Design and Implementation of An Health Monitoring System using IOT

Dr. S. Durgadevi
Electronic and Instrumentation Engineering
Sri Sairam Engineering College
Chennai, India

R Anbazhagan
Electronic and Instrumentation Engineering
Sri Sairam engineering college
Chennai, India

A. Vimonisha
Electronic and Instrumentation Engineering
Sri Sairam Engineering College
Chennai, India

R Harini
Electronic and Instrumentation Engineering
Sri Sairam Engineering College
Chennai, India

Abstract:- **In today's environment, the use of mobile phones and smart devices has expanded dramatically. The primary goal of this project is to design and construct a "IoT-based Integrated Health Monitoring System" that will track key patient characteristics such as body temperature, breathing rate, heart rate, and glucose level. A Microcontroller supported Wi-Fi enabled IOT controller was used to read and interpret sensory data. As a result, an IoT-based patient monitoring system can efficiently monitor patients' health and save lives.**

Keywords— Microcontroller, Temperature sensor , Respiratory sensor, Heart beat sensor, Level sensor ,Solenoid valve ,RFID Reader and IOT.

I. INTRODUCTION

A wireless sensor network (WBAN) can be used for a variety of purposes, including area monitoring, industrial monitoring, and, most critically, health monitoring (Wireless Body Area Network). In these monitoring systems, arithmetic circuits do the major role [1-3]. Every object becomes addressable, accessible, and actionable thanks to the Internet of Things. The embedded technology in IOT items allows them to exchange information with each other or with the Internet, and it is estimated that between 8 and 50 billion gadgets will be connected by 2020. Since their introduction, these gadgets have improved people's lives, created safer and more engaged communities, and changed healthcare. Change is swift in today's advanced technology-enabled society, and the status quo is continuously disturbed. The Microcontroller is programmed with an intelligent programme developed in the Embedded C language to carry out this operation.The suggested module's major goal is to create an automated real-time wellness monitoring system.

One compact electronics unit will be used in the process, which will include a Micro Controller, temperature sensor, respiration sensor, heartbeat sensor, level sensor, solenoid valve, RFID reader, and IOT.

Using health care sensors, this system continuously monitors the patients' cardiac, respiration, and temperature levels. The microcontroller analyzes all of the sensor data and sends it to the IoT portal. The RFID reader was used to read the patient's information from the RFID tag. The level sensor controls the solenoid valve of the glucose container. Using IOT technology, all data will be displayed on an LCD and transferred to a cloud server.

The most crucial thing is to keep track of the patient's health because it has such terrible consequences. The patient's health parameters are not automatically monitored in the present system. If the patient is in a life-threatening situation, he or she will not be able to call the doctor right away. This might result in major issues. There is also no advanced technology for directly transferring the monitored data to the physicians for their reference. These are all the issues that the current system has.

II. MODEL DESCRIPTION

A. Power supply

The ac voltage, which is normally 220V rms, is fed into a transformer, which reduces the ac voltage to the desired dc output level. A diode rectifier then produces a full-wave rectified voltage, which is first filtered to generate dc voltage by a simple capacitor filter. There is frequently some ripple or ac voltage change in the dc voltage that results.

Even if the input dc voltage fluctuates or the load attached to the output dc voltage changes, a regulator circuit removes the ripples and maintains the same dc value. Typically, one of the popular voltage regulator IC chips is used to do this voltage regulation.

B. Microcontroller

The Arduino Uno is a microcontroller board that uses the ATmega328P microcontroller. There are 14 digital input/output pins (six of which can be used as PWM outputs), six analogue inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button on the board. It comes with everything you need to support the microcontroller; all you have to do is plug it into a computer or power it with an AC-to-DC converter. A computer, another Arduino board, or other microcontrollers can all be communicated with using the Arduino Uno.

C. Level sensor

Level sensors monitor the concentration of flowing fluids such as liquids, slurries, granular solids, and powders. The substance to be measured can be in its natural state or inside a container. Continuous or point values can be used to measure the level. Continuous level sensors determine the exact amount of substance in a given location by

Fig. 1 Level Sensor

measuring the level within a specified range. While point-level sensors merely tell if the chemical is above or below the sensing point, the latter detect extremely high or low amounts. It is critical to choose a sensor that is appropriate for the application requirements.

D. Solenoid valve

The sensor detects the process on the solenoid valve's outlet side. When it detects that a specific amount of fluid flow is necessary, it allows current to flow through the solenoid valve. As a result, the valve is powered, and a magnetic field is created, which causes the plunger to move despite the spring's action. The plunger travels upwards as a result of this, allowing the orifice to be opened. The fluid is allowed to flow from the inlet port to the outlet port at this time. When the sensor detects that the fluid is no longer needed in the process, the current to the solenoid valve is entirely shut off.Due to this the solenoid valve gets de-energized and the plunger reaches the bottom most position and closes the orifice completely thus stopping the flow of fluid from the inlet port to the outlet port.

E. *LCD display*

This is an E-blocks-specific LCD display. It has a single

Solenoid volve

Fig. 2 Solenoid Volve

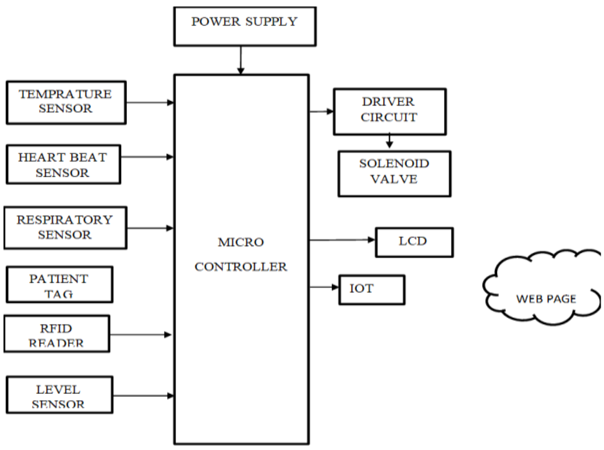
This enables the device to connect to the majority of E-Block I/O ports. The LCD display requires serial data, which is described in full in the user guide below. A 5V power supply is also required for the display. Please ensure that the voltage does not exceed 5V, as this will damage the device. The E-blocks Multi programmer or a 5V fixed regulated power supply are the finest sources of 5V. The 224 distinct characters and symbols can be displayed on the 16 x 2 intelligent alphanumeric dot matrix displays.

III. SYSTEM REQUIREMENTS

A.Temperature sensor

The LM35 is an IC temperature sensor with a proportional output to the temperature (in 0C). Because the sensor circuitry is sealed, it is not susceptible to oxidation or other processes. Temperature can be measured more precisely with the LM35 than with a thermistor. It also has a modest self-heating capability, causing a temperature rise of less than 0.1 0C in still air. The gadget can be used with either a single power supply or a plus and minus supply. The LM35 gadget has a very low self-heating of less than 0.1°C in still air because it only requires 60 A from the supply. The LM35 device is rated to work in a temperature range of 55°C to 150°C.

B. Respiratory sensor



As a strategic partner to medical device makers in the domain

Fig. 2 Block Diagram

of breathing and respiration, First Sensor develops and manufactures highly dependable sensors and bespoke sensor systems. Breathing in air, or inhaling, is the first stage in this process. Inhalation is the process of bringing oxygen-rich air into the body and expiration is the process of removing carbon dioxide-rich air from the body. The second stage is gas exchange, which occurs in the lungs and involves the diffusion of oxygen into the blood and the diffusion of carbon dioxide out of the blood. Cellular respiration is the third step, which creates chemical energy and carbon dioxide for the body's cells.Finally, the carbon dioxide from cellular respiration is breathed out of the body from the lungs.

C.*Heartbeat sensor*

Pulse Sensor is a well-designed plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heart rate data into their projects. The sensor clips onto a fingertip or earlobe and plugs right into Arduino with some jumper cables. It also includes an open-source monitoring app that graphs your pulse in real time. The front

of the sensor is the pretty side with the Heart logo. This is the side that makes contact with the skin. On the front you see a small round hole, which is where the LED shines through from the back, and there is also a little square just under the LED. The square is an ambient light sensor, exactly like the one used in cellphones, tablets, and laptops, to adjust the screen brightness in different light conditions. The LED shines light into the fingertip or earlobe, or other capillary tissue, and the sensor reads the light that bounces back.

D. *IOT*

The Internet of Things (IoT) is a network of ordinary objects that are integrated with electronics, software, sensors, and connectivity that allows data to be exchanged. Basically, a small networked computer is connected to something, allowing data to flow back and forth. A small networked computer can be integrated with lightbulbs, toasters, refrigerators, flower pots, watches, fans, planes, trains, automobiles, or anything else around you to accept input (particularly object control) or gather and provide informational output.This means that computers will pervade every aspect of our lives – ubiquitous embedded computing devices that are uniquely recognised and connected through the Internet. The Internet of Things is really starting to take off thanks to low-cost, networkable microcontroller chips.

E. *RFID reader*

One method for Automatic Identification and Data Capture is radio frequency identification (RFID) (AIDC). RFID tags are widely employed in a variety of industries. An antenna, a transceiver, and a transponder are the three components of an RFID system. The antenna transmits a signal that activates the transponder using radio frequency waves. When the tag is engaged, it sends data back to the antenna. The purpose of an RFID reader is to interrogate RFID tags. The interrogation method is wireless, and because the distance between the reader and the tags is very small, a line of sight between the reader and the tags is not required. An RF module in a reader serves as both a

RFID Reader

transmitter and a receiver of radio frequency signals. The transmitter is made up of an oscillator that

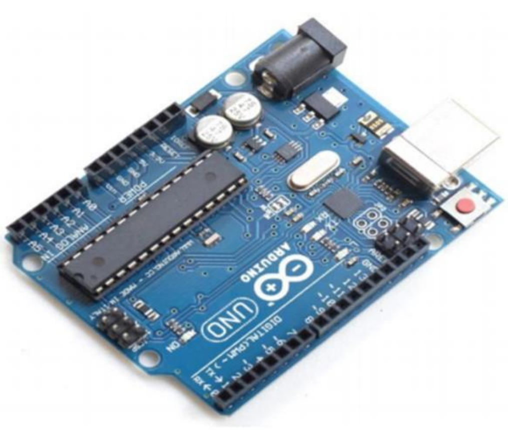
Fig. 2 RFID Reader

generates the carrier frequency and a modulator that impinges on the carrier frequency. data commands upon this carrier signal and an amplifier to boost the signal enough to awaken the tag. The receiver has a demodulator to extract the returned data and also contains an amplifier to strengthen the signal for processing.

F. *Arduino Uno*

Arduino UNO is a low-cost, versatile, and easy-to-use open-source programmable microcontroller board that may be used in a wide range of electrical applications. This board can operate relays, LEDs, servos, and motors as an output and can be interfaced with other Arduino boards, Arduino shields, and Raspberry Pi boards.

G.*Pictorial representation*



Arduino UNO

Fig. 3 Arduino Uno

IV SOFTWARE REQUIREMENTS

A. Arduino Software (IDE)

The Arduino Software (IDE) makes it simple to create code and upload it to the board while you're not connected to the internet. It is recommended for people who have a slow or non-existent internet connection. Any Arduino board may be used with this software.

B.*Embedded C*

The goal of Embedded C is to overcome the performance gap between Standard C and the embedded hardware and application architecture. It adds primitives to the C language that are usually given by DSP processors and are required by signal-processing applications. DSP-C was used to design the support for fixed-point data types and named address spaces in Embedded C. DSP-C [1] is an industry-designed extension of C that has been used by numerous DSP manufacturers in their compilers since 1998. Cooperation with embedded-application designers and DSP manufacturers were sought for the development of DSP-C by ACE (the firm where three of us work). The Embedded C specification extends the C language to support freestanding embedded processors in exploiting the multiple address space functionality, user-defined named address spaces, and direct access to processor and I/O registers. These features are common for the small, embedded processors used in most consumer products. The features introduced by Embedded C are fixed-point and saturated arithmetic, segmented memory spaces, and hardware I/O addressing. The description we present here addresses the extensions from a language-design perspective, as opposed to the programmer or processor architecture perspective.

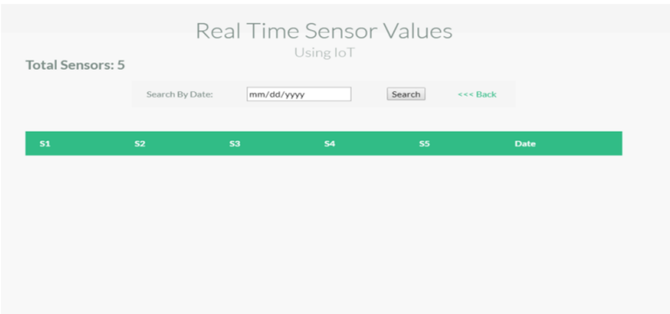
C.*WEB server*

In the Internet of Things business, Espresso's ESP8266EX presents a highly integrated Wi-Fi SoC solution to suit consumers' constant expectations for economical power utilization, compact design, and reliable performance. The ESP8266EX can function as a standalone application or as a slave to a host MCU due to its complete and self-contained Wi-Fi networking capabilities.When the application is hosted by the ESP8266EX, it starts up right away from the flash. The embedded high-speed cache aids in improving system performance and memory optimization. ESP8266EX can also be used as a Wi-Fi adapter in any microcontroller architecture using SPI / SDIO or I2C / UART interfaces. Antenna switches, RF baluns, power amplifiers, low noise receive amplifiers, filters, and power management modules are all included into the ESP8266EX.VER

D.GHz Receiver

The 2.4 GHz receiver down-converts the RF signals to quadrature baseband signals and converts them to the digital domain with 2 high resolution high speed ADCs. To adapt to varying signal channel conditions, RF filters, automatic gain control (AGC), DC offset cancellation circuits and baseband filters are integrated within ESP8266EX

E.GHz Transmitter



The 2.4 GHz transmitter up-converts the quadrature baseband signals to 2.4 GHz, and drives the antenna with a high-power CMOS power amplifier. The function of digital calibration further improves the linearity of the power amplifier, enabling a state of art performance of delivering +19.5 dBm average power for 802.11b transmission and +16 dBm for 802.11n transmission..

F.Technical details

Every time the Arduino Bootloader is run, it resets the "erase Address" to zero. The "Load Address" command in ROBOTC is used to specify the address to which we wish to write/verify while downloading a programme.When you write a page of memory to the Arduino, the boot loader erases the previous page and creates a new one.Everything is fine while downloading firmware because the Erase Address and the Loaded Address both start at zero.When constructing a user application, we begin at memory location 0x7000, however the Boot loader erases data starting at zero because the "Load Address" command does not update where to delete.Our change is to set both the Load Address and the Source Address. and the Erase Address so the activity of writing a user program doesn't cause the firmware to be accidentally erased. [4-7]

G.Communication

A computer, another Arduino, or other microcontrollers can all be communicated with using the Arduino UNO. For TTL (5V) serial transmission, the Arduino UNO has four hardware UARTs.

One of these is channeled over USB by an ATMEGA on the board, which gives a virtual comfort to applications on the computer (Windows machines will require a.inf file, while OSX and Linux machines will instantly detect the board as a COM port). A serial monitor is included in the Arduino software, allowing simple textual data to be transferred to and from the board. When data is exchanged via the ATmega8U2 chip and USB connection to the computer, the RX and TX LEDs on the board will blink (but not for serial transmission on pins 0 and 1).A SoftwareSerial library allows for serial communication on any of the digital pins.The Arduino UNO also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation on the Wiring website for details. To use the SPI communication, please see the Arduino UNO datasheet.

H.Programming

The Arduino UNO can be programmed with the Arduino software (download). For details, see the reference and tutorials.The Arduino UNO on the Arduino UNO comes pre-burned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). [8-14]

You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details.

V. CONCLUSION

These systems provide a handy solution for creating a smart wellness health monitoring system through the usage of the Internet of Things. The system is less expensive and produces consistent results when compared to other systems that are beneficial to society. It is primarily applied on a large scale in order to achieve better outcomes and problem-free solutions in the future.

VI. INNOVATION

The most crucial thing is to keep track of the patient's health because it has such terrible consequences. The patient's health parameters are not automatically monitored in the current system. If the patient is in a life-threatening situation, he or she will not be able to contact the doctor right away. This could result in major issues. There is also no advanced technology for directly transferring the monitored data to the doctors for their reference. These are all the issues that the current system has.Many new technologies ,software and sensors are used.

VII. REFERENCE

[1] P. Anguraj and T. Krishnan, “Design and implementation of modified BCD digit multiplier for digit-by-digit decimal multiplier,” Analog Integr. Circuits Signal Process., pp. 1–12, 2021.

[2] T. Krishnan, S. Saravanan, A. S. Pillai, and P. Anguraj, “Design of high-speed RCA based 2-D bypassing multiplier for fir filter,” Mater. Today Proc., Jul. 2020, doi: 10.1016/j.matpr.2020.05.803.

[3] T. Krishnan, S. Saravanan, P. Anguraj, and A. S. Pillai, “Design and implementation of area efficient EAIC modulo adder,” Mater. Today Proc., vol. 33, pp. 3751–3756, 2020.

[4] S. R. Patil, D. R. Gawade, and S. N. Divekar, “Remote wireless patient monitoring system 1,” Int. J. Electron.Commun. Technol., vol. 6, no. 1, 2015.

[5] S. Shaikh, D. Waghole, P. Kumbhar, V. Kotkar, and P. Awaghade, “Patient monitoring system using IoT,” 2017 Int. Conf. Big Data, IoT Data Sci. BID 2017, vol. 2018-Janua, pp. 177–181, 2018, doi: 10.1109/BID.2017.8336594.

[6] T. K. Ramesh and C. V. Giriraja, “Wireless sensor network protocol for patient monitoring system,” 2017 Int. Conf. Comput. Commun. Informatics, ICCCI 2017, pp. 5–8, 2017, doi: 10.1109/ICCCI.2017.8117798.

[7] G. J. Bharat Kumar, “Internet of Things (IoT) and Cloud Computing based Persistent Vegetative State Patient Monitoring System: A remote Assessment and Management,” Proc. Int. Conf. Comput. Tech. Electron. Mech. Syst. CTEMS 2018, pp. 301–305, 2018, doi: 10.1109/CTEMS.2018.8769175.

[8] S. P. McGrath, I. M. Perreard, M. D. Garland, K. A. Converse, and T. A. Mackenzie, “Improving Patient Safety and Clinician Workflow in the General Care Setting With Enhanced Surveillance Monitoring,” IEEE J. Biomed. Heal. Informatics, vol. 23, no. 2, pp. 857–866, 2019, doi: 10.1109/JBHI.2018.2834863

[9] P. W. Digarse and S. L. Patil, “Arduino UNO and GSM based wireless health monitoring system for patients,” Proc. 2017 Int. Conf. Intell. Comput. Control Syst. ICICCS 2017, vol. 2018-Janua, pp. 583– 588, 2017, doi: 10.1109/ICCONS.2017.8250529.

[10] Jeyasudha, S., & Geethalakshmi, B. (2021). Modeling and performance analysis of a novel switched capacitor boost derived hybrid converter for solar photovoltaic applications. *Solar Energy*, *220*, 680-694.

[11] SNub enthan and K. Sivachelvan, “A wireless continuous patient monitoring system for dengue; Wi- Mon,” Proc. 2017 Int. Conf. Wirel. Commun. Signal Process. Networking, WiSPNET 2017, vol. 2018- January, pp. 2201–2205, 2018, doi: 10.1109/WiSPNET.2017.8300150.

[12] S. Marathe, D. Zeeshan, T. Thomas, and S. Vidhya, "A Wireless Patient Monitoring System using Integrated ECG module, Pulse Oximeter, Blood Pressure and Temperature Sensor," Proc. - Int. Conf. Vis. Towar. Emerg. Trends Commun. Networking, ViTECoN 2019, pp. 1–4, 2019, doi: 10.1109/ViTECoN.2019.8899541.

[13] R. Karthikamani, P. S. Y. Prasath, M. V. Sree, and J. Sangeetha, "Wireless patient monitoring system," Int. J. Sci. Technol. Res., vol. 8, no. 8, pp. 1081–1084, 2019.

[14] Jeyasudha, S., Geethalakshmi, B., Saravanan, K., Kumar, R., Son, L. H., & Long, H. V. (2021). A novel Z-source boost derived hybrid converter for PV applications. *Analog Integrated Circuits and Signal Processing*, *109*(2), 283-299.