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Smart Nursing Robot for COVID-19 Patients

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Abstract— one of the most recent syndrome viruses, Corona Virus Disease (CVD), causes serious respiratory issues in humans. It distributes the virus to others in close proximity to those who are ill. The pandemic of this virus is a direct result of this. For physicians, dealing with patients is the most difficult part of their job. Patients who are ill require a steady supply of medication and unrushed attention. As a result of the ramifications, it affects everyone in the vicinity. It's a solution to issue that this suggested equipment acts as an artificially intelligent nurse. In order to maintain a close eye on the patient and ensure that they are taking their prescribed medication at the right time, a nursing robot has been built. Fine potential was built into the delivery of medication as well as food and clothing. It plays a crucial function in determining how much medication to provide to a patient. This aids the front-line practitioners in protecting themselves against the corona virus. Due to the pandemic circumstances, global economic outputs are greatly affected. The social transmission will be reduced even more with the aid of this planned nursing robot. As a result, there are fewer severe instances and disease severity is more evenly distributed over the globe.

Keywords— Autonomous robots, Corona virus, Nursing Robot

1. INTRODUCTION

One of the fastest-growing hotspots for the Corona Virus Disease (COVID-19) pandemic is the healthcare facility setting. Since the first patient infected with the COVID-19 virus in Wuhan, China, in December of this year, The majority of patients are merely told to take medication in accordance with the suggested daily dosage, and some frustrating situations arise when patients forget to take their prescription at the prescribed intervals. The World Health Organization (WHO) released its situational report 127 on May 26, 2020, revealing that there have been 5,404,512 confirmed cases and 343,514 fatalities globally. In the same age group, male patients are more at risk of mortality than female patients, and the death rate

is higher in older people than in younger people. Nursing robots may be used to suppress large pandemic disease outbreaks. The corona virus's front-line location is controlled by this. Automated harvesters and food delivery robots are only some of the applications for autonomous robots. Applied to enhancing

hours worked and output. In a productive setting, autonomous robot systems and self-driving trucks are both used. Technology in the food business is exposed in Viral Shah et al. (2016)'s publication, which explains how supply chain decision-making is carried out. Their suggested work has raised awareness of the oncoming track of the food sector among everyone. Agricultural harvesting is a critical and ending step in the production process. Despite advances in technology, picking fruit is still done manually by humans in traditional methods. It was shown in this research that fruit-picking robots can be built independently, and that they can be instructed to use a variety of picking techniques. As a way to help future food processing enterprises become more self-sufficient, the researcher evaluated all of the procedures employed [4]. Beyond the route map of the hospital and room locations and destinations, these robots are configured with the destinations of the associated patients. A number of European nations use autonomous robots to aid people with disabilities in a variety of duties, including feeding. Elderly people outnumber younger individuals in industrialised nations around the globe. For this reason, they need a sanitary quirk to let them flourish on their own [5]. The Internet of Things (IoT) has become an important and promising topic in the food business, according to the author. A large part of it centres on all of the difficulties in the food supply chain [6]. A new technology in autonomous robotics, humanoid robots are capable of mimicking human body postures in a variety of ways. In 1996, Honda unveiled its first autonomous robot, a bipedal walking automaton. With the assistance of a bipedal walking software, it is able to simply go up and down the staircases. Additionally, it demonstrates how the Honda robot adapts to varying loads [7]. In the last several decades, medical and hospital applications throughout the globe have seen a significant increase in the need for autonomous robots to help in situations like the present epidemic. Food and clothing are both served by autonomous robots in certain locations. At this time, the autonomous robots are transformed into the nurses to better protect the patients [8]. Patients who were impacted by the corona had to take their medicine more often than those who weren't. Traditional medication methods have various peculiarities, such as over- or under-dosing, forgetting pills and inconsistent timings. A substantial number of dose errors are caused by a combination of the ageing population and the severity of the illness [9]. People may use the robots to help them dress, eat, and move about in a wheelchair or physically. The robots are programmed to operate more like humans. With additional sensors, physical robots may be transformed into autonomous robots. Sensors are required to be more precise and able to manage patients in medical applications because of the nature of the work. Autonomous robots based on sensors offer various advantages, such as safety and ease of use. In order to be more effective, nursing and autonomous robots must be more user-friendly, smaller, and more precise. As a human caretaker, a nursing robot has many of the same characteristics. [10]

In certain cases, a person may be infected with a highly infectious illness, in which case the patient must be treated. Doctors need to keep a safe distance from the patient in order to avoid spreading the dangerous sickness to themselves [11]. Classifying EEG signals [12] is covered. Keeping an eye on patients while they are being treated is a difficult undertaking in and of itself. Human care assistance robots may be used in situations when the doctor-patient relationship is strained to a minimum and social distance has to be maintained.

2. PROPOSED SYSTEM

Assistive Bots, based on the 'Line Following robot' idea, is what we're calling our smart nursing robot. The Line Follower robot follows the black lines on the surface, and it will halt when it reaches a white line. Figure 1 shows how the various components of this nursing robot are interconnected: RFID tag and scanner, RTC module, Arduino controller (Node MCU), LCD display, DC motor with driver module, infrared sensor, ultrasonic sensor and the power supply. RFID Tags with unique codes are attached to each patient. For authenticating patients and delivering their prescribed medications to them, RFID Scanners installed on the robot show information such as the drug's name, dosage and expiration date.

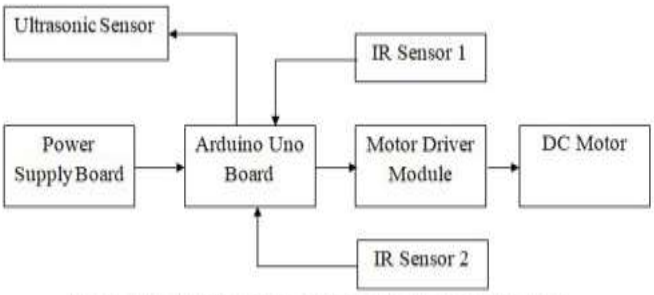

Fig.1.Block Diagram of Line Following Robot

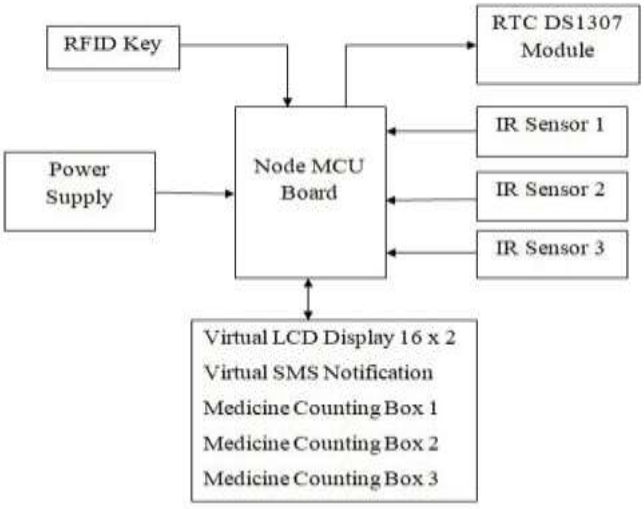

Fig.1.Block Diagram of Medicine Box

The RTC Module guarantees that patients get their medication on time. Infrared sensors

direct the robot's movement along a predetermined course, while ultrasonic sensors identify obstructions in its path as it approaches patients. Node MCU (Arduino controller) is in charge of all processes, depending on sensor output. The front of the robot is equipped with an IR sensor module that allows it to keep track of its course. Front and back of the robot are equipped with two ultrasonic sensors. In order to identify the items in the route, the Ultrasonic sensor is positioned correctly in the system. The Arduino controller slows or stops the robot if it detects any impediments, depending on the robot's distance from them.

An SMS is sent to the patient's guardian after the medication has been consumed by the patient. It allows caregivers to monitor the patient remotely to see whether he or she is taking their medication on a regular basis. Fig. 2 depicts a flowchart. It outlines the proposed system's workflow.

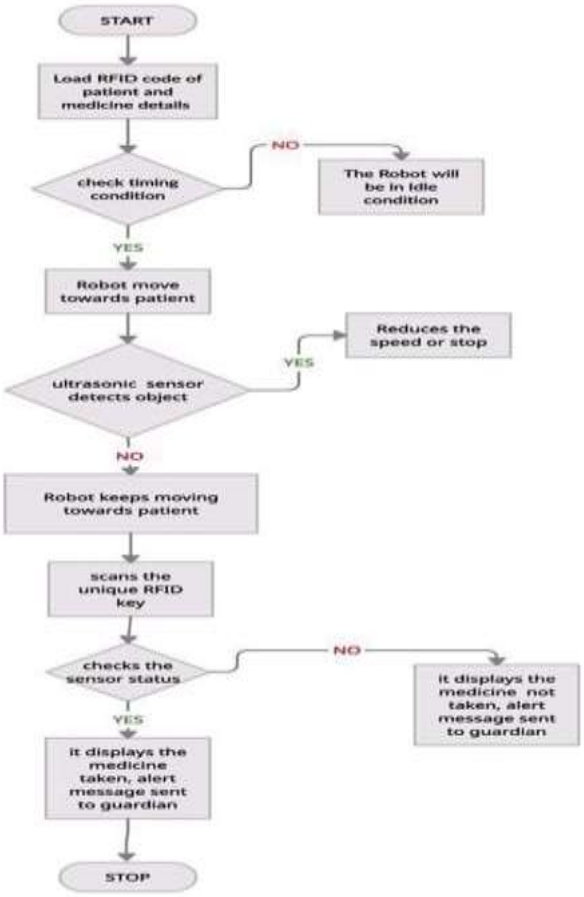

Fig.2. Flow chart

3. RESULTS AND DISCUSSION

An intelligent nursing robot is shown in fig.3 and fig.4, which show how it works. These simulation findings shed light on how a real-time machinery robot uses ultrasonic and infrared sensors to perform dual functions as a line follower and a medicine dispenser. When the robot's IR sensors are turned off, it accomplishes nothing and the LCD display shows no results, as seen in Figure 3. Using the IR sensors, the robot follows the line code to approach

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the patient. If a patient's RFID key is different from another patient's, the robot will scan it to display the patient's medication name on the LCD display as illustrated in Fig.4 when it approaches the patient. Figures 5 and 6 show the patient's medication intake status on the LCD panel. The LCD panel will show the patient's condition if they haven't taken their medication. In addition, the robot will send a virtual message to those who are concerned about the consumption state of the product.

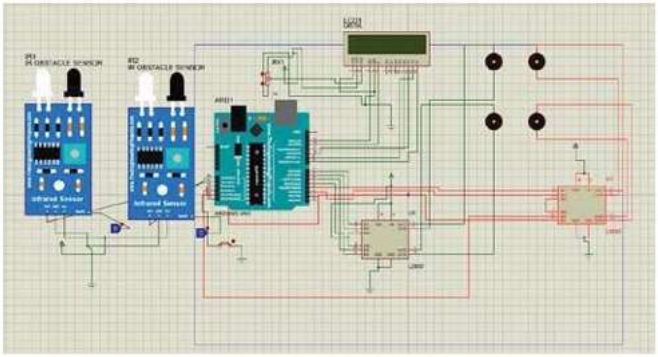

Fig.3. Overall simulation output for Smart nursing robot

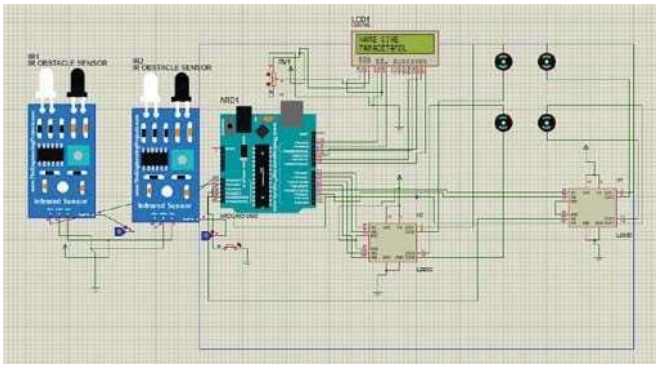

Fig.4. Simulation results after displaying medicine name.

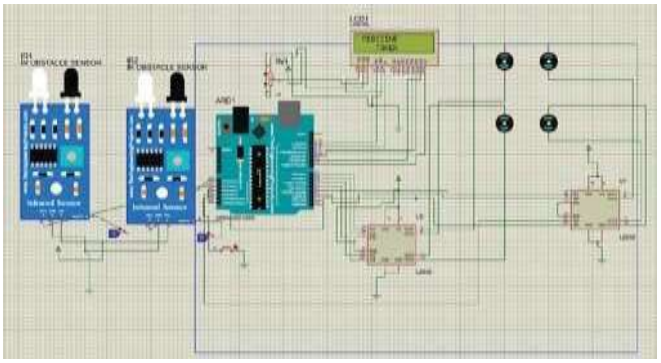

Fig.5. Simulation results after medicine taken.

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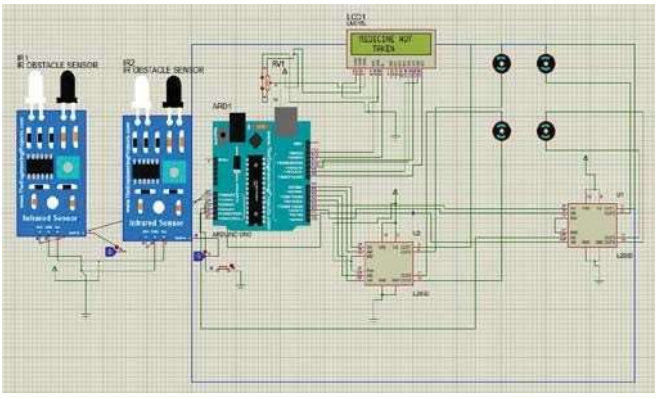

Fig.6.Simulation results after medicine not taken.

If ultrasonic sensor detects any obstacles in a particular distance, then automatically the robot will slow down or stops and it will alert near by person by giving indication as shownin fig.7 for removing the obstacle. If no obstacle is detected the robot will move in the desired path without anyinterruption as shown in fig.8.

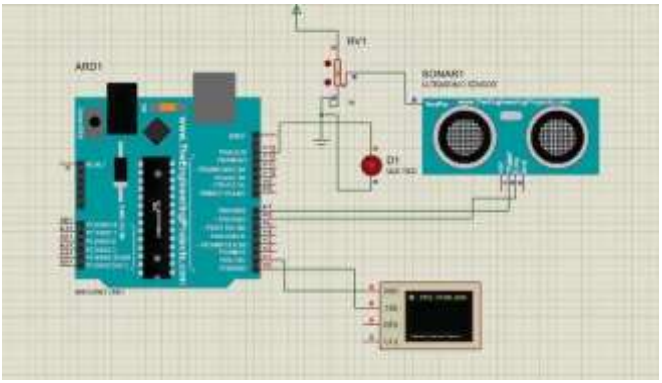

Fig.7 Simulation results for ultrasonic sensor withindication

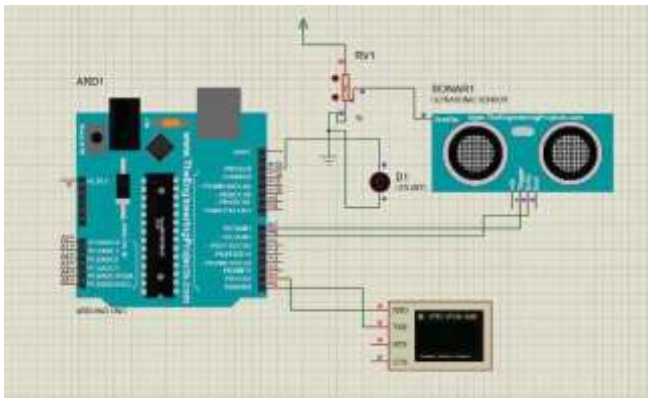

Fig.8 Simulation results for ultrasonic sensor withoutindication.

4. CONCLUSION

Patients in hospitals may use the Medicine Robot to help them remember to take their medications on a regular basis, following their doctor's orders. More beneficial is observation to quantify the amount of medication the patient consumes and prevent over- or under-

dosing, as well as forgetting to take the prescribed dose. Also, after the patient has taken the prescribed medication, the status will be immediately emailed to the patient's family members so that they are aware of the patient's progress. Depending on the conditions, a nurse may be able to incorrectly design the recommendation system, which might result in a patient taking the wrong medication. When a pandemic lasts for a long time, autonomous robots are more beneficial in controlling the virus's ability to spread. It has a significant impact on the transfer of information between those who are impacted and the front-line clinician. When this system is completely autonomous in the future, additional medical sensors may be used to monitor and analyse a patient's health state, as well as to distribute medication.

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