Medicine Delivering and Patient Parameter Monitoring Robot-MedRobo

Mr. Rathod G. G.[1], Miss. Navale Diya[2], Miss. Navale Pranita[3], Miss. Thitame Payal[4]

Professor, Department of Electronics & Telecommunication[1]
Students, Department of Electronics & Telecommunication[2,3,4]
Amrutvahini Polytechnic, Sangamner, India

Abstract*: The advent of robotic assistance in healthcare settings offers a transformative approach to managing and enhancing patient care, especially in environments burdened by infectious diseases and staffing shortages. In this paper, we propose a robot named MedRobo with some functionality of providing medicine as well as to measure the vital parameters (Heart rate, Pressure, Temperature) of the patient. During the current scenario, reducing the human to human contact in hospitals is required. In a bid to prevent doctors and medical staff from getting affected by Coronavirus, the role of medicine delivering robots is evolving. The movement and finding the path to patient location is done through a line follower. Line following method is used to identify the path with help of two infrared sensors. Using the vending machine the medicine delivery is made possible to the patients. All the measured parameters will be sending to care taker person's mobile application through Bluetooth module.*

Keywords: Medicine Delivery, Healthcare, Patient Parameter Monitoring, Robotics, Android Application

I. INTRODUCTION

In recent years, the healthcare industry has shown rapid growth and has been a major contributor to revenue and employment. A few years ago, the diagnosis of diseases and abnormality in the human body was only being possible after having a physical analysis in the hospital. Most of the patients had to stay in the hospital throughout their treatment period. This resulted in an increased healthcare cost and also strained the healthcare facility at rural and remote locations. The technological advancement that has been achieved through these years has now allowed the diagnosis of various diseases and health monitoring using miniaturized devices like smartwatches. The use of such communication services in conjunction with the rapidly growing technologies (e.g., machine learning, big data analysis, Internet of things (IoT), wireless sensing, mobile computing, and cloud computing) has improved the accessibility of the healthcare facilities.

The utilization of robots like MedRobo can play a pivotal role in handling routine tasks, such as delivering medication and monitoring patient vital signs, thereby reducing the workload on human staff and limiting their exposure to potential health risks. This research delves into the capabilities and benefits of implementing a robotic system specifically designed for use in hospital settings to address both operational efficiency and patient safety concerns. The integration of advanced technologies such as RFID, IoT, and automated navigation systems into healthcare services provides a glimpse into the future of medical care, where technology and health management converge to create safer, more efficient hospital environments. This paper will explore the background, objectives, and scope of the MedRobo project to establish a comprehensive understanding of its potential impact on modern healthcare.

II. LITERATURE SURVEY

The synchronization between IoT and robotics, It talks about the technologies in IoT that would benefit the robotics domain. The advent of Cloud Robotics and its role in aiding robot functions like sensing, manipulation, and mobility. IoT-aided robotic applications are discussed in various domains like health-care, military, industrial plants and rescue operations. This concludes by considering the use case of an Intelligent Transportation System endowed by an IoT-inspired architecture. The introduction of Robots and IoT made the industries and firms fully smart automated and digitalize [1]. In other perspective, robots were also serving medical sectors since many years successfully in heart

surgeries, fighting cancer cells etc. and making the footprints for further research and developments. An attempt is made to highlight the methods and applications of Robots & IoT in large extent in medical and societal areas to safeguard from corona virus [2].The path to a mature development of IoT aided robotics applications requires several pivotal issues to be solved, design methodologies to be consolidated, and strong architectural choices to be discussed, In particular, the present contribution is four-folded. First, it provides a solid state of the art on the main topics related to IoTaided robotics services: communication networks, robotics applications in distributed and pervasive environments, semantic-oriented approaches to consensus, and network security [3]. In this paper, an idea to improve the current status of health care worldwide through automation and robotics has been propounded. Health Care & proper monitoring is the most integral part of medication as it is the recovery stage of the patient [4].

The comprehensive requirements for updating the healthcare system, this presents a novel system framework and designed aIoT robot which based on cloud technology and Internet of Things. The system based on multi-core embedded system, communication protocol, and cloud technology [5].The experimental results show that the well performance and feasibility of the system. The study in recent advancements in technology and the availability of the Internet make it possible to connect various devices that can communicate with each other and share data. It discusses a new semantic model for patients' e-Health. The model named as makes use of layers; the sensor layer, the network layer, the Internet layer and the services layer. All layers cooperate with each other effectively and efficiently to provide a platform for accessing patients' health data using smart phones [6].

The paper presents [7], finding the path using line following method which identifies the track with the help of two infrared proximity sensor and using cards identifies the room number of the patient. It can also monitor the pressure and temperature levels of the patient and record it in the hospital patient database by incorporating a pressure and temperature sensor in it which is an added advantage in this model. This shows that it provide stable and reliable system and keeps the manufacturing cost low.A fleet of autonomous mobile robots are used in the hospital for the delivery service [8]. To increase the efficiency of using multiple robots, an appropriate task allocation algorithm is required. The indoor service robot which has the capabilities to follow human commands and handle emergency is designed and implemented. A location algorithm of the robot based on the wireless sensor network is proposed. Stability of the proposed home monitoring system in long time monitoring tasks is tested [9].Automatically classifying affective and informative. Various websites today provide medical information and this information can either be affective or informative, contains information which are facts and information which are opinions from a fellow patient, doctor or nurse who try to analyse the given query and give an opinion [10]

III. METHOD OF DISEASE DETECTION

Our project MedRobo is an alternate solution to the difficulties faced by the hospital staff in treating the coronavirus positive patients, who raised this problem. It checks the important parameters of the patient such as temperature, heart rate without the involvement of humans or by avoiding the direct contact of hospital staff with the patients. By using the reference parameters which are given to the system, will compare with the measured parameters. Then the recorded parameters data will be sent to the doctors through the Android application via Bluetooth module. The movement and finding the path to patient location is done through a IR Sensors. Also can re-evaluate and view the data's of individual patients after a particular interval of time to make sure that all those patients suffering from coronavirus are feeling better and are in good condition.
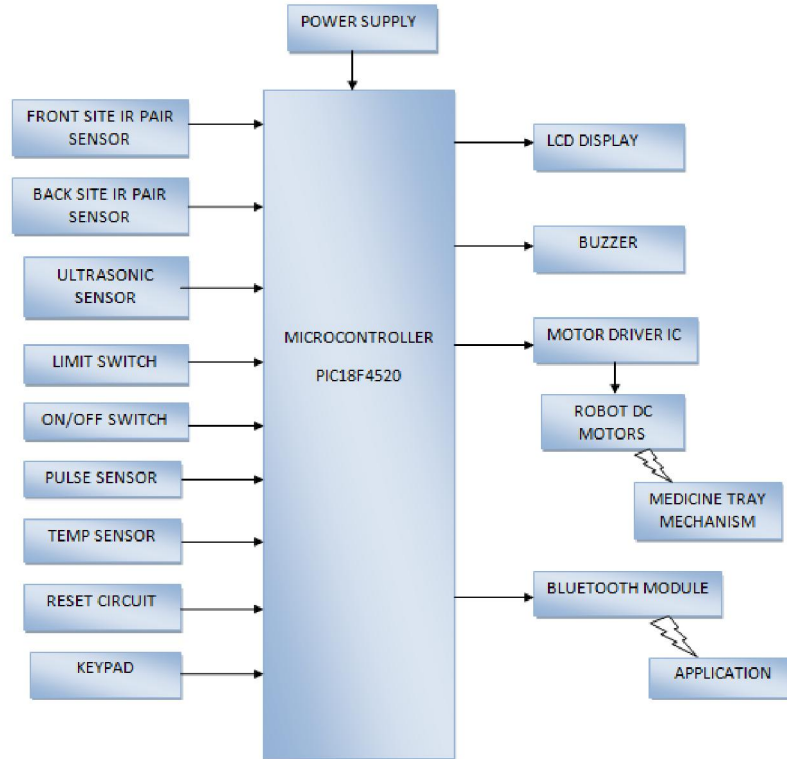
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Fig. 1. Block Diagram

A. PIC18f4520 Microcontroller

PIC18f4520 is a 40 PIN Micro-controller from Microchip with 13 channel 10 bit Analog to Digital Converter.

Special PIC18f4520 Micro controller Features

- Up to 10 MIPS Performance at 3V
- C compiler optimized RISC architecture
- 10-bit ADC, 13 channels, 100K samples per second
- Programmable Low Voltage Detection Module
- Master Synchronous Serial Port supports SPI™ and I2C™ master and slave mode
- EUSART module including LIN bus support
- Four Timer modules
- Up to 5 PWM outputs

Fig. 2. PIC 18f4520

B. Pulse Sensor

Heartbeat sensor provides a simple way to study the function of the heart which can be measured based on the principle of psycho-physiological signal used as a stimulus for the virtual- reality system. The amount of the blood in the finger changes with respect to time.

The Sensor is Based IR moulded in silicon, So Once the Finger is inserted Heart Beat will not miss t. In order to calculate the heart rate based on the blood flow to the fingertip, a heart-rate sensor is assembled with the help of OP-AMP for monitoring the heartbeat pulses.

Fig. 3.Thumb Pulse Sensor

C. Temperature Sensor

- HC-05 LM35 is a temperature measuring device having an analog output voltage proportional to the temperature.
- It provides output voltage in Centigrade (Celsius). It does not require any external calibration circuitry.
- The sensitivity of LM35 is 10 mV/degree Celsius. As temperature increases, output voltage also increases. E.g. 250 mV means 25°C.
- It is a 3-terminal sensor used to measure surrounding temperature ranging from -55 °C to 150 °C.
- LM35 gives temperature output which is more precise than thermistor output

Fig. 4.Temperature Sensor

D. IR Sensor

MQ IR sensor is an electronic device that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the **infrared spectrum**, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations.

Fig -5: IR Sensor

E. Bluetooth Module

- The HC05 bluetooth module is used as UART serial converter module and can easily transfer the UART data through the wireless bluetooth.
- The Bluetooth module has a Frequency: 2.4GHz ISM band, PIO control and comes with an integrated antenna and edge connector.
- The HC-05 bluetooth module can be used in master or slave configuration.
- Package Content: 1 x HC05 Bluetooth Transceiver Module
- You can use it simply for a serial port replacement to establish connection between MCU and GPS, piece to your embedded project and etc.
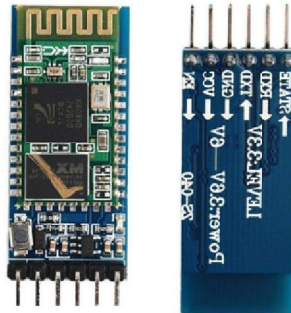
Fig. 6. HC05 Bluetooth Module

F. Display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.
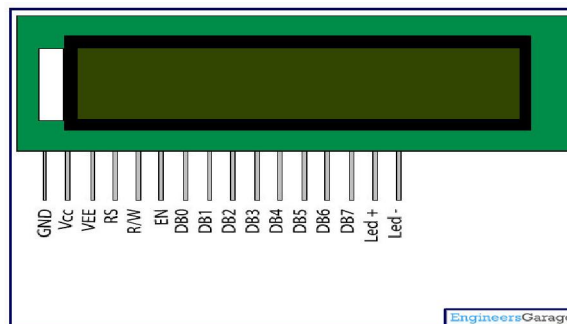

Fig. 7.LCD Display

IV. CONCLUSION

Medical Robot, the innovative medicine-delivering and patient monitoring robot, stands as a significant advancement in the real time of healthcare technology. Developed to address urgent needs in hospital settings, particularly under the extraordinary circumstances imposed by the COVID-19 pandemic, this robotic system serves a dual role. It not only ensures the safe delivery of medication directly to patients but also monitors vital health parameters accurately the implementation of systems such as Bluetooth tracking and line following for navigation, combined with the integration of Android application, enhances the operational efficiency of healthcare services while minimizing the risk of virus transmission among hospital staff and patients. The extensive testing phases have validated Medical Robots

functionality and reliability, indicating that it is well-equipped to assist in daily medical tasks and emergency responses effectively. As healthcare continues to evolve with technological innovations, Medical Robot can be seen as a forward step towards safer, more efficient patient care, setting a benchmark for future developments in medical robotics.

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