Smart Nursing Robot for COVID-19 Patients

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Abstract— **Corona Virus Disease is a novel syndrome virus and it causes severe respiration problems for human beings. It spreads the virus close contact persons from the affected ones. This is the main reason behind the pandemic of this virus. It is toughest to handle the patients for the doctors. Affected patients need adequate drugs swallowing and untimed care. Because of the consequences, it spreads over the person from the affected peoples. So to overcome the problems, this proposed device act as a robot instead of nurses. This proposed nursing robot designed well as which keep monitor the patient and consumption of medicine with depends on the time. It programmed fine potential into delivering of medicine, food and clothes. It plays a vital role in a measure the amount of drugs to give for the patient. It more helps to the frontline practitioners and protect themselves from the minute corona virus. Due do the pandemic conditions immensely affect the world economic throughputs. This proposed nursing robot will more help to reduce the social transmission. It also reduces the number of severe cases as well as severity localization of diseases.**

Keywords— Autonomous robots, Corona virus, Nursing Robot

I. Introduction

Corona Virus Disease (COVID-19) pandemic spreads especially in hospital zones. Since the first COVID-19 virus affected patient identified in Wuhan city, china in December 2019.

Majority of patients is only recommended to intake consider amount of medications in each day and some tedious cases created at forgetting to take medicine in a specific time interval. According to the W.H.O's situational report 127 revealed on might 26, 2020, thus far, 5,404,512 confirmed cases are reportable worldwide with 343,514 casualties. The death rate is highest among older individuals compared to young ones, whereas male patients are a lot of at risk of risk compared to feminine patients within the same age group. Huge pandemic disease cases can be controlled by the usage of well-designed nursing robots. It controls the front line localization of the corona virus. The autonomous robots are widely used in food deliveries, quantity analyzer, delivering goods and agriculture harvesters. This is used for improving productivity and working hours. Autonomous robot system is used as well as automatic truck transportation with self-driving in a constructive area. Viral Shah et al. (2016) revealed the process of technology in food industry, this paper discloses how supply chain decision-making; their proposed work their research heightened of the upcoming track of the food industry among all the peoples [1]. Harvesting is a process of important and concluding stage in agricultural production. In traditional approaches still fruit harvesting is carried out manually by the human beings [2]. This paper exposed to make fruit picking robots in autonomously and it has been developed with the feature of vision processing capability and it is programmed by the various picking mechanisms [3]. The researcher appraised all the techniques used to enhance future food processing industries towards autonomous food serving and cleaning attributes [4]. These robots are programmed beyond with the route map of hospital and room locations and destinations of the corresponding patients. In some other autonomous robots are used in European countries, which is assist differently abled persons for their feedings and some numerous tasks. All over the developed countries have more number of elder peoples compare than younger Peoples. So it needs some hygienic peculiarity for their individual grow [5]. The author explored the importance of the Internet of Things in food industry and it makes how the food chain made emphasizing and promising area. It majorly revolves all the challenges in food industry and supply chain [6]. Humanoid robots are a recent technology in autonomy of robots and it how works in the various degree of human body postures. The Honda introduced first autonomous robot in 1996 and it is made by the feature of biped walking machine. It has one of the important feature is easily move upstairs and downstairs automatically with the help of biped walking program. It also reveals the Honda robot how adopting to various load changes [7]. In the recent decades of the world, medical and Hospital applications is huge need of autonomous robots for serving in that pandemic situation like what happens in the current scenario. In some places the autonomous robots are used to serving food and clothes. During this pandemic

839

duration, the autonomous robots are modified into the nursing robots to secure the patients in a more eminent manner [8].

In that corona affected patients needed more times of medications compared than others per day. In traditional method of medications have some estranges such as over dosage or insufficient dosage, forgetting medications and irregular timings. Some of the dosage accidents made when the co-occurrence of age factor as well as severity of disease will be high [9]. The robots work in more processioned like human beings to serve the people to change clothes, food feeding and mobility of both wheelchair and physically. The normal physical robots can be converted into autonomous robots with the help of more number of sensors. Due to medical applications, the sensors need to be more precision and high ability to handle the patients. These sensors based autonomous robots have some good features like reliability, safety and easy adoptability. The nursing or autonomous robots are should be more user friendly, more compact and more précised manner. Nursing robots have the eminent feature like as a natural human care taker [10].

Also, in certain circumstances, a highly contagious disease affects a person, and the patient is to be treated. Under such situations, the doctors are in need of maintaining proper distance from the patient so as to prevent the contagious disease affected the doctors themselves [11]. The classification of EEG signal is discussed [12]. Treating the patients under continuous observation becomes a very challenging task altogether. Human care assistive robots are in such cases where in the interaction between the doctor and the patient becomes very minimal and can also help to maintain social distancing.

II. PROPOSED SYSTEM

Our proposed smart nursing Robot is an Assistive Bots which is developed from the concept of 'Line Following robot. The Line follower robot follows the traces of line which marked with black color on the surface and it will stop at white color marking. The block diagram of line follower robot is shown in fig.1. This nursing robot has RFID Tag and Scanner, RTC Module, Arduino controller (Node MCU), LCD display, DC Motor with driver module, IR sensors, Ultrasonic sensor and Power supply which are interconnected as shown the fig.2. Every patient has RFID Tag with unique code. RFID Scanner is mounted on the robot which are used to identify the authenticated patient and deliver the respective medicines to the patient and medicine details like name of the medicine, Quantity of the medicine will be displayed in the LCD display.
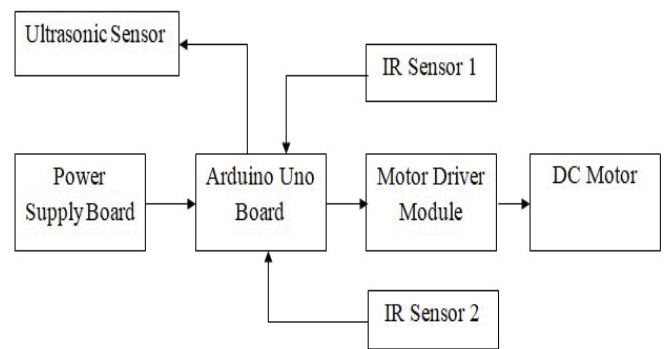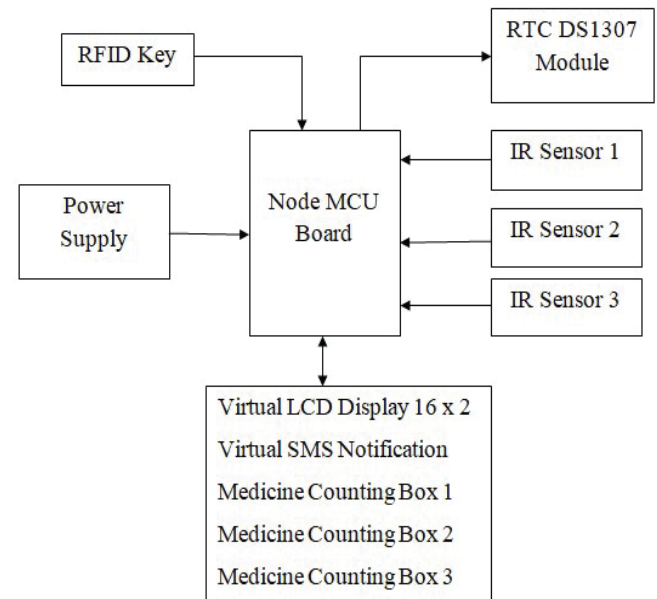

Fig.1.Block Diagram of Line Following Robot

Fig.2.Block Diagram of Medicine Box

RTC Module ensures the timely delivery of the medicine to the patients. IR sensors used for controlling the robot movement to follow the marked path and Ultrasonic sensor used for detecting objects(obstacles) when its travelling towards patients. Arduino controller (Node MCU) have the control of all process based on the output of the sensors. An IR sensor module is fixed at the front of the robot so that it can trace its path. A pair of ultrasonic sensors are placed at the front and rear of the robot system. The Ultrasonic sensor is placed in the right place of the system to detect the objects in the path. If it detects any objects, the Arduino controller will slow down or stop the robot based the distance from the obstacles.

Once the medicines are taken by the patient, an SMS notification is sent to the patient's guardian. It helps the guardians remotely to ensure whether the patient taking medicine regularly or not.
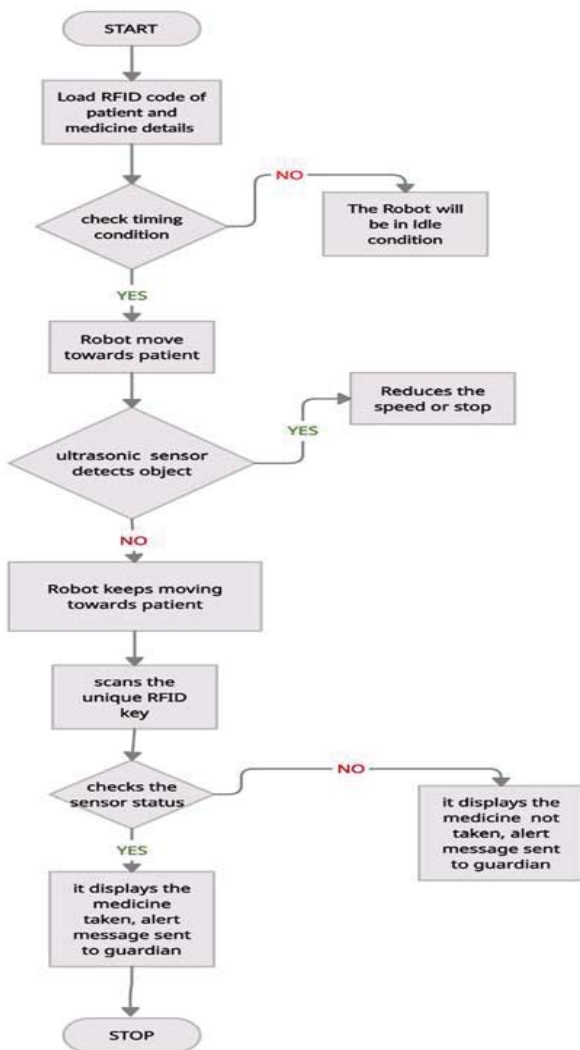
Fig.3. Flow chart

In flow chart fig.3. It explains the work flow of the proposed system.

III. RESULTS AND DISCUSSION

From fig.4 and fig.5 elucidates how the autonomous robots are functioning as a smart nursing robot. These simulation results illuminate the real time machinery robot works as line follower as well as medicinal caretaker with the help of ultrasonic and IR sensor. Fig.4 elucidates when the IR sensors are in off condition the robot does not perform any action and LCD display also doesn't show any results. When the IR sensors are in ON condition the robot follows the line code and reach the patient. Once the robot reaches the patient it will scan the RFID key allotted to the patient which is different from one to another and it will display the respective medicine name in the LCD display as shown in Fig.5. The medicine consumption status of the patient is displayed in the LCD screen as shown in fig.6 and fig.7. If the patient is not taken the medicine that status also will be displayed in LCD

screen. As well as the robot will deliver the consumption status to the concern people as a virtual message.
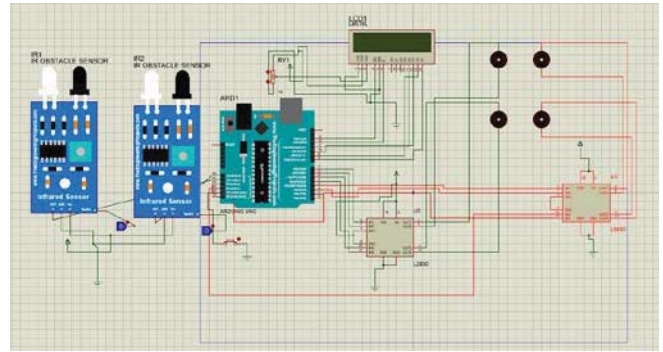

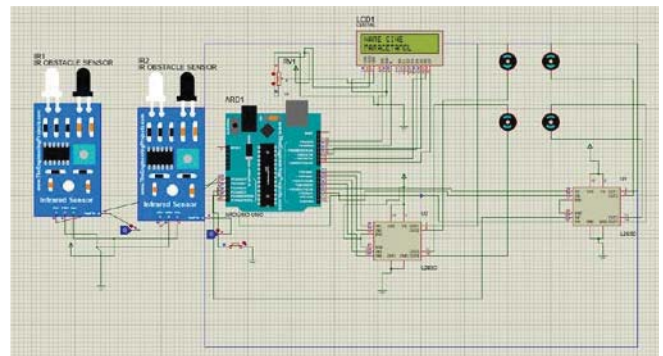Fig.4. Overall simulation output for Smart nursing robot

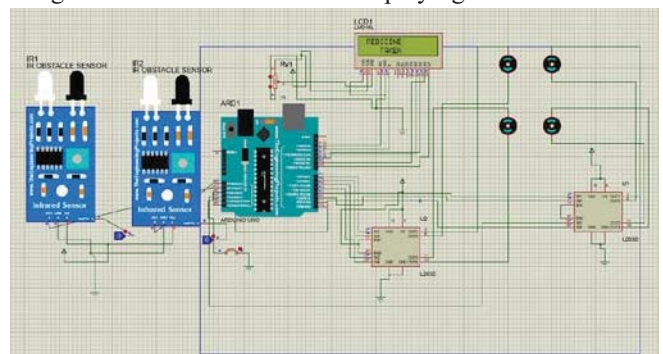Fig.5. Simulation results after displaying medicine name.

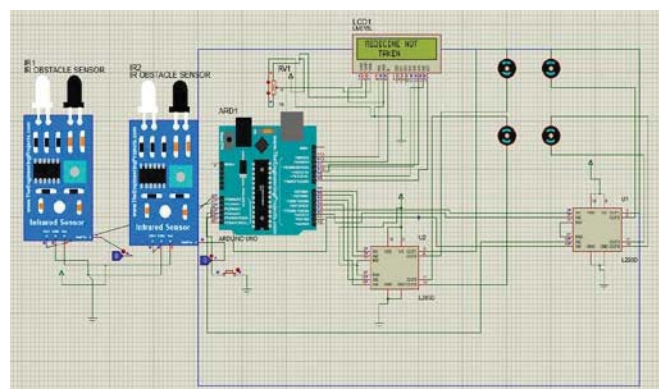Fig.6. Simulation results after medicine taken.

Fig.7.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 shown in fig.8 for removing the obstacle. If no obstacle is detected

the robot will move in the desired path without any interruption as shown in fig.9.
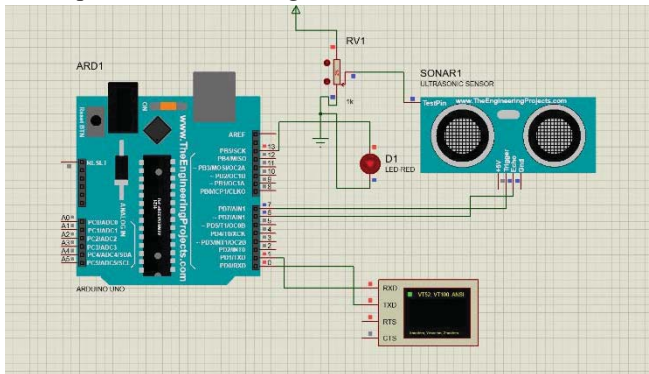

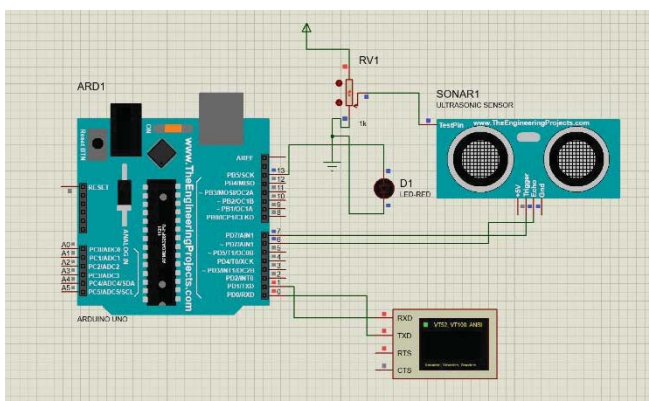Fig.8 Simulation results for ultrasonic sensor with indication.

Fig.9 Simulation results for ultrasonic sensor without indication.

IV. CONCLUSION

The Medicine Robot act as an assistive bot but this idea more helps to the patients in hospitals to consume the medicine periodically as per the prescription given by the doctors. With the assistance of observation is more useful to measure the quantity of medication taken by the patient and avoid mal dosage of medicines and conjointly forgetting to require the medicines at specific time duration. Also, once the tablets ate duly taken by the patient, the status will be sent as notification SMS automatically to the patient's relatives so that they know about the patient has taken the medicines at the right time. There might of a chance of accident rounder certain circumstances, wherein the nurse who is feeding the medicinal data that is to be taken by the patients may wrongly configure the recommendation system. It that pandemic duration, autonomous robots are more useful to control the level of transmitting strength of the virus. It plays major role for the transmission between affected peoples and the frontline practitioner. In Future, this system can be developed as a fully autonomous system and by incorporating other medical sensors to monitor and analyses the various parameters to find the health status of the patient along with medicine distribution.

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