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Health Tracker Using IOT with Automatic Nurse Assistant Robot

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Abstract

As innovation upgrades it turns out to be less expensive in cost, more open, and easy to use by all, its applications are progressively profiting all the industrial sector and more in a medical services industry... In order to expedite the process, from disease diagnosis, regular health monitoring to drug delivery while handling pandemics like Covid-19 and emergencies, the use of the latest technology may become the game-changer. In this project, we are proposing an "Automatic Nurse Assistant Robot". It will enhance the performance of medical staff and empowered them to tackle medical emergencies efficiently. The new carrier robot uses a health tracker system-based IoT platform to analyze all the real-time data related to the patient, such as oxygen level, pulse rate, and Temperature, etc. The primary objective of the project is to take care of and track the wellbeing boundaries of the patient's health condition by the use of voice commands, text commands, and also from the database of a cloud server (Adafruit IO, Google Assistant, and IFTTT) with a high level of security by the use of Relays and Sensors over the Internet. The project incorporates some advanced sensors like an oximeter sensor, ECG sensor, and Infrared sensor with LCD. The Internet of Things technology is used to store and retrieve data through the Internet or local areas using HTTP and MQTT protocols. The main goal is to create affordable smart automation so that it reaches out to all sections of the society.

KEYWORDS - Arduino, MQTT, Adafruit IO, IFTTT, Google Assistant

INTRODUCTION

The health care system of India has suffered drastically in this global pandemic COVID-19. The system needs revolutionary changes to mitigate the effects Covid-19 or any future pandemic. Owing to this, the health care personnel have found themselves helpless to save many innocent lives. Besides this, health care system is unable to cope up with me with menace of COVID-19, which leads to a rise in the case of death of patients and spreading of infections. In a developing country such as India, where population density amounts to 1,389,382,743 and comprising just 20 health workers per 10,000 people, it is a challenge for doctors and paramedical staff to take utmost care of every single patient. This problem requires immediate attention of health care services for people of all age groups and all the locations, be it in

urban areas or rural areas. During the Covid -19 situation where the hospital environment was quite stressful and mental trauma of the doctors and associated health staffs were all-time low while expectation from the service was an all-time high. Due to their 24-Hours work culture in challenging times, efficiency slumps exponentially. This reduction had also affected the quality of services provided to Covid patients, and other problems observed that the immediate family members outside the Hospital are unable to get the latest health updates of their admitted relatives due to increased admission intake in Hospitals. Moreover, Government protocols on covid-19 need to be followed for the safety and precautions of health care personnel. These extreme situations on part of medical personnel can be better handled by the use of the latest technology like the Automatic Nurse Assistant Robot. This project will be beneficial for people residing taking medical treatment in both village and city hospitals, where dealing with the critical problem is altogether different. The absence of professionals and machinery is taken into consideration while designing the overall model.

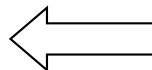
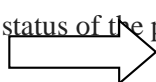
Robots provide those facilities to use with the help of which we can reduce human fatigue and provide a better secure environment to medical personnel to focus their work on increasing accuracy and decision-making situations. Robots can be used to do repetitive work in a well-organized manner with great accuracy without any carelessness in work, just needed proper maintenance and services to them. This project titled, '**Health Tracking using IoT with Automatic Nurse Assistant Robot**' is the amalgamation of IoT-based environment with robotics along with the latest wireless technologies. The major advantages of this project are handling and analysis of real-time data by reflecting the new information pattern of IoT, cost-effectiveness, and low power requirement.

PROJECT METHODOLOGY

The scope of this project targets only the patients being admitted in General wards of Hospitals. The idea is to upgrade them into a specialized general ward in which we can implement this project in healthcare technology. The motion of the robot will help to provide food and medicine to the patient. It will also monitor the patient oxygen level, pulse rate, and temperature sensor. The current monitored data is collected and sent to concerned medical authorities in the Hospital. If the patient is in critical condition, it alerts those authorities about the critical condition of the patient. The framework is executed by utilizing the Arduino-Uno module that empowers us to utilize different sensors for taking data through pins.

The functioning interaction of Automatic Nurse Assistant Robot (ANAR) can be streamlined as follows:

1. The patient will have an RFID card that contains a unique patient identity and all the necessary information regarding the patient's health condition is stored in it.
2. If any new patient will be admitted to the ward, then this ANAR will be updated for new user Id.
3. To monitoring the health parameters of a patient in the ward, ANAR will reach to each patient in the specific ward and ask the patient to pass their RFID tag in front of the RFID reader so that it can open the database of that user only.
4. After the successful identity verification of a patient id, it instructs patients to place their fingers on health-tracking sensors.
5. Sensors mounted on ANAR will Read the data from the patient body and will upload and store it on a cloud platform like Thingspeak.
6. After Successfully storing the data on the cloud, it will be easy for the medical personnel and family members to live track the current health status of the patient.



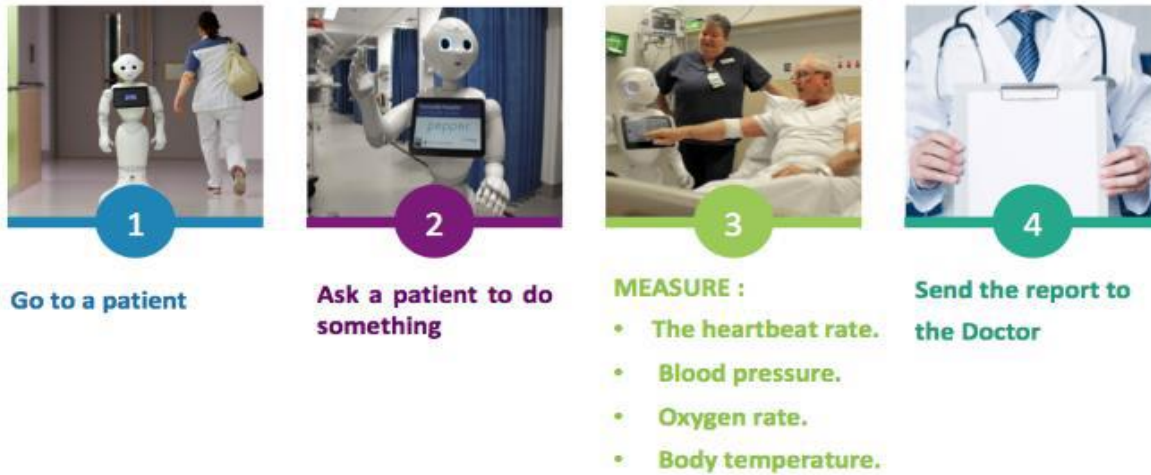


Figure 1. Simple description of the

System Description

1. 1 System Design

The figure shows the design of the proposed ANAR project

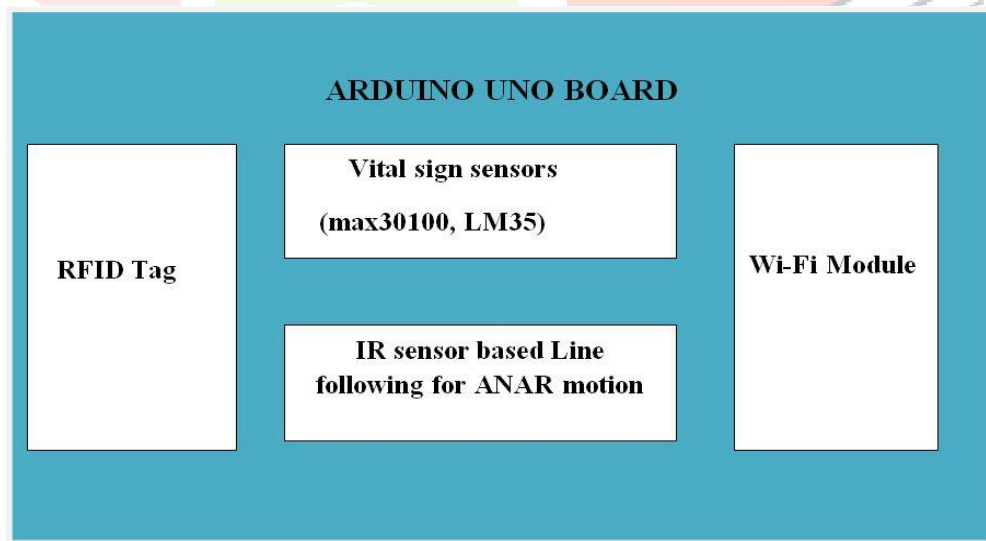


Figure 2. System Architecture

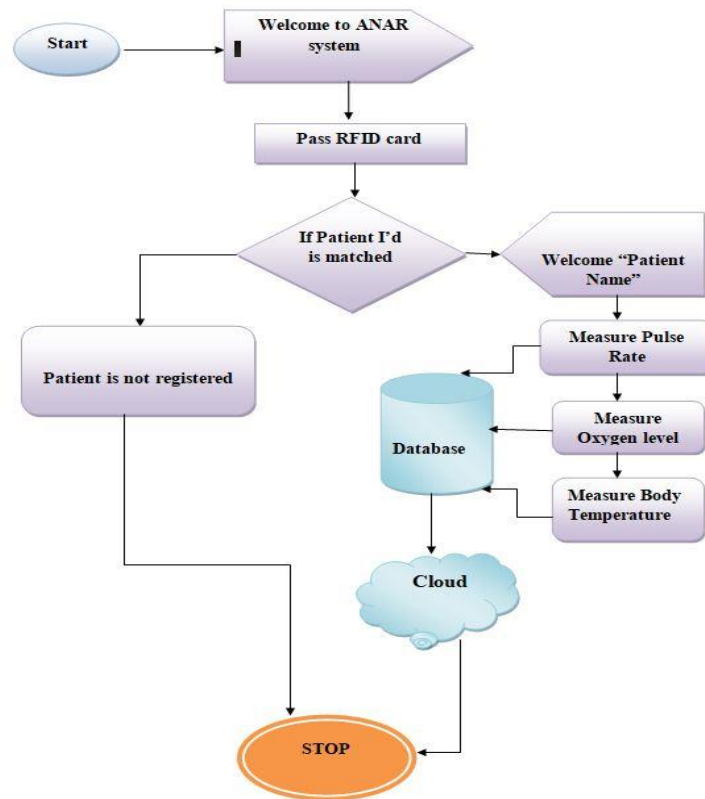


Figure 3. Flowchart of a Automatic Nurse Assistant Robot

1.2 Component Specification

- 1- **Arduino Uno (Microcontroller):** It is an ATmega328 microcontroller. Its input voltage is 7 to 20V, it incorporates digital I/O pins -14 and analog input pin - 6, clock speed is 16MHz, flash memory is 32KB.
- 2- **MAX30100:** It is a Pulse Oximeter and Heart-Rate Sensor module its operating voltage is 1.8V to 5.5V and the interface type is I2C, it has 7 Pins.
- 3- **ESP8266:** The ESP8266 is a minimal expense Wi-Fi computer chip, with a full TCP/IP stack and microcontroller ability. It is generally utilized for making the use of the Internet of Things (IoT) inserted applications easily. The ESP8266 is prepared to do either facilitating an application or offloading all the Wi-Fi organizing capacities from another application processor.
- 4- **LM35:** LM35 is an incorporated simple temperature sensor whose electrical output is corresponding to Degree Centigrade. LM35 sensor doesn't need any outside adjustment to give an exact result.
- 5- **RC522:** The RC522 is an RFID (Radio-frequency identification) it is a coordinated reader/writer IC for contactless communication at 13.56 MHz and it works at 3.3V.

1.3 Software Implementation

Arduino IDE: Arduino IDE is an Open-source stage for the programming of the Microcontroller that will be utilized to control the project. It's transferred to the Node MCU ESP8266 Board and runs on Windows, Mac OS X, and Linux.

Adafruit Server IO: Adafruit IO is a framework that makes information helpful. Our attention is on convenience and permitting basic information associations with programming required. IO incorporates customer libraries that MQTT APIs.

Google Assistant: With the help of Google assistant, we can operate the devices using Voice Command and also used the type option for controlling the devices by the Internet.

IFTTT Server: IFTTT is known as though If This Then That. IFTTT is free online support of make chains of simple conditioning statements, called applets. Also, merge two servers like Adafruit IO and Google Assistant for triggering the device.

MIT App Inventor: MIT App Inventor for Android is an open-source web application. It depends on Visual Programming Language no coding is needed for fostering the Android Application for working the gadgets.

1.4 Technical Specification

1.4.1 RC522:

As mentioned above for reading unique patient ID, RFID sensor RC522 is used. RFID scanner is embedded in the robot and the patient has to scan the RFID card as per the instruction of the robot.

RFID functions on two main components a transponder and a transceiver. The reader comprises of a receiving wire and radio recurrence module which produce high recurrence electromagnetic field, and a tag is a gadget which comprises of a CPU that store and execute data and a receiving wire to get and send a signal.

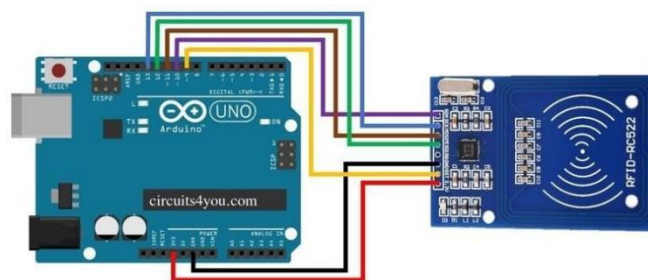


Figure 4.RC522 Arduino Shield

1.4.2 MAX30100:

MAX30100 is incorporating a heartbeat oximeter and Heart rate screen sensor. It consolidates two LED's, a photograph locator and low noise simple signal to distinguish heartbeat oximeter and pulse signals. It works from 1.8 to 5.5V.

The gadget has two LED one producing red light with frequency 650nm and one discharging infrared light with frequency 950nm and just infrared LED is utilized for pulse rate, and both red and infrared is utilized to quantify oxygen level of blood. It estimates the pulse rate as expansion in oxygenated blood and when the heart unwinds there is a decline in oxygenated blood and by knowing the time among increment and diminishing in oxygenated blood, the pulse rate can be estimated.

For estimating oxygen level both LED's are utilized as oxygenated blood absorbs more infrared light than red light and deoxygenated blood ingests more red light when contrasted with infrared light and oxygen fixation can be effortlessly determined by seeing the amount of Red light is retained when contrasted with infrared.

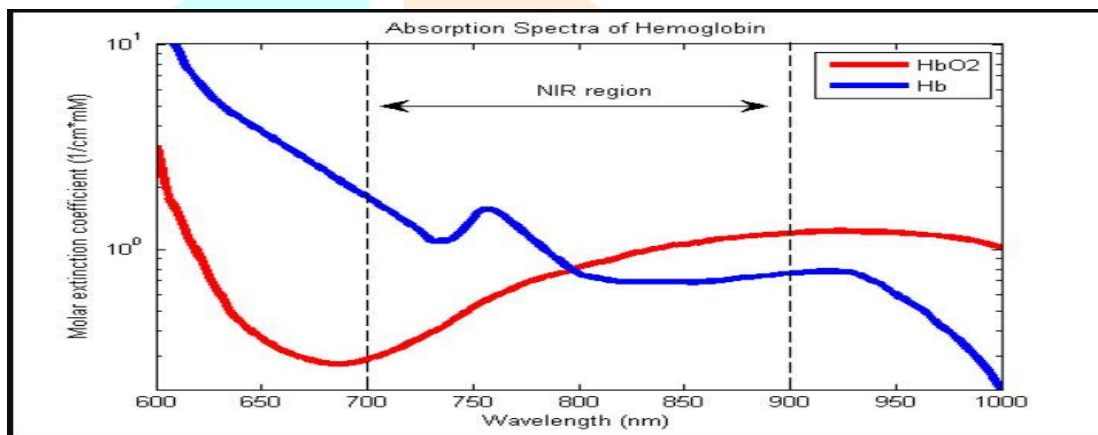


Figure 5. Absorption Spectra of Hemoglobin

1.4.3 Transmission of data

For wireless transmission of data from a microcontroller to the cloud and other devices, Wi-Fi microchip ESP8266 is used. It operates on a 2.4GHz frequency, and the operating voltage is 3.3V.

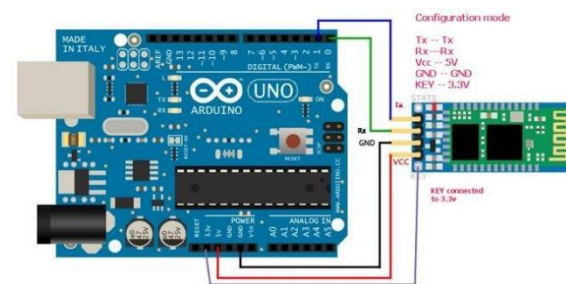
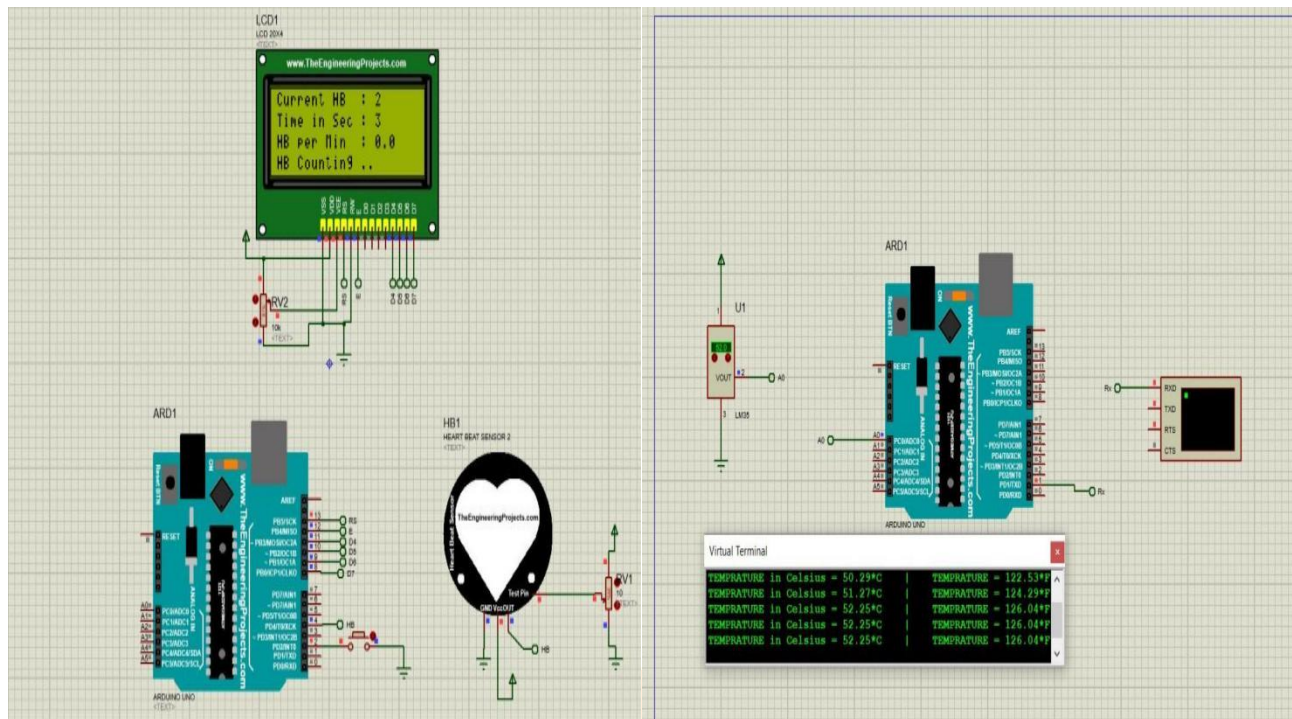


Figure 6. Bluetooth shield

Simulation Result




Conclusion

This project will assist health workers while handling emergencies. It is going to provide full-time monitoring of the patient under critical care, without compromising on social distancing between the patient and the medical staff. It seeks to bring transparency into the hospitals where a patient's health wellbeing can be observed constantly on the server. Though automated partners can't supplant fundamental human contacts and intense subject matters, they will bring accuracies and overall efficacy into the system. The robot will provide a new dimension to the changing healthcare technology. It will reduce the workload, mental stress of the health worker while dealing with pandemics like Covid-19.

This project will address problems of the health care services while dealing with the pandemic type of situation like Covid-19. Further, it will handle problems related to elderly health care, appointment, testing, treatment, and e-medicine. Development and Enhancement of the Medical sector is the key aspect that needs immediate attention, especially during Covid-19. The medical facilities must reach the common man and enhance our medical facilities more efficiently and also comes under the Government Program of DIGITAL INDIA and SMART CITY mission. By automating healthcare processes, hospitals can enhance clinical precision, reduce human error, improve patient satisfaction, and increase practice productivity. In doing so, they'll also be able to offload a considerable amount of their staff's clerical responsibilities — freeing them up to focus on their more highly skilled work. Ultimately, these advantages should not be limited to improving the clinical care's benefit, but also, to update and improve the quality and practicality of care.

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