WHEELED ROBOT FOR ISOLATION WARDS

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ABSTRACT — Covid-19 pandemic has affected every walk of life, isolating the infected or suspected people and monitoring their health condition and treating them has become a biggest challenge, the nature of disease spreading has made everyone to maintain a social distance. To deal this toughest situation health sector needs more innovative and intelligent devices which work smartly without or less human intervention. It is required to develop a smart device which collects the patient parameters and upload over wireless media for the notice of care takers, along the with data collection device should be able supply essentials things as and when required with remote controlled facility.

Keywords: Covid-19, IoT, Isolation Ward, Robotic vehicle.

I. INTRODUCTION

In a bid to keep specialists and clinical staff from getting tainted with Covid, this task proposes the idea of robots to serve food and prescriptions to covid-19 patients or individuals contaminated with the sickness.

Providing food and giving prescriptions to covid positive patients in medical clinics has stayed a test. This is the reason people are taking the assistance of machines, the robots arms hold a fixed plate where food and medication could be conveyed to the assigned spot and the hardware is distantly controlled utilizing blynk application, Robot is stacked with IR temperature sensor and heartbeat sensor to get the internal heat level and heartbeat pace of the patients.

Isolated individuals and Virus influenced patients can be helped through Internet of Things and Robotic frameworks in this present-day time. As of late the entire world is experiencing the Covid- 19 pandemic. The infection influenced and Quarantined individuals are powerless in light of the fact that guardians, specialists This work will bring about an IoT based Robotic specialist which will actually want to help specialists and attendants to screen the state of patients and supply food and medications to them from far off place, Robot outfitted with portable cam communicates data to far off worker through video for this reason droid cam application will be used. Sensors help to bring the body temperature from far off place additionally any snags

experience in the way of the robot and others are afraid of the infectious infection.

ROBOT

Robot is a machine that is programmable by a computer and capable of carrying out a complex series of action automatically. Robots may be controlled by an external device or the control may be embedded within them. Robots may take the form of humans, but most are made to resemble machines.

Figure 1: Wheeled Robot

II. LITERATURE SURVEY

1) Mohd Javaid, Abhishek Vaish, Raju Vaishya, Karthikeyan P. Iyengar.

In an ongoing situation, the manufacturing has drastically lowered, and the supply chain is disrupted. This technology is used to deliver food, medicine, and other essential items for COVID-19 patients. Robots are used to sort out real-time problems and avoid face to face contacts of peoples. This technology is used for patient examination, helps healthcare worker during overloading, collections of garbage from the patient bedroom, food for admitted COVID-19 patient, sanitising locations and hospitals, assist COVID- 19 testing, policing during the lockdown, entertaining and social support to persons

during the lockdown, manufacturing of essential medical equipment, interacting directly to the people, surveillance and cleaning of hospitals.

Robotic is an emerging technology that can provide numerous solutions to fight against the COVID-19 pandemic. This performs a variety of tasks like transportation of food, medicine, and laundry supplies.

2) Valeria Seidita, Francesco Lanza, Arianna Pipitone and Antonio Chella

In this paper, they have examined the main actions taken to combat COVID-19 from the academy, industry and government initiatives point of view since the outbreak of the coronavirus epidemic to date. This review is intended to be a starting point for researchers and professionals, both in the academic and industry, for investigating the state of the art of robotics in the field of healthcare. At the time of writing, there were not reviews providing such kind of considerations. Indeed, the argument refers to a new situation occurring at the beginning of the year. The only review in the field is the one proposed in which also proposes some consideration basing on results gained during the Ebola contagion some years ago. Here, they have provided a step ahead and try to investigate how much mature is robotics for being applied successfully in prevention and in therapy. The difference with other reviews in such a similar case lay in the fact that they aim at providing means for quickly identifying which approach is most promising depending on the specific field of application in which one are working on.

3) Hee Kyoung Choi, Chunguang Cui, Hyeri Seok , Joon-Yong Bae, Ji Hoon Jeon, Gee Eun Lee, Won Suk Choi , Man-Seong Park and Dae Won Park

We analyzed 216 environmental samples from 17 rooms: 2 from airborne infection isolation rooms (AIIRs) in the intensive care unit (ICU) and 15 from isolation rooms in the community treatment center (CTC). Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) RNA was detected in 40 (18.5%) of 216 samples after patient discharge: 12 (33.3%) of 36 samples from AIIRs in the ICU, and 28 (15.6%) of 180 samples from isolation rooms in the CTC. In 1 AIIR, all samples were PCR negative after UV LED irradiation. In the CTC rooms, 14 (8.6%) of the 163 samples were PCR positive after UV LED irradiation. However, viable virus was not recovered from the culture of any of the PCR-positive samples.

4) Sarah O'Meara

A new hospital ward run entirely by robots has opened in Wuhan, China, in a bid to protect medical staff from contracting the coronavirus. The robots deliver food, drinks and drugs to the patients, and keep the ward clean. Some have a humanoid head, arms and upper torso but a wheeled base, while others look more like a box on wheels. The machines can move around autonomously but are under the observation and control of staff outside the ward. Medical staff can also use the screen to assign the robots their next task. "The staff have a much better view of how things are going and can immediately find out if something isn't right. I think it's a very high-tech and new way of trying to run a hospital," says Huang. Patients may also welcome the novelty, he says. "As we developed the plan, I talked to staff in the hospitals. They say the patients are very bored being isolated, so they love to see the robots." - Chenguang Yang at the Bristol.

5) Srikanth Kavirayani Electrical Engineering, Divya Sree Uddandapu Electronics and Communication Engg Dept, Aravind Papasani Computer science Dept

In view of the safety and medical concerns of patients and the persons delivering medicines on a timely fashion, robotic delivery of medicines in wards of hospitals using artificial intelligence techniques is investigated in this work. The program would ensure that the robot does not collide with other robots and humans in the path and also would search for the indicator where the medicine would have to be delivered on a timely fashion. This way, we would ensure that contagious diseases are not transferred when medicine delivery is done and also compared to the same with laborious process being done manually. This proposed method functionality and algorithm is tested on a prototype arena and was proven to be successful using a firebird V robot in the laboratory for the algorithm. The proposed method saves time and also human resources and is easy to operate with external monitoring from the hospital reception.

6) V Seethalakshmi, V S Kaviyaa Varshani, R Madhumitha, L Mukunthan, B Pooja Kumari - Electronics and Communication Engineering, KPR Institute of Engineering and Technology, Coimbatore, Tamil Nadu, India

The findings ensured that the developed robots through telemedicine and robotic technology helps to treat the patients without human intervention. Most robots are working for people in industries, factories, warehouses, laboratories and hospitals. Therefore, it is found that having this Tele-presence robots in hospitals help doctors and nurses to prevent themselves from the contagious diseases. Because robots can do jobs better and faster than humans can, and thus they reduce the spread of diseases. This can be used as a substitute for doctors on the daily basis. However, the development of new technologies is essential and is needed effectively due to this pandemic situation.

7)TeCaRob: Telecare using telepresence and robotic technology for assisting people with special needs.

This paper examines a novel approach to home care delivery that benefits frail people with special needs. It's an evolution of the Smart House (SH) idea, which is put to the test when PwSN residents need physical assistance. Assistive technologies for Tele-monitoring in homes constitute a very promising avenue to decrease load on the health care system, reduce hospitalization period and improve quality of life.

8) Arnon Jumlongkul

This article demonstrates the concept of a healthcare telepresence and delivery robot that can provide distancing during the present COVID- 19 crisis, using optimum technology for low and middle-income countries. In the future, the researcher should consider development of the delivery controls, combined with the telepresence system using the internet of things, to improve the navigation system, the manipulator system for supporting multi-floor transportation, and also other multi- functional purposes.

9) *Antonio Di Lallo, Robin R. Murphy, Axel Krieger, Junxi Zhu, Russell H. Taylor, and Hao Su*

This paper talks about some of the challenges faced during Covid-19 and how we can overcome those challenges. Also, the adoption of technology needs to be expedient but safe and responsible for facing disasters like a pandemic crisis. Speedy and mindful regulations that properly weigh the benefits and risks are necessary to guarantee the safety and effectiveness of robots and prevent biases and privacy issues.

10) *Design and Simulation of an Automated guided vehicle through Webots for Isolated COVID-19 patients, IEEE 2021.*

In this study, an automated guided vehicle that is capable of transporting a payload of 8Kgs is carried out. The AGV which follows the desired path with a collision-avoidance system is designed and simulations are carried out. The simplest way to decrease the spread is by avoiding direct contact with the affected person. This proposed system resolves the problems faced in hospitals during this pandemic period. The AGV collects food, medicines, and other required things from the nurse station and supplies it to the 1solated patient's wards which are divided into two halves. The robot runs through the environment created in Webots. Four mobile robots are created and simulated to run around the isolated ward. The bots run as per the controller code given. It does not duplicate the path and finds its shortest path while returning from the isolation ward and heading toward the nurse station. his avoids and decreases the spread of the deadly coronavirus. COVID-19 is vastly spreading and Health professionals are fighting to save the world. This AGV 1s a good initiative to stop the spread of COVID-19 within doctors and nurses inside the hospital. This AGV will follow the desired path carrying the required things for the patients and stops at each isolated ward for the patients to grab their food and other requirements.

III. EXISTING SYSTEM

In the present system there are very few automated systems to monitor the health parameters of patients, staffs have to manually collect the information with various electronic devices.

IV. PROBLEM STATEMENT

Nowadays, covid-19 pandemic has influenced different social statuses, concealed the contaminated or suspected individuals and observing their medical issue and treating them has become a greatest test, the idea of expire spreading has made everybody to keep a social separation.

To bargain this circumstance, wellbeing area needs more inventive and acute gadgets which work cleverly without or less human interaction. It is needed to foster a keen gadget which gathers the patient boundaries and transfer over remote media for the notification of guardians, along the with information assortment gadget ought to be capable to store the fundamentals things as and when needed with far off controlled office.

V. PROPOSED SOLUTION

It is required to develop an intelligent prototype which place crucial role to help front line health warriors while fighting against contiguous diseases like covid19. Monitoring various parameters of patients and giving treatment according to them is important activity, while doing so staff like nurses or doctors putting their life to threat.

VI. PROPOSED OBJECTIVE

- To develop an IoT based solution to monitor the condition of patients present in isolation ward.

- To fetch the parameters of patients such as temperature and populate the information on blynkapp, for the notice of officers who supposed to monitor patients or suspects.
- To supply food and medicine via a robot that is controlled by a remote place.
- To provide information at wards using video streaming concept with the help of droid cam app.
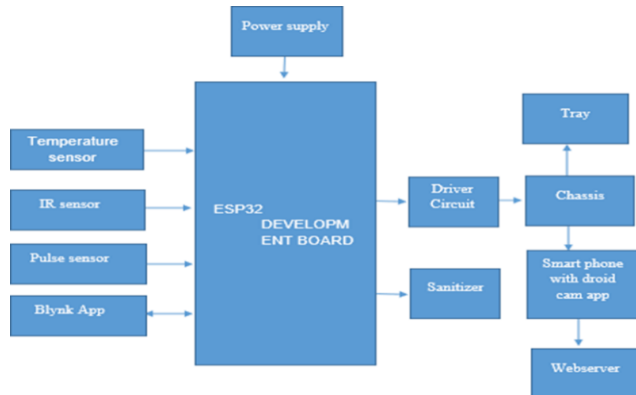
VII. PROPOSED METHODOLOGY

Figure 2: Architectural Block Diagram

First, we have to declare the variables, initialize the variables and then we need to define the pin configuration of Arduino board. Now, establish the connection using WI-FI and Blynk Server. The sanitizer sensor will detect the object i.e., the hands and it will dispense the sanitizer on loop. Meanwhile, the video of ward will be live streamed and Temperature sensor can be used to scan the patient's temperature. Based on commands provided by the Caretakers/Doctors the patients will use the medicine provided in the tray.

The above diagram shows the functional entities being present in the proposed model, main unit of the model is ESP32 development board, as it acts as controlling and coordinating section, it is interfaced with sensors, drivers circuit via jumper wires. It communicates blynk app over Wi-Fi. Having received command from blynk app sends control signal to driver circuit to control directions. Smart phone loaded with droid cam generates its own IP address that has to be used at browser to get the video streaming. Sanitizer is an indent module with IR sensor and driver IC, soon after detecting obstacles such as hand it dispenses sanitizer via submersible motor present in container.
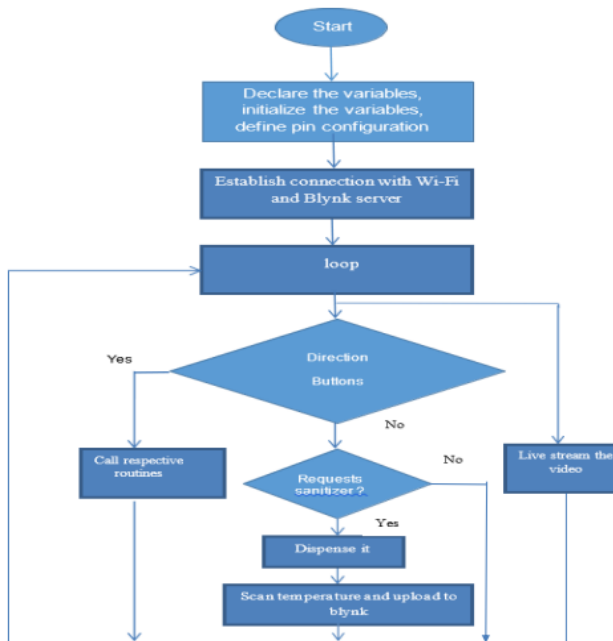
VIII. FLOWCHART

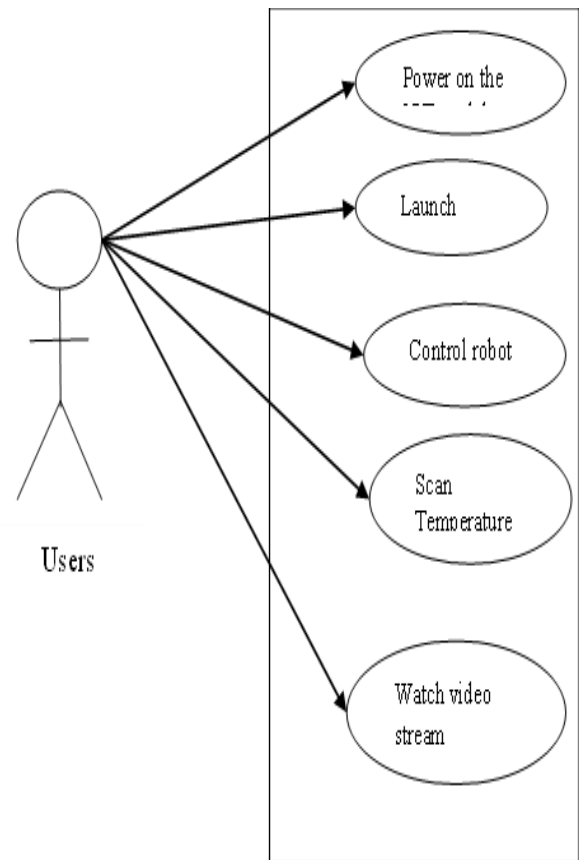
Figure 3: Flowchart

IX. USE CASE DIAGRAM

Figure 4: Use Case Diagram

User needs to turn on the IoT module i.e, the robot and user have to launch the Blink app by which they can control the robot so that it can reach the needy person. Robot has the temperature scanner that is attached to the shaft. Through the DroidCam app. The care takers can watch the livestream video of ward.
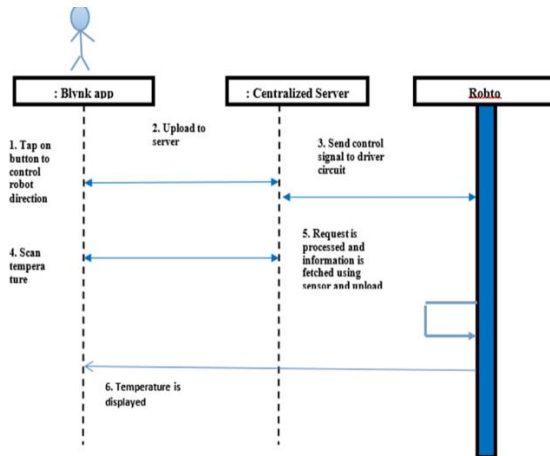
X. SEQUENCE DIAGRAM

Figure 5: Sequence Diagram

First, we need to tap on the button to control the robot that is uploaded to the server and then the server sends control signal to the driver circuit. With the help of temperature scanner, temperature of the needy person will be scanned. Request is processed and information is fetched using sensor and temperature is displayed on the Blynk app.

XI. RESULTS AND SNAPSHOTS

None of the systems produced by mankind is 100% efficient and error free. The same holds good for our project also, but has provided satisfactory results under many circumstances. The proposed system would able to achieve all its targets. The corresponding results and its advantages, disadvantages, future scope and conclusion are discussed below

Figure 6: Proposed Model With Sanitizer and Tray

The above image shows the proposed model with various components mounted, it has BO motors, interfaced with wheels, Tray containing sanitizer and other required components.

Figure 7: Model Streaming the video

The above image shows the proposed model streaming video to local server, for this purpose it makes use of droid cam present in the smart phone, it communicates with the local server using IP address.

Figure 8: Model with Bluetooth speaker

Above image shows the deployment of Bluetooth speaker at model, it's used to give voice instructions to patients from health warriors over a phone or any other devices.

Figure 9: Model with temperature sensor

Above image shows the temperature sensor being mounted on the column, it's used to fetch body temperature of the patients, soon after sensing the temperature the read information is displayed on blink app.
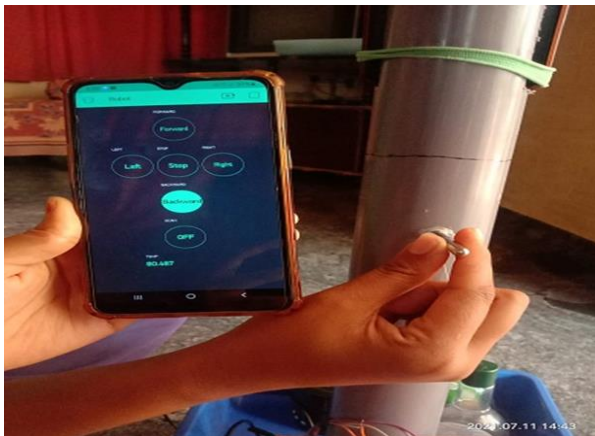

Figure 10: Model with blynk app dashboard

Above image shows the dashboard being built using blynk app, it has options to control the director of the motor and also to scan the temperature and display. It communicates with the esp32 board over WiFi and helps to control and receive information from remote place.

XII. ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- As told in the proposed plan, this prototype supports remote controlling hence staff could get benefit from it by controlling whole system from remote place
- The camera which is mounted over the top helps to look at the current situation hence the physical presence of staff is not required at wards
- The proposed model has space to carry required food and medicines to patients hence staff could use it as a vehicle to supply essentials
- One could use this prototype to fight against covid like situations.

DISADVANTAGES:

- As we have tested, with increase in load to carry system fails to respond properly. Hence, its well suited for small loads.
- While testing non rechargeable batteries have been used, hence performance starts decreasing with continuous usage, good reliable energy is must.
- As told earlier remote controlling is achieved using WIFI media hence having WIFI connection is must for remote monitoring and controlling.

CONCLUSION

The proposed model is an attempt to make use of robot and IOT concept to develop an innovative product which is hand and useful for the society to combat covid 19 like situation, it's being targeted to support frontline health warriors and help needy people.

The prototype has been tested for various test cases and it has performed well and it has some limitations too which are listed in disadvantages section the document.

By considering the limitations described in the previous sections prototype could be further developed and made usable at real time applications.

FUTURE WORK

- The proposed model is good to carry less loads it could be improved further to carry more load.
- More features can be added to support additional requirements.

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