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IOT based Virtual Doctor Robot for COVID-19 Isolation Ward

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ABSTRACT

The COVID-19 epidemic has been spreading globally since late 2019. The global health and safety of the general people, medical professionals, and medical systems around the world are seriously threatened by the epidemic. Globally, there has been a proposal to use robots during the pandemic to enhance patient care and lighten the strain on the healthcare system, with a particular emphasis on robotics. Here, we construct a virtual medical robot for the physicians who are normally expected to staff each clinic and occasionally serve as crisis advisors. It isn't feasible, though, for every specialist to be available at every location at every desired time. This is for keeping a close eye on elderly folks and alerting medical professionals and close relatives. In order to prevent these unexpected mortality rates, we are putting out a novel concept called Patient Health Monitoring, which makes use of sensor technology and the internet to contact loved ones in the event of an emergency. The Internet of Things is quickly changing healthcare. maintaining constant monitoring of your patient's health. Patients in particular should be checked on on a regular basis. Therefore, we suggest a novel approach that easily automated this task. With the help of a web server, our gadget offers a sophisticated patient health tracking system that allows body temperature to be tracked. Therefore, the MLX90614 contactless infrared temperature sensor will be used in this project. It is capable of tracking real-time data with timestamps over the Internet and measuring temperature without the need to touch the object. The problem with video calling is that it should only be done from a PC or PC on a work location. Consequently, patient health monitoring systems based on the Internet of Things use the internet to effectively monitor patient health and help. This limits the specialists' capacity to see patients, move freely throughout the activity theater, and, in certain cases, even pass through emergency clinic rooms. at order to address this problem, we have developed a virtual specialist robot and health status that enables a specialist to travel freely at a remote location and even communicate with people there when needed.

Keywords : MLX90614, Virtual Specialist Robot, Health Status

I. INTRODUCTION

Modern technological developments have made it easier for scientists and researchers to improve healthcare services. Modern technologies have been widely incorporated into the creation and operation of a wide range of medical devices, including those used for testing, monitoring, diagnosis, and treatment. The implementation of sensor networks in hospitals and the advancement of clinical-grade sensors have both made this possible. Optimizing healthcare delivery from a remote location has been greatly aided by the sensors and sensor network working together. The aforementioned developments have made healthcare services more flexible, available, and reasonably priced. Several of the most effective and commonly used cutting-edge technologies.

Big data analytics, machine learning, artificial intelligence, cloud computing, computer vision, and the Internet of Things (IoT) are all part of the revolution in healthcare applications. By enabling effective decision-making, data analytics has the potential to reveal trends and hidden aspects in health data, thereby increasing the quality of care. In addition, the utilization of artificial intelligence (AI) methods such as machine learning (deep learning, artificial neural networks, etc.) has improved the workload of healthcare practitioners by handling vast amounts of healthcare data stored in electronic health records. AI is being used in healthcare for a variety of purposes, such as forecasting human health issues, early cancer detection, and the identification of respiratory ailments using chest X-rays. In a same vein, with operations and therapeutic applications.

The many cutting-edge imaging methods, such as computer tomography and computer vision, have been effectively used. Healthcare organizations can store, process, and exchange patient data, medical records, and reports by utilizing cloud services. By employing intercloud infrastructures to transmit health information, create bills, and other functions, this gives healthcare services more flexibility. The Internet of Things (IoT) is one of the cutting-edge technologies that has lately surfaced in the healthcare sector, and it has the potential to be used in conjunction with other technologies in a single setting.

A "global emergency" was officially declared by the planet Health Organization (WHO) on January 30, 2020, due to the velocity with which the COVID-19 epidemic has spread throughout the planet. The virus has shook economies around the world, causing a stock market meltdown in numerous nations. The coronavirus pandemic has spread quickly throughout China and beyond its boundaries since the first group of cases were discovered in Wuhan City, China, in December 2019. As seen in Fig. 1.1, multiple instances have been reported in practically every country in the world, with the exception of Antarctica. Scientists from all over the world have made headway in assessing the pandemic's size, rate of advancement, and different patterns of disease transmission despite the dearth of publicly available data. Clinical data has revealed that a considerable proportion of COVID-19 patients have mild symptoms during the first four days, highlighting the disease's potential for covert transmission. Researchers have determined that COVID-19 is far more contagious.

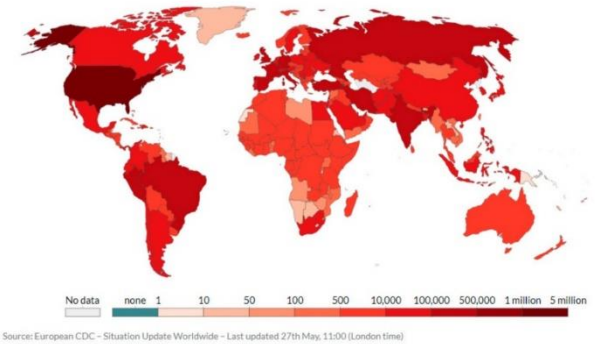


Fig 1 : Total worldwide deaths due to COVID-19 per million people (as on May 27, 2020).

As per the WHO's situational report 127, which was released on May 26, 2020, there have been 5,404,512 confirmed cases globally to date, resulting in 343,514 fatalities. Older adults have a higher death rate than younger ones, and male patients in the same age group are more vulnerable to danger than female patients.

Individuals who have comorbid disorders such as diabetes, cancer, cardiovascular disease/hypertension, and chronic respiratory disease are more likely to die from COVID-19 problems than those who do not. The most impacted countries in the world as of right now are the United States, China, Italy, Iran, Brazil, France, the United Kingdom, and Germany. Figure 1.2 illustrates the paths of COVID-19 transmission, which can be asymptomatic, symptomatic, or pre-symptomatic due to the disease's high contagiousness. Therefore, in order to prevent the viral infection—which can spread by sneezing, touching, and shaking hands—it is crucial to utilize hand sanitizers, facemasks, and social distancing techniques. Close observation of COVID-19 patients requires the medical and healthcare community to use personal protective equipment (PPE), such as N-95 facemasks and gloves, to prevent the spread of the coronavirus. Therefore, in an effort to stop the spread of infection over a vast population, alternative technologies such as telemedicine systems and medical robots are being focused on.

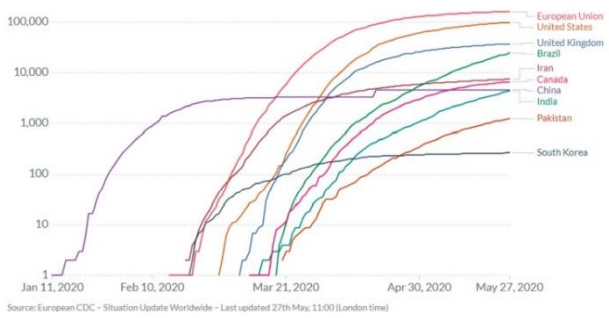


Fig 2 : Total confirmed deaths due to COVID-19 on log scale (as on 27 May 2020)

The physician can also monitor the efficacy of treatment by taking the patient's body temperature. However, the primary drawbacks of the present continuous body temperature measuring (CBTM) technology are labor requirements, movement noise, and reaction times. Additionally, there is a pain factor and waste of consumables associated with the conventional contact body temperature measuring method. In order to solve the aforementioned problems, a contactless infrared temperature sensor, the MLX90614 sensor, which measures temperature without even contacting the object, is used to provide a noncontact, automatic CBTM system. monitored real-time data via the Internet with timestamps. The problem with video calling is that it should only be done from a PC or PC on a work location. Consequently, patient health monitoring systems based on the Internet of Things use the internet to effectively monitor patient health and help. This limits the specialists' capacity to see patients, move freely throughout the activity theater, and, in certain cases, even pass through emergency clinic rooms. At order to address this problem, we have developed a virtual specialist robot and health status that enables a specialist to travel freely at a remote location and even communicate with people there when needed.

II. PROBLEM STATEMENT

In this time of COVID-19 pandemic situation the patient will be needing the doctor's attention is very much necessary and also there is a risk for the doctors of getting infected by the same virus is also high if they are not wearing any of the safety equipment's. A slight negligence in the safety precaution can affect the health of the doctors. So, to reduce this risk and ensure the safety of the medical officials we have a designed this robot which will ensure the doctor and patient conversation in a video conference without even getting into a physical contact.

III. LITERATURES SURVEY

Literature analysis will discuss about the published information in a particular field, it may be just a simple abstract of the sources, but it generally has a directorial prototype and it combines together the summary and synthesis. The crucial point in a literature survey is to recapitulate, sum-up and synthesize the influence and thoughts of different authors without adding up any novel contributions

2.1 Real Time Implementation of Virtual Doctor using Robot

Author: R. Ramadas

Technique: AVR Micro Controller

The primary goal of this paper is to develop a fully automated tool that can automatically distribute medication via a robotic arm and diagnose patients for a number of prevalent ailments. Currently, self-testing scenarios include temperature and blood pressure monitoring. Furthermore, there are very few medical facilities for people who reside in rural areas, and the majority of professionals and cutting-edge facilities are found in urban areas. The goal of this project is to create and put into use a dependable, affordable, low-powered, non-intrusive, and accurate system that can decrease the amount of labor required of humans to measure vital signs and diagnose abnormalities with the necessary prescriptions. The signal conditioning and data collecting of vital signs, such as body temperature, blood pressure, and heart rate, as well as the prescription of medications for conditions including cough and diarrhea, are the particular focus of this research. First, the patient and the Automatic Virtual Robot (AVR)-Doctor are asked to speak into a microphone about their age and the nature of their ailment using a code system (e.g., FEVER-01, BP-02), after which the appropriate medication is automatically dispensed.

2.2 Robotics Utilization for Healthcare Digitization in Global COVID-19 Management

Author: Zeashan Hameed Khan, Afifa Siddique and Chang Won Lee

Technique: Micro Controller

This article discusses how robotics is developing in the healthcare industry and related fields, with a focus on managing and controlling the spread of the new coronavirus illness 2019 (COVID-19). These robots are mostly used in hospitals and comparable facilities, such quarantines, to assure cleaning, sterilization, and assistance while reducing human-to-person interaction. This will lessen the risk to medical personnel's lives, and physicians will be able to actively participate in the COVID-19 pandemic management process.

In order to help hospital management maximize the use of medical robots for a variety of medical procedures, the current study aims to first highlight the significance of medical robotics generally and then to connect its utilization with the perspective of COVID-19 management. This is in spite of the fact that telemedicine is widely used and useful in comparable circumstances. Modern medical technology was, in essence, necessary for the Korean and Chinese health sectors to achieve their recent success in actively controlling the COVID-19 outbreak.

2.3 A literature survey of the robotic technologies during the COVID-19 pandemic

Author: Xi Vincent Wang , Lihui Wang

Technique: Micro Controller

The COVID-19 epidemic has been spreading globally since late 2019. The global health and safety of the general people, medical professionals, and medical systems around the world are seriously threatened by the epidemic. Using robots during the pandemic has been suggested globally as a way to enhance patient care and lighten the burden on the healthcare system. Still lacking, though, is a thorough and organized analysis of the robotic research related to the epidemic from the standpoint of technologies. As a result, a comprehensive analysis of the literature is done for this

study, looking at over 280 papers, with a particular emphasis on robots during the epidemic. This literature review's primary goal is to address two research questions: 1) what, from the standpoint of robotic technologies, are the primary research contributions to combat the pandemic, and 2) what promising supporting technologies are required both during and after the pandemic to aid in and direct future robotics research. The current state of robotic technologies is analyzed and debated in several categories, and the technology readiness level of the representative work is then determined. The next section highlights key technologies and research directions for the future, such as artificial intelligence, 5G, big data, wireless sensor networks, and human-robot cooperation.

IV. IMPLEMENTATION OF THE PROJECT

Fig. shows the block diagram of the "IoT Based Virtual Doctor Robot for Covid-19 Isolation Ward" AnNodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espress if Systems, ESP8266 Wi-Fi module which is mainly utilized for IoT-based embedded applications development. It is capable of handling various functions of the Wi-Fi network from another application processor.

With the MLX90614 contactless infrared temperature sensor, you can take an object's temperature without ever touching it. An integrated circuit chip called a motor driver is typically used to regulate motors in autonomous robots. An interface between Arduino and the motors is provided by the motor driver. The L293 series of motor driver integrated circuits, including the L293D, are the most often used ones. I2C LCDs: These screens employ the I2C communication interface. This means that the LCD display just requires four pins.

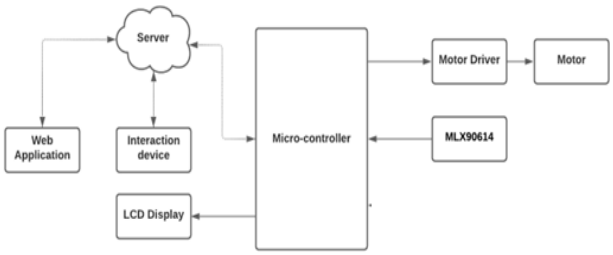


Fig 3 : IoT based Virtual Doctor Robot for covid-19 Isolation Ward

This project is to ensure a virtual support of the doctors to the patients. Hence there is an interactive device is attached with the robot which will provide the virtual meeting of the doctor and the patient without any physical contact. There is an IR based touchless temperature sensor is also attached to the system which will check the body temperature of the patient. There are also motors attached to the device that in the chassis which will help for the movement of the robot in and around the ward. By the help of this the interactive device like Tablet or mobile phone attached to the robot can move to the patient's bed. There is server connected with the device and web platform which will help the doctors to move the robot and control it and also to show the video feed from the Interactive device so that there is by using this robot doctor can avoid getting personal contact with the patients and can ensure the safety of the medical personals.

V. FLOW DIAGRAMS

A flowchart is a diagram that describes a process or operation. Flowcharts typically use standard symbols to represent different stages or actions within the chart.

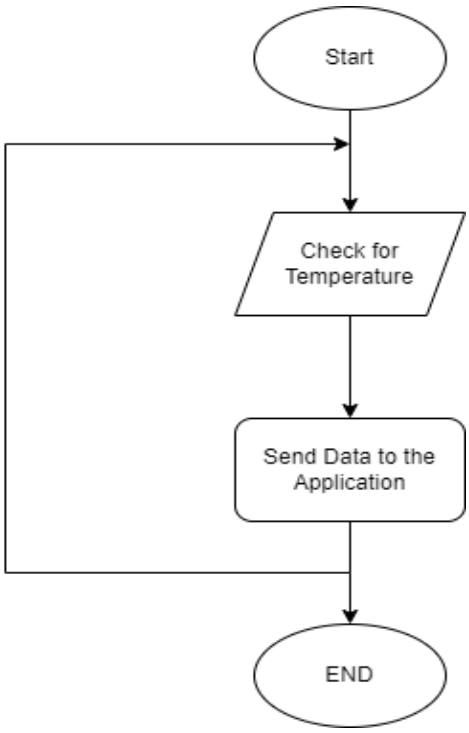


Fig 4: Touchless Infrared Temperature Sensor

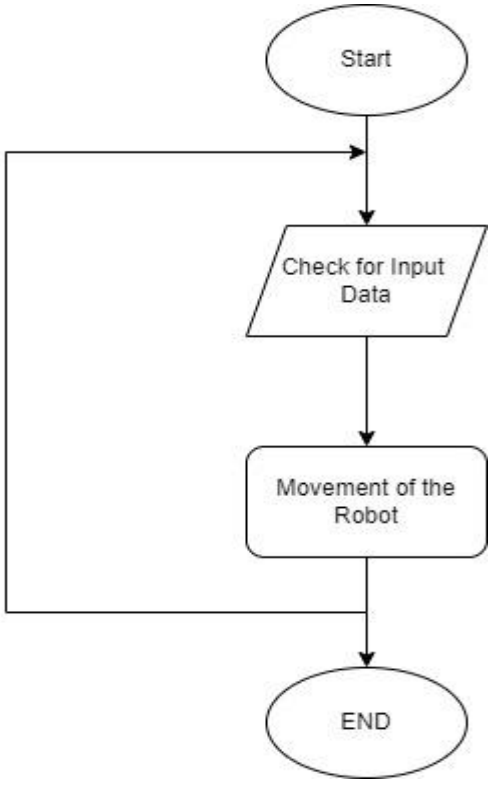


Fig 5: Controlling of the Robot

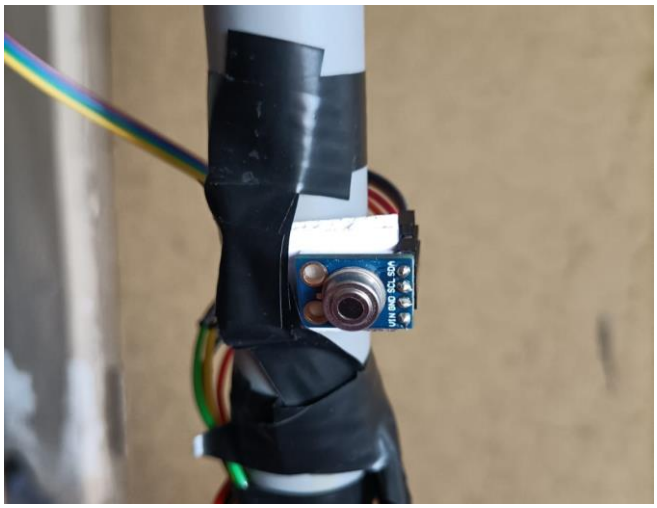
VI. RESULTS AND DISCUSSION

Model of Medical Assistant Robot

Fig 6: Model of Medical Assistant Robot

Fig shows the model of the of the Medical Assistant Robot. The model consists of 4 DC motors, Infrared temperature sensor, LCD Display. The DC Motors are used for the movement of the model. The Infrared sensor is used for the checking of the body temperature. And the Result will be displayed on the LCD Display.

Fig 7 :LCD Display



. **Fig 8:** Infrared temperature sensor

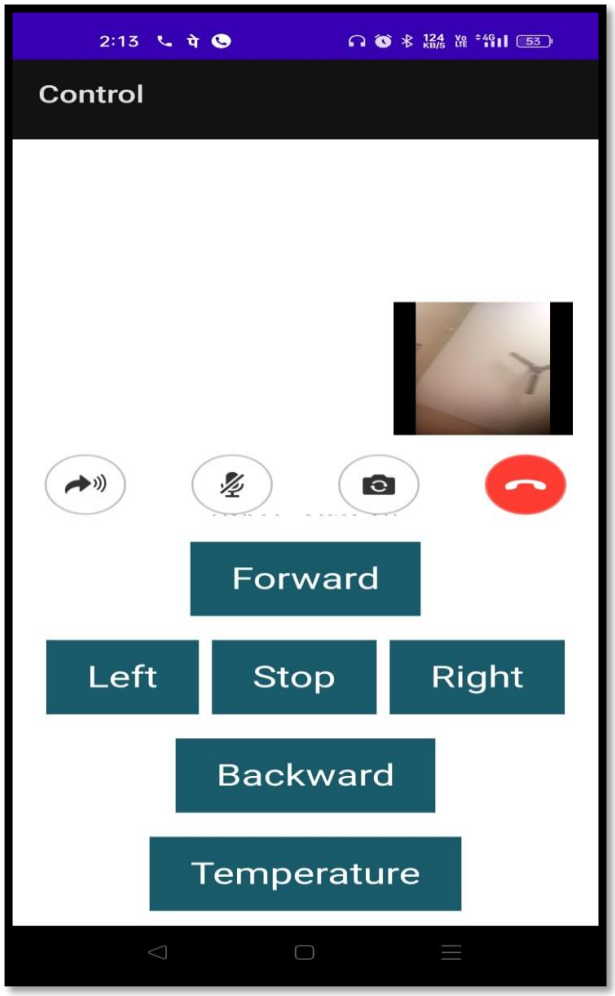


Fig 9: Control Application

Fig shows the Control application which is used for the doctors control the robot.

VII. CONCLUSION

Our country has a great history in providing medical facility at low cost. This can be extended to remote areas also by our innovative technology Medical Assistant Robot creates a great impact on the society and the health industry will drastically depend on bio-medical electronics like the proposed one which shall be implemented in every remote We have a long tradition of offering affordable medical care in our nation. Thanks to our cutting-edge technology, this may even be extended to isolated places. Medical assistant robots have a significant impact on society, and biomedical electronics like the one that is being suggested and will be installed in every isolated village in the state and nation will play a critical role in the health sector. People's lives are changing daily, and they anticipate technology innovations to help them solve their problems. This effort is special and will undoubtedly assist the underprivileged who are ignorant of the present health risks. "That's one small step for a man, one giant leap for mankind," as Neil Armstrong famously said. The goal of this research is to create humanoid robots that can help and heal patients in the future.

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