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IOT based virtual Doctor and Human care Robot

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Abstract : Doctors are usually needed to work at every hospital and emergency centre every now and then. 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 doctors 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 move around at a remote location at will and even talk to people at remote location as desired. Now-a-days there is an increase in elder adult population that should be capable of taking care and need a close monitoring in an emergency situation. There is more demanding for smart system like health monitoring emergency system. This paper proposes a smart health monitoring robot system to provide a secure emergency solution to elder people that is living alone at their home. An intelligent smart real-time connected video communication between patient and doctor and there is a wireless Bluetooth connectivity or wifi connected robot system which can be controlled by the remote. The smart robot system will detect the health, alarm in emergency situations

***IndexTerms* – IOT,Arduino,Robot,Bluetooth,health monitoring robot**

I. INTRODUCTION

The world increasing population of elders at age 65 and above who are living independently in their home without help of their relatives and caregivers. Even the caregivers and relatives may can't take care of them 24-hours by monitoring and providing the basic first aid if he/she gets hurts. people at the age of 65 or above may have health problems like cause of sudden death, heart attack, chronic lower respiratory disease, lose consciousness, strength, body pains, bones weakness etc., If he/she is in serious condition and they are unable to call an ambulance, due to that there may be cause of death situation. To overcome these situations the real-time smart health monitoring robot assistant is provided to protect them. This paper presents a smart real-time health monitoring robot system will detect his/her daily health condition like his/her blood pressure, heart rate, temperature. In emergency situation it detects alarm to the relative so that they can protect and they can communicate and see in which conditioned person is through the video communication. The smart health monitoring robot system protects elders in emergency situation. Now-a-days the most occurring health problem is falls in elders it is a major issue due to which above 60 age people don't live alone. Falls cause disabling fractures and near-fall events are more difficult then fall events because they do not recognize an event by themselves. Falls can be recognized by the evaluation of their posture, vital signs, and balance through their daily activity. But near-falls can't be determined such as cardiac attack, change in blood pressure combined with poor balance. To detect the location of the human target, the plan is to project a tracking algorithm based on pyroelectric infrared sensor[2] network and video technologies to improve the advanced new technology innovation. The new technologies in E healthcare [6] are of medical treatment where it starts with patient's registration and update the data of all medical reports of patient and any other information and store the data

II. EXISTING SYSTEM

This project will present a robot-assisted intelligent emergency system for individual elderly independent living. It as an innovative senior independent living emergency assistance platform through a robot- sensor system as shown in the below figure Figure 1. Overview of robot-assisted emergency system The emergency assistance capabilities, wearable sensors will be implemented. Motion sensors are used to monitor different activities of the senior citizen. In case of emergencies, such as falling on the ground, will be detect in real-time. Due to the acceleration rate of person's positions exceeds a certain threshold, etc., it will automatically determine that is not sitting on sofa, or lying on bed, but a falling accident. We integrated the robot and wearable device together and achieve a seamless hardware / software integration. The wear- able device is wirelessly (Wi-Fi or Bluetooth) connected to robot. When an alarm is fired by wearable device, the robot will initiate actions, for example, automatically call a relative who can remotely tele-control the robot with video communication to investigate the situation and respond accordingly. In this case, we can reduce the false alarm rate which limits the effectiveness of other solutions. The wearable device can also send an alert directly to relatives or doctors in case acknowledgement is not received from robot.

III. Proposed System

Block Diagram of Wearable Device It is very important to provide health-care service for elder's who live alone at their home especially people who have chronic diseases and heart problem they need 24/7 healthcare where it can't be provided by others or by a medical staff of hospital. so to overcome these emergency situations making the health-care service available for everyone mostly for elder's, and to avoid the public transportation problems while reaching the particular destination too late. To prevent these kind of emergency problem we use cloud storage service to store the data information of elders daily health activities like blood pressure, pulse rate, temperature, mems and data can be monitored by their relatives and doctors. Block diagram shown in figure

IV. Design Technology

4.1Voltage regulator

A voltage regulator is an electronic circuit that provides a stable DC voltage independent of the load current, temperature and AC line voltage variations. Although Voltage regulators can be designed using op-amps it is quicker and easier to use IC voltage regulator. The IC voltage regulators are inscribe and inexpensive and are available with features such as programmable, output, current voltage, boosting and floating operation for high voltage application.78XX series are three terminal positive fixed voltage regulators. There are seven output voltage options available such as 5, 6, 8,12,15,18 and 24V in 78XX the two numbers (XX) indicate the output voltage. The connection of a 7805-voltage regulator is show infix. The AC line voltage is stepped down a cross each half of the center tapped transformers. If full wane rectifier and capacitors filter then provides an unregulated DC voltage with AC ripple of a few volts as a input to the voltage regulator. The 7805 of IC provides an output of +5 Volts D.C.

4.2 Bridge Rectifier

During positive half cycle of input signal, anode of diode 1 becomes positive and at the sometime due anode of diode D2 becomes negative. Hence D1 conducts and D2 does not conduct. The load currier flow through D1 and the voltage drop across RL will be equal to the input voltage. During the negative half cycle of the input the anode of D1 becomes negative and the anode of D2 becomes positive. Hence D1 does not conduct and D2 conducts. The load current flow through D2 and the voltage drop across RC will be equal to the input voltage. The maximum efficiency of a full wane rectifier is 81.2% and ripple factor is 0.48 peak inverses voltage for full ware rectifies is 2VM because the entire secondary voltage appears across the non-conducting diode.

4.3Temperature Sensor

LM35 is a IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1°C temperature rise in precision still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every °C rise/fall in ambient temperature, *i.e.,* its scale factor is 0.01V/°C.

4.4Pulse Sensor

Knowing the heart rate data is very helpful while doing exercises, actively studying, etc. But measuring heart rate is a difficult problem. So, a pulse sensor is used to overcome this problem. This sensor is a plug & play heart-rate sensor, utilized by artists, students, athletes, mobile & game developers, makers who desire to know the existing heart-rate data to use in their live projects.This sensor merges a simple optical heart rate sensor through a circuit. This circuit is used for noise cancellation & amplification to get consistent pulse readings very quickly. It uses 4mA of power at 5V, so it is very useful in mobile applications. This article discusses an overview of pulse sensors and their working with applications. A plug-and-play sensor that is used to detect the heart rate data is known as a pulse sensor. This sensor is used by athletes, students, mobile & game developers, etc. This sensor clips on an earlobe or a fingertip by connecting right to an Arduino board through jumper cables. In real-time, the pulse rate can be monitored through an open-source monitoring app.

4.5ESP8266 Wi-Fi Module:

An ESP8266 Wi-Fi module is a SOC microchip mainly used for the development of end-point IoT (Internet of things) applications. It is referred to as a standalone wireless transceiver, available at a very low price. It is used to enable the internet connection to various applications of embedded systems. If systems designed the ESP8266 Wi-Fi module to support both the TCP/IP capability and the microcontroller access to any Wi-Fi network. It provides the solutions to meet the requirements of industries of IoT such as cost, power, performance, and design.It can work as either a slave or a standalone application. If the ESP8266 Wi-Fi runs as a slave to a microcontroller host, then it can be used as a Wi-Fi adaptor to any type of microcontroller using UART or SPI. If the module is used as a standalone application, then it provides the functions of the microcontroller and Wi-Fi network.The ESP8266 Wi-Fi module is highly integrated with RF, power modules, RF transmitter and receiver, analog transmitter and receiver, amplifiers, filters, digital baseband, power modules, external circuitry, and other necessary components. The ESP8266 Wi-Fi module is a microchip shown in the figure below.A set of AT commands are needed by the microcontroller to communicate with the ESP8266 Wi-Fi module. Hence it is developed with AT commands software to allow the Arduino Wi-Fi functionalities, and also allows loading various software to design the own application on the memory and processor of the module.

V. BLOCK DIAGRAM OF PROPOSED TECHNOLOGY

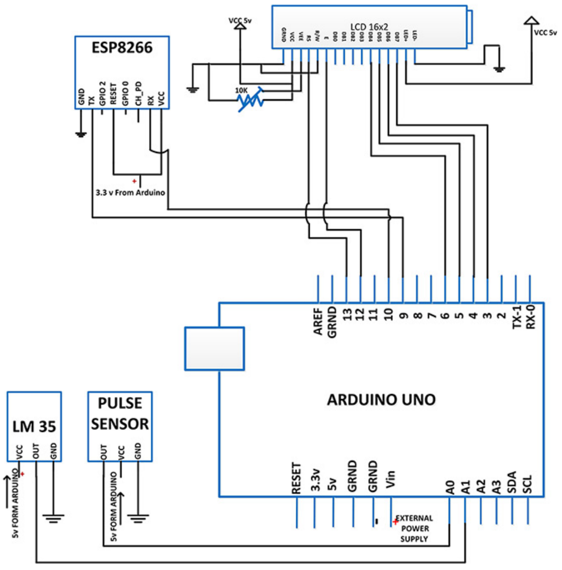

Figure 1.Block diagram of Proposed Technology

In this project, the two Analog Input pins of the board are used to interface the Pulse sensor and LM-35 temperature sensor, two GPIO are used to interface ESP8266 module where pins are configured UART transmitter and receiver pins using software serial and 6 GPIO pins are used to interface the 16X2 character LCD.

LM-35 is a precision IC temperature sensor with its output proportional to the temperature (in oF). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM-35, the temperature can be measured more accurately than with a Thermistor. It also possesses low self-heating and does not cause more than 0.1 oC temperature rise in still air. The LM-35 has three pins – VCC (Pin 1), Out (Pin 2), and Ground (Pin 3). The VCC and Ground pin are connected to VCC and ground respectively. The LM-35 can be supplied a voltage between 4V and 20V, so a 5V supply is used on it same which is powering the Arduino board. The out pin of the LM-35 is connected to the A1 pin of the Arduino since the output from the LM-35 is analog in nature. The value read is converted to Fahrenheit using the standard formulas.

The Pulse Sensor Amped is a plug-and-play heart-rate sensor for microcontrollers like PIC, AVR, Arduino, etc. It can be used to easily incorporate live heart-rate data into a project. It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry making it fast and easy to get reliable pulse readings. It simply needs to be clipped to the earlobe or fingertip and plug into 3.3 V or 5 V supply from Arduino or battery. The pulse sensor module has three terminals – VCC, Ground, and Out. The output pin of the pulse sensor module is connected to analog pin A0 of the Arduino. The VCC is connected to 5V DC output of Arduino and Ground is connected to the common ground.

The ESP8266 Wi-Fi Module is used to connect the Arduino board with a Wi-Fi router so that it can access the cloud. It is a self-contained SOC with an integrated TCP/IP protocol stack that can access to a Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware. The module comes available in two models – ESP-01 and ESP-12. ESP-12 has 16 pins available for interfacing while ESP-01 has only 8 pins available for use. The ESP-12 has the following pin configuration.The RESET and VCC pins of the module are connected to the 3.3 V DC from Arduino while the Ground pin is connected to the common ground. The Tx and Rx pins of the module are connected to the 9 and 10 pins of the Arduino UNO. 16X2 LCD – A character LCD is used to display the pulse rate and surrounding temperature. The 16X2 LCD display is connected to the Arduino board by connecting its data pins to pins 3 to 6 of the Arduino board. The RS and E pins of the LCD are connected to pins 13 and 12 of the Arduino board respectively. The RW pin of the LCD is grounded. The VCC pin of the LCD module is connected to 5V DC from the Arduino. For adjusting the brightness of the LCD module, a variable resistor is connected at the VEE pin and the other two terminals of the variable resistor are connected between VCC and ground.

The standard open-source library for interfacing LCD with Arduino board is used in the project. The library works as expected and needs no changes or modifications. All the components in the circuit require 5V DC. The circuit is initially powered by a 12V battery. The power from the battery is regulated to 5V DC using a 7805 voltage regulator IC. Pin 1 of the voltage regulator IC is connected to the anode of the battery and pin 2 of it is connected to the ground. The voltage output is drawn from pin 3 of the IC. An LED along with a 10K Ω pull-up resistor is also connected between common ground and output pin to get a visual hint of supply continuity. The character LCD, pulse sensor, and LM-35 temperature sensor are provided 5V DC from the 5V DC power output of the Arduino while the ESP module is provided 3.3 V DC from 3.3 V DC power output of the Arduino.

VI. HARDWARE IMPLEMENTATION

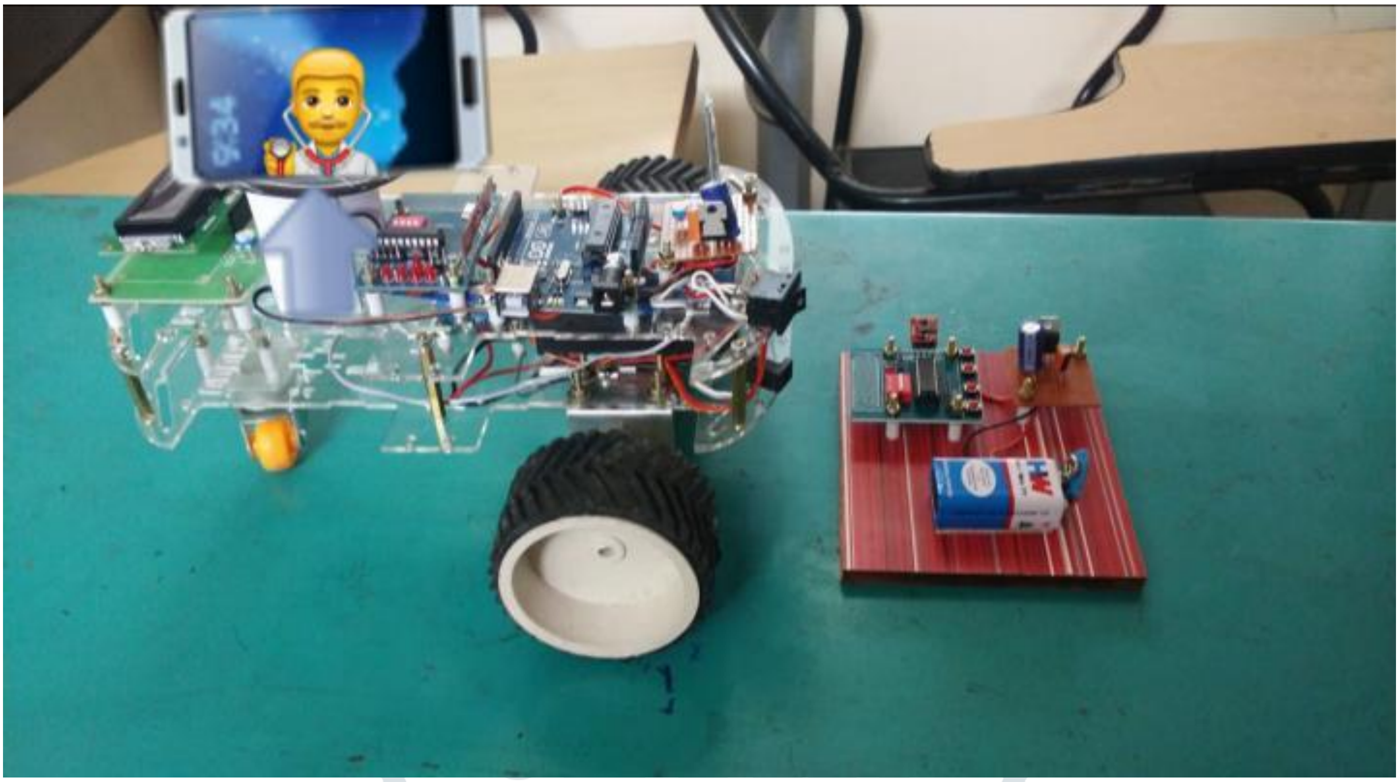

Figure 2. Hardware Implementation

This is a prototype model for IoT based pulse rate monitor. It can be designed as a wearable watch or earplug. In a wearable design, the character LCD could be removed and the entire circuit can be shifted to a small controller board or SOC. When the circuit is powered by the battery, the Arduino starts reading the pulse rate from the pulse sensor and the ambient temperature from the LM-35 temperature sensor. The pulse sensor has an infrared LED and a phototransistor which help detect the pulse at the tip of the finger or earlobe. Whenever it detects a pulse, its IR LED flashes. The flash of the IR LED is detected by the phototransistor and its resistance changes when the pulse is changed. The heartbeat of a normal adult ranges from 60 to 100 per minute. For detecting beats per minute (BPM), first, an interrupt is set which triggers in every 2 Milliseconds. So, the sampling rate by the Arduino to detect pulse is 500 Hz. This sampling rate is sufficient to detect any pulse rate.

So, at every 2 Milliseconds, the Arduino reads analog voltage output from the pulse sensor. The analog output from the pulse sensor is converted to a digital value using in-built ADC channel. The Arduino has 10-bit long ADC channel, so the digitized value can range from 0 to 1024. The middle value for this range is 512. Initially, the first beat is set to true and the second beat is counted when the condition that analog output from the pulse sensor is greater than the middle point i.e. 512 is satisfied. Then, onwards, every next beat is counted when the analog output from the pulse sensor is greater than the middle point i.e. 512 and 3/5 of the time between the beats recorded in previous cycle has passed. Every time, the beat is detected, a variable representing BPM is updated. This value in this variable is pushed to an array in every minute and is used to represent the actual Beats Per Minute or Heart Rate. The Arduino code also uses a function to provide an LED fading effect on every beat.

The pulse sensor can also detect body temperature. The LM-35 is used to detect the surrounding temperature here. The operating temperature range of LM-35 is from -55 °C to 150 °C. The output voltage varies by 10 mV in response to every oC rise/fall in ambient temperature, i.e., its scale factor is 0.01 V/ oC. The LM-35 IC does not require any external calibration or trimming to provide typical accuracies of ±0.25 °C at room temperature and ±0.75 °C over the temperature range from −55 °C to 150 °C. Under normal conditions, the temperature measured by the sensor won't exceed or recede the operational range of the sensor. Typically in the temperature range from −55 °C to 150 °C, the voltage output of the sensor increases by 10 mV per degree Celsius. The voltage output of the sensor is given by the following formulae

Vout = 10 mV/°C*T

where,

Vout = Voltage output of the sensor

T = Temperature in degree Celsius

So, T (in °C) = Vout/10 mV

T (in °C) = Vout(in V)*100

If VCC is assumed to be 5 V, the analog reading is related to the sensed voltage over 10-bit range by the following formulae –

Vout = (5/1024)*Analog-Reading

So, the temperature in degree Celsius can be given by the following formulae

T (in °C) = Vout(in V)*100

T (in °C) = (5/1024)*Analog-Reading *100

So, the temperature can be measured directly by sensing the analog voltage output from the sensor. The analog Read() function is used to read analog voltage at the controller pin.

The Arduino collects data from both the sensors and converts the values to strings. The heartbeat is graphically represented on the character LCD along with the measured pulse rate and time between pulses as text. The temperature is also displayed on the LCD module. The ESP8266 Wi-Fi module connected to the Arduino uploads the same data to ThingSpeak Server as it finds the Wi-

Fi Access Point. For displaying and monitoring data uploaded to the ThingSpeak server, either a digital dashboard or a data broker is needed. In this project, a digital dashboard called Freeboard.io is used to monitor the sensor data visually online. The Freeboard.io use the JASON file to visualize ThingSpeak data. It offers three elements to build a dashboard.

VII. CONCLUSION

In this project, the advanced personal health safety telemonitoring system that offers many critical features which are missing from contemporary home security and personal emergency response system at a significantly lower cost. The telemonitoring application is presented which allows others to view the patient's vital parameters remotely and dynamically in a Web page in real time. In future this work can be extended by adding smart robot vehicle. The smart robot plays a core role for emergency assistance of senior individual, In order to automatically recognize the emergency situation.

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