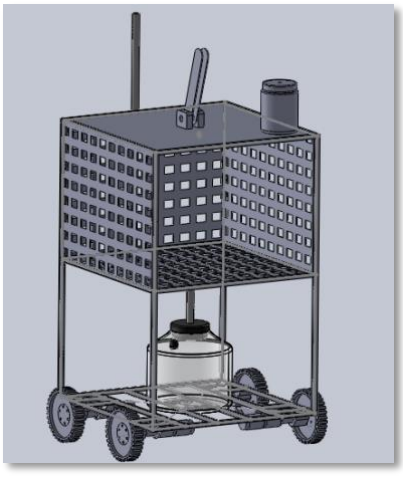

Fig 7 : Solidwork Design1

3. FEATURES OF THE BOT

A] Medical Transportation Robot: Supplies, medications, and meals are delivered to patients and staff by these robots, thereby optimizing communication between doctors, hospital staff members, and patients.

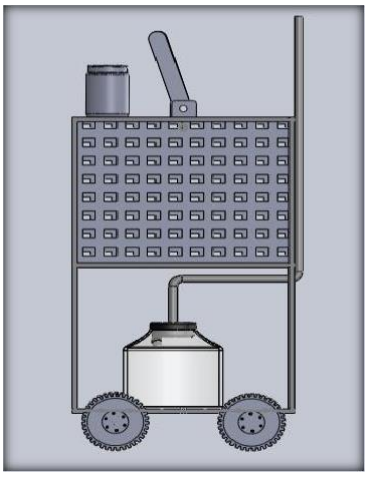

Fig 8: Solidwork Design2

B] Mask detection: WHO's guidance and strict advice on the use of masks to protect against COVID-19. Masks are a simple barrier to help prevent your respiratory droplets from reaching others. This robot will be going room to rooms in public places and detect who all are wearing masks or not. It will also display them a message through the LED placed above. Will also help the concern authorities about who is not wearing a mask and not following covid protocols

C] Contactless monitoring: It will help the doctors in monitoring and helping patient symptoms without being in close contact with the patient. The bot will have a mice and camera which will help both have a smooth interaction.

D] Video surveillance: Patient safety is a growing issue which can be improved with the usage of high-end centralized surveillance systems allowing the staff to focus more on treating health issues rather that keeping a watchful eye on potential incidents.

E] Automatic door opening, closing: During hard times where staff is busy with other critical patients, this bot can open/close doors through its module and keep track on patients. This way staff does not need to keep doors open to make the bot work. It can access on its own.

F] Hand sanitization: The robot also has an integral hand sanitization mechanism mounted on the top whose primary function is to automatically dispense an apt amount of sanitizer when people place their hands below

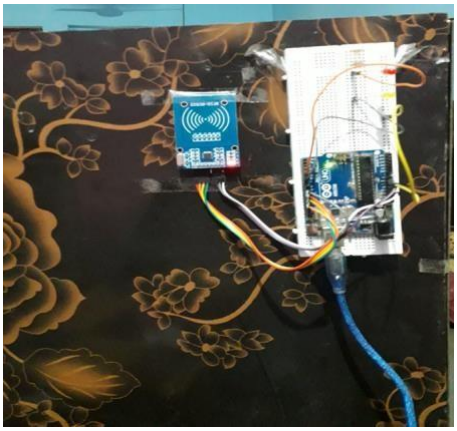

Fig 9:RFID Connection With Bot

the dispenser promoting touch-free and safe sanitization to everyone.

G] Room sanitization: The base of the bot is equipped with a small vessel (tank) containing 6-7 liter of sanitizer which will be used for human-less disinfection over more voluptuous spaces like a patients room, minimizing the jeopardy of hospital staff to get infected due to COVID patients, this mechanism solely promotes easier and a more contactless sterilizing of places.

3.1 ACTUAL PROTOTYPE OF THE BOT

We have successfully built the prototype of Automated Medicare transformer which works as intended in every required aspect.

Fig 10:Actual Prototype of Bot

Fig 11:Prototype with Naming

CONCLUSION

Multiple testing on the final made robot prototype have confirmed that it is entirely functional in terms of its pre-defined capabilities of mask detection, video surveillance, automatic door opening and closing based on RFID, hand and room sanitization, and, most crucially, contactless monitoring. Furthermore, in comparison to other similar initiatives on the market, the project is quite cost-effective because it intends to help all medical frontline COVID professionals in the present pandemic crisis.

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