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Online Consultation through Virtual Assistance Robot Using IOT

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***Abstract*—** Doctors are needed to serve at hospitals and emergency center on all time at day and night. However it is not feasible to present doctor to be available at each place at desired time especially at quarantine. The problem with video calling is another risk that video calls needed to be done from PC or laptop on a desk. This situation may limit the doctor to monitor patient, view around operation theatre or even move around hospital rooms as on need. To resolve this problem, as well requirement of doctor consultation, virtual mode of consultation may provide for effective usage of guidance by doctors though their presence are not available at same place. This issue can overcome by extend thought of virtual doctor robot that allows a doctor to virtually move around at a remote location and even doctor can talk to people at remote location as desired. This robot provides a loT of advantages for patient as Doctors' available to consult at anyplace, at anytime. Doctors can monitor around in operation theatres the patients easily, they can see medical reports remotely via video calls, Doctors can virtually move around in other rooms to consult. This system makes use of robotic vehicle with 4-wheel drive for easy navigation. The robot also includes a controller circuitry and a mount to hold mobile phone or tablet. The mobile or tablet is used to hold live video calls. The doctor can use an IoT based panel to control the robot. The control commands sent online are received by the robot controller. The robot controller operates over Wi-Fi internet. The received commands are received in real time and the robot motors are operated to achieve the desired movement commands. Virtual Doctor Assist (VDA) is an emerging technology that uses IoT applications to enable remote patient consultations with healthcare professionals. With the help of VDA, patients can consult with doctors and medical specialists from the comfort of their own homes, reducing the need for hospital visits and minimizing the risk of exposure to infectious diseases. The robot collects the patient's data such as heart rate, blood pressure, and oxygen levels of the patient to start doctor's consultation.

Keywords: Robotic vehicle, Easy navigation, controller box, IoT based panel, robotic motors.

I. INTRODUCTION

There is a growing trend in the medical field to increase the need for hospitalization, as well several health care procedures from hospitals (hospital centric) to patient's homes (home centric). This strategy has been raised mainly due to its possibility for improving patient's wellness and treatment effectiveness. It can also reduce the costs of the public health system worldwide and its efficiency, which in the last decade has been challenged by the population, aging and the rise of chronic diseases. For this purpose IoT provides the scalability which supports continuous and reliable health monitoring [6-7][9][11] on a global scale. This paradigm is increasingly becoming a vital technology in low-power consumption, miniaturization, and biosensors has revolutionized the process of monitoring and diagnosing health conditions. For patients' de-hospitalization, the platform proposed initially was designed, by including wearable and unobtrusive sensors. The software is developed and the components are guided by the reference architecture for IoT based Health care applications [14][16] for a real Intensive Care Unit (ICU) and the inter operability with existing multiparametric monitors.

Doctors are usually needed to work at every hospital and emergency centre at all time. But it is not feasible for every doctor to be available at every place at desired time. The problem with video calling is that video calls need to be done from a PC or laptop on a desk. This limits the doctor's capacity to view patient

or around operation theatre at will or even move through hospital rooms as needed.

To help solve this issue we here develop a virtual doctor robot that allows a doctor to virtually [17][18] move around at a remote location at will and even talk to people at remote location as desired. This robot provides a whole lot of advantages for doctors: Doctors ability to be at anyplace anytime Doctors can move around in operation theatres Doctors can move around the patient with ease. Doctors can see medical reports remotely via video calls. Doctors can move around in other rooms with the system makes use of a robotic vehicle with 4-wheel drive for easy navigation. The robot also includes a controller box for circuitry and a mounting to hold a mobile phone or tablet. The mobile or tablet is used to hold live video calls. The doctor can use an IOT based panel to control the robot. The control commands sent online are received by the robot controller. The robot controller operates over Wi-Fi internet. The received commands are received in real time and the robot motors are operated to achieve the desired movement commands. Also, the root has other functions including battery status alert to remind of battery charging on time.

II. LITERATURE SURVEY

Mr.R.Ramadoss [1], the main objective of this project is to bring fully automated device to diagnose the patient for certain common diseases and dispense the medicines through Robotic arm automatically. A current scenario in self-testing is like BP monitoring, and temperature monitoring. Moreover, the medical facility is very less for those who live in remote areas and most of the experts and advanced facilities are available in urban areas. The scope of this project is to design and implement a reliable, cheap, low powered, non- intrusive, and accurate system that can reduce human effort in measuring vital signs and diagnose with required medications in case of abnormality.

Bikash Pradhan [2] The main aim was the study focused on the application of the IoT and robotics in providing healthcare services such as rehabilitation, assistive surgery, elderly care, and prosthetics. Recent developments, current status, limitations, and challenges in the aforesaid area have been presented in detail. The study also discusses the role and applications of the aforementioned technology in managing the current pandemic of COVID19. A comprehensive knowledge has been provided on the prospect of the functionality, application, challenges, and future scope of the IoT-aided robotic system in healthcare services. This will help the future researcher to make an inclusive idea on the use of the said technology in improving the healthcare.

Anita Chaudhari [3] This paper depicts the advancing job of mechanical technology in medical care and control of the spread of the COVID illness 2019 (COVID- 19). The heavenly utilization of such robots is to restrict individual to-individual contact and to ensure support in clinical facilities. This will achieve restricting the presence risk to clinical staff and experts playing a working position in the organization of the COVID-19 pandemic [8][12][15]. This robot gives benefits for specialists some like as: Doctors can move around in activity theatres. Specialists can see clinical reports remotely through video calls. Specialists can move around in different rooms. The specialist can use an IoT based board to control the robot. The control orders sent online are gotten by the robot controller. The robot controller works over Wi-Fi web.

A Virtual Doctor system [10][13] that enables an expert to essentially roam about any clinic space and have spoken conversation with patients helps with this problem. Such robots are used in healthcare settings to ensure assistance and to reduce individual-to-individual interaction. This may be accomplished by reducing the danger that the pandemic poses to clinical staff members and many other individuals who hold operational positions within the company. For professionals, this method has a number of benefits, including: In activity theatres, doctors will walk around. Through video chats, specialists will remotely see clinical records. Various rooms will be

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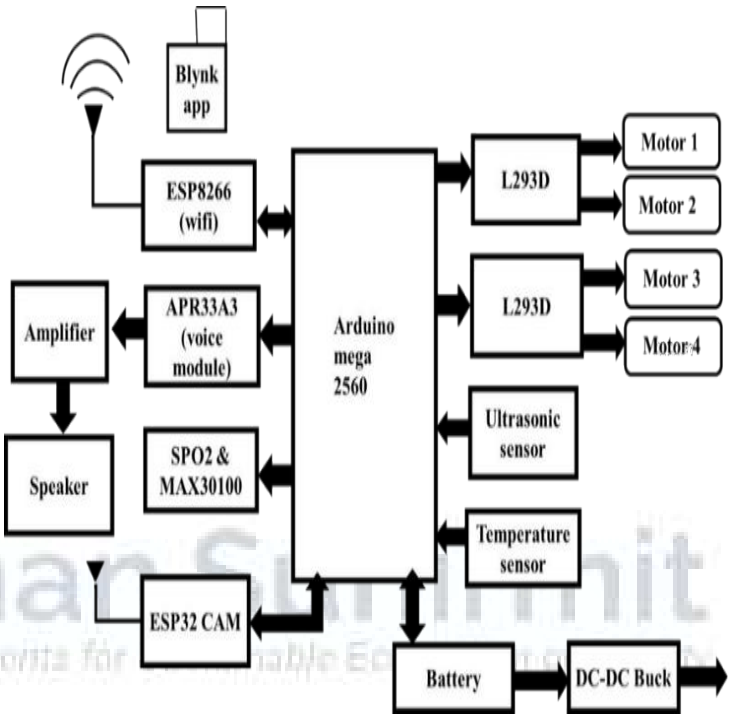
visited by specialists. The professional will control the mechanism using an IoT-based board. The mechanism controller receives the management orders given online. The device's Wi-Fi controller controls

Anuradha.M [5] IoT provides the scalability which Virtual Doctor Assist for Online Consultation Using IoT supports continuous and reliable health monitoring on a global scale. This paradigm is increasingly becoming a vital technology in healthcare. Furthermore, the recent progress in low-power consumption, miniaturization, and biosensors has revolutionized becoming a vital technology in healthcare. Furthermore, the recent progress in low-power. The recent progress in low-power consumption, miniaturization, and biosensors has revolutionized the process of monitoring and diagnosing health conditions. For patient de-hospitalization the platform proposed initially were designed, by including wearable and unobtrusive sensors. The software is developed and the components are guided by the Reference Architecture for IoT-based Healthcare Applications for a real intensive care unit (ICU) and the interoperability with existing multiparametric monitors.

III. METHODOLOGY

The major component of the Robot which is the Arduino mega2560 microcontroller which runs on battery power supply, that as to be charged and with DC-DC buck to control the power supply. It consists of ESP32 Camera which is used to see the real time situation. The robot having four wheels is controlled using L293D IC commands by which it can move around the patients, robot is controlled by doctor by monitoring on the screen using ESP32 camera. It consists of ARP3303 voice module through which the patient can listen is connected to the robot, ESP8266 consists of eight voice commands. It consists of r (heartbeat & Oxygen) sensor ad temperature sensor when touched the values are sensed ad displayed on LCD. The four wheels are controlled using motors which are connected to the controller via L239D module. Ultrasonic sensor is used to detect the obstacle, whenever it detects obstacle the robot stops, through speaker the voice can be heard and again commands should be given to start the robot. All this is connected through IoT platform called BLYNK App.

Fig 1: Block diagram



IV. HARDWARE AND SOFTWARE REQUIREMENTS

Hardware Requirements

1. Arduino ATmega 2560
2. APR3343 (voice module)
3. DC Gear Motor 30rpm
4. ESP8266 (WI-FI)
5. ESP32-CAM (Camera)
6. L293D (motor driver IC)
7. Ultrasonic Sensor
8. SPO2 & MAX30100 Sensor (heartbeat & oxygen)
9. DC-DC Buck
10. Speaker
11. Wheelers

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Software Requirements

1. Arduino Sketch IDE 1.8.1 or higher version
2. Blynk app

V. DESCRIPTION OF HARDWARE COMPONENTS

A. Arduino ATmega 2560

Arduino Mega 2560 which is a microcontroller board based on the ATmega2560 microcontroller, which is a powerful 8-bit AVR (Advanced Virtual RISC) microcontroller developed by Atmel (now owned by Microchip Technology Inc.). The Arduino Mega 2560 is one of the popular members of the Arduino family, known for its extensive input/output (I/O) capabilities, making it suitable for a wide range of projects that require a larger number of I/O pins.

B. ESP8266

ESP8266 which is a popular and widely used Wi-Fi module that offers wireless connectivity capabilities for embedded systems and IoT projects. It is a low-cost, low-power, and highly integrated system-on-a-chip (SoC) that combines a microcontroller with Wi-Fi capabilities, allowing devices to connect to Wi-Fi networks and communicate over the internet. The ESP8266 was developed by the Chinese company Espressif Systems and has gained widespread popularity due to its ease of use, affordability, and extensive community support. It comes in various versions, including the ESP8266-01, ESP8266-07, ESP8266- 12E, and ESP8266-12F, each with different pinouts, features, and capabilities

C. APR33A3 Voice Recorder and Play back Module

APR33A3 which is a voice recorder and playback module designed for recording and playing back audio in various applications. It is manufactured by Integrated Systems Development (ISD), a company specializing in providing integrated voice solutions. The APR33A3 module is widely used in applications such as voice messaging systems, security systems, interactive toys, medical devices, and more. The APR33A3 module features a compact form factor and easy-to-use interface, making it suitable for embedded systems and other applications where audio recording and playback are required.

D. L293D IC

L293D which is a popular integrated circuit (IC) used in electronics and robotics for driving DC motors and stepper motors. It is a versatile motor driver IC that provides bidirectional control for up to four DC motors or two stepper motors. The L293D is commonly used in applications such as motorized vehicles, robotics, automation, and other projects that require precise motor control.

E. ESP32-CAM

In ESP32-CAM that is a popular development board based on the ESP32 system-on-chip (SoC) from Espressif Systems, a leading manufacturer of IoT (Internet of Things) solutions. The ESP32-CAM is specifically designed for camera applications and provides a convenient and cost-effective solution for adding camera functionality to IoT projects. The ESP32-CAM development board features an ESP32-WROVER module, which integrates an ESP32 SoC, a camera module interface, and other components necessary for camera applications. The board also includes a camera module that is compatible with the OV2640 camera sensor, which supports JPEG image encoding and provides a resolution of up to 2 megapixels

F. SPO2 Sensor

SPO2 sensor, also known as a pulse oximeter sensor, is a medical sensor used to noninvasively measure the oxygen saturation level (SPO2) in the blood. It is a key component in pulse oximeters, commonly used in healthcare settings for monitoring patients' oxygen levels. SPO2 sensors use photoplethysmography (PPG) to measure changes in light absorption and reflection to determine oxygen saturation levels. They are widely used in medical applications for monitoring respiratory and cardiovascular conditions, as well as in fitness and sports monitoring devices.

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V. WORKING OF PROPOSED MODEL

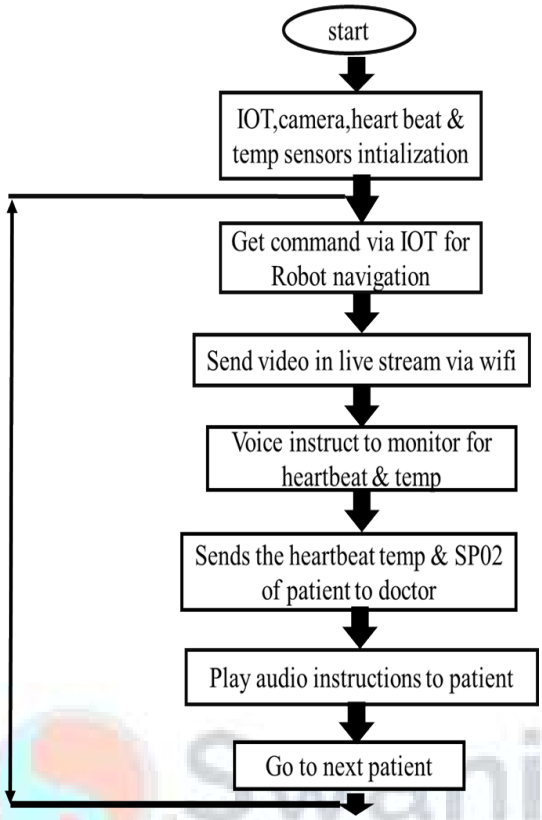

Fig 2. Flow chart of proposed working model

The virtual doctor assistant robot system is designed to work with 12V of power supply, connected with IoT- based remote control machine to monitor the patient health with support of Blynk App. The hardware components are connected with control of sensor circuits, scrollbar speed control circuit on servo motor and with remote control. In part of hardware, Arduino mega 2560 connected components with internet. The performance parameter is send via Arduino Atmega through internet by provide instructions using Blynk App, as well to receive sensors output similarly. Blynk app records the reading data and to display through mobile/tablet. Proposed working model is given figure 2.

The Arduino Atmega 2560 and Wi-Fi ESP8266 has the additional pin configurations for Serial clock (SCL), Serial Data (SDA), Input voltage (VIN) and Ground (GND) to connect with MAX 30100 Pulse Oximeter, SPO2, heart rate sensor, MLX90614 Temperature sensor, Ultrasonic sensor for robot movement, APR33A3 Voice module, and ESP32 CAM system. DC-DC buck converter is connected with battery. To control the robot, the doctor can use an IoT-based panel. The control based instructions are receives by virtual assistant robot, which transmits over through internet. The robot wheel assessment is control through servo motor by pair connectivity of wheels in L293D connectors to activate appropriate movement allocation.

Hardware model of virtual doctor robot is shown in Figure (3).

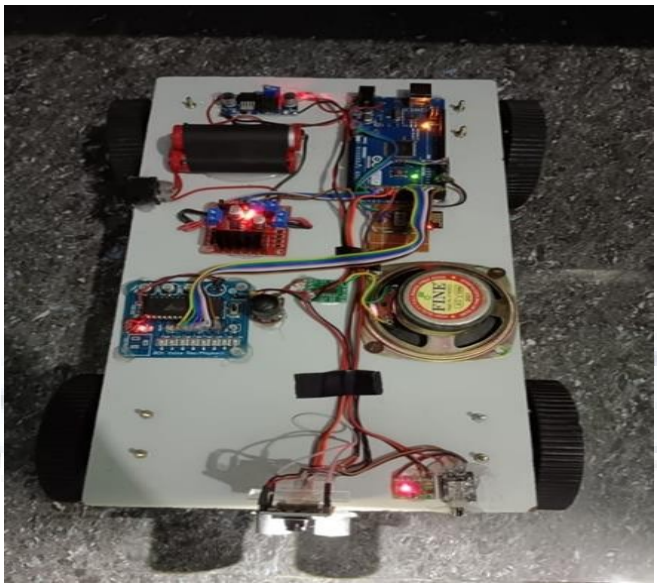

Fig 3: Hardware model of virtual doctor robot

VI. RESULTS

The Proposed system monitors various physical body measurements of the patients and referred prescribed medicines related to that. We measured human body temperature and oxygen level by pulse oximeter using SPO2 sensors. The measurement parameters are displayed in the smart phone and used to observe by doctors to do online consultation. The standard measurable levels of SPO2 is 95-100%, the body temperature for normal person is 36ºC. The blood pressure level for normal person is 80-120mmHg. With reference to the above standard measurement the virtual doctor robot is designed and is been tested with sample for patient

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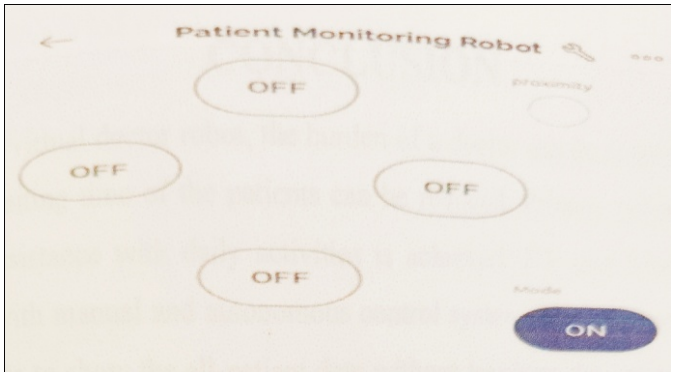

Fig 4: Mobile control of virtual assistance robot

Through mobile control the virtual assistance robot is operate by doctor and reading are measured recorded by Blynk application (Fig(4)), and

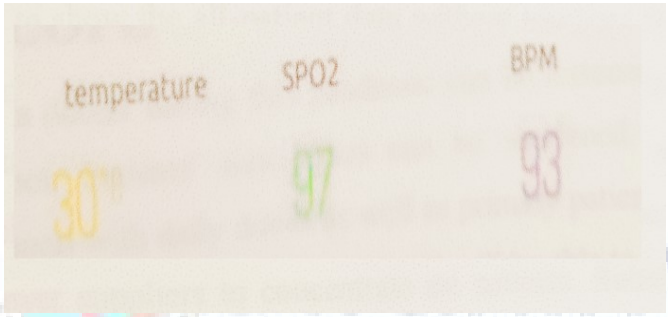

Fig 5: Patient health monitoring system by Blynk App

received following reading through Blynk app as: The parameter measurement of temperature is 30 degree Celsius, SPO2 sensor measurement value is 97 and the blood pressure value measured is 93. Used by above readings, doctors can consult prescribed medical treatment for the concern of patient with particular time. These parameters are saved and used for future references.

VII. CONCLUSION

The workload for a doctor during this pandemic can be lessened by utilizing a loT based virtual doctor robot. Patients' wait times can be shortened. It is feasible to provide compassionate support with daily duties as well as primary patient monitoring. Thanks to the Internet of Things, doctors from all over the world will be able to video chat with patients and see all of their data. With the integration of wearable devices and artificial intelligence algorithms, patients can receive real-time feedback and personalized recommendations based on their health status. The expansion of telemedicine will also make healthcare more accessible and affordable, particularly for those in underserved communities. Virtual assistants can help patients manage chronic conditions more effectively and reduce the need for in- person consultations and hospitalizations, Overall, the potential for virtual doctor assistants using IoT is significant, and we can expect to see more sophisticated and effective applications in the future.

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