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IOT BASED GLUCOSE MONITORING SYSTEM

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Abstract

A wealthy and developed nation will have a sophisticated healthcare system. The digital healthcare system has been overrun by the Internet of Things (IoT), which permits remote monitoring of patients' health problems and gives physicians access to such information. This study proposes an automated and intelligent system based on the Internet of Things (IoT) that automatically recognizes patients' health state, If the flow rate deviates from the predetermined settings, the device can be designed to sound an alarm, notifying doctor and nurse to take prompt action. The reduction of system expenses and enhancing system usability for the general public are the main topics of this article. The suggested system gives medical staff the ability to respond appropriately in the event of a shortage by providing real-time information. Doctors could continually monitor the health of their patients with the help of this technology. The recommended approach will alert the patient's family and doctor about any sort of injury in an emergency .The experimental results demonstrate the proposed system's accuracy and dependability, demonstrating its usefulness in hospitals.

Keywords: ARDUINO UNO ,Temperature sensor, Pulse sensor, Load cell, GSM, Switch ,Solenoid, Relay, LCD Display, ESP8266 Wi-Fi.

1. Introduction

Modern technology advancements have made it possible to significantly enhance our way of life in many areas. One of these is the medical industry, particularly in the heart rate and glucose monitoring areas, which are prevalent issues among children and adults. To avoid heart attacks as early as possible, which might mean the difference between a patient's life and death, heart rate monitoring is very crucial. It often requires a lot of people and resources to complete the entire treatment process and monitoring process. Through the use of IoT, researchers have been experimenting with ways to further improve medical treatment.

The goal of this project is to create a heart rate monitoring system using Internet of Things (IoT) technologies. There will be a system that records and keeps track of the patient's data in real time rather than using SMS (short message service) as a communication channel between the patient, nurse, and doctor. Additionally, it will immediately alert the doctors and nurses to any abnormalities and any emergencies that require attention.

This project will be using a development kit and it will take the heart rate and temperature of the patient through sensors. Then it will send the data back to the development kit and send the data by using a Wi- FI module thus dispatching the collected data to an IoT Platform and display it for the nurses or doctors to monitor consistently.

EXISTING SYSTEM

In the existing system, the manual process exits for detecting when the bottle gets empty. When the bottle runs out of glucose, a buzzer alerts the user, and a notification is sent to their mobile device. This type of system is relatively simple and inexpensive, but it does require the user to manually refill the glucose bottle when it runs out. A more advanced smart glucose monitoring system could incorporate continuous glucose monitoring (CGM) sensors that transmit real-time glucose readings to a mobile app or other device. These systems can provide alerts and notifications when glucose levels fall outside of a safe range and may also provide insights into glucose patterns and trends over time.

PROPOSED SYSTEM:

The proposed system consist of temperature sensor, pulse sensor, Load cell, GSM, Switch, motor, solenoid, relay, esp8266 wifi, display, power supply.

- The measured data would be processed by the ESP8266 microcontroller to determine if the patient's glucose levels are in the normal range or if they require intervention.
- If the patient's glucose levels are outside of the normal range, the ESP8266 would activate the solenoid valve to continously measure the flow rate of the glucose from the glucose monitoring site, if such a condition is detected.
- The LCD display would be used to show the drip bottle weight and other relevant information, such as their heart rate and body temperature.
- A power supply would be used to provide power to the system..
- Verifying flow rate for different cases.
- Pulse and Temperature Sensors are used for monitoring the patient’s condition.

2. Literature Survey

"A review of smart glucose monitoring systems: Current challenges and future prospects" by N. Abdullah et al. (2020). This article provides a comprehensive review of the existing smart glucose monitoring systems, including continuous, flash ,non-invasive glucose monitoring . The authors also discuss the challenges faced by these systems and the future directions for research [1].

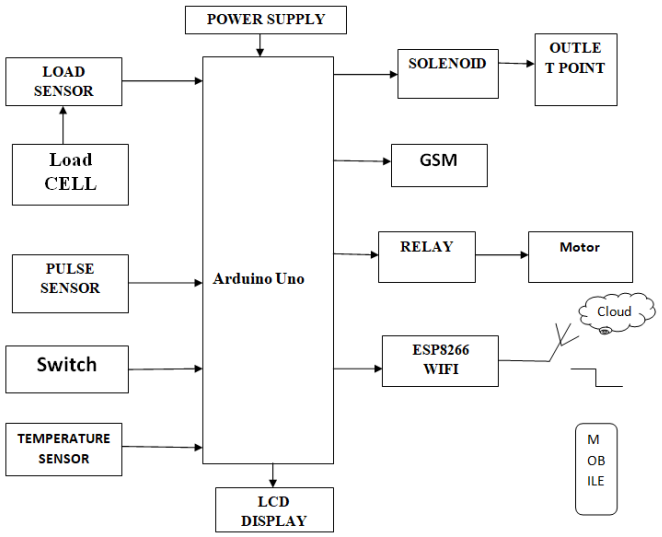
"Continuous glucose monitoring: Current use and future directions" by R. A. Gabbay et al. (2021). This article provides an overview of the current state of CGM technology, including the different types of sensors available and the benefits and limitations of CGM. The authors also discuss the potential future directions for CGM, such as the use of artificial intelligence and machine learning algorithms [2].

"Accuracy of flash glucose monitoring systems: A systematic review and meta-analysis" by P. Meier et al. (2021). This study evaluated the accuracy of FGM systems by analyzing data from several clinical trials. The authors concluded that FGM systems are generally accurate and reliable for glucose monitoring, but there are some limitations to the technology [3].

"Non-invasive glucose monitoring: Recent developments" by R. N. Tsinberg et al. (2020). This article provides an overview of the different non-invasive glucose monitoring technologies currently under development, including optical, electrical, and thermal methods. The authors also discuss the challenges faced by these technologies and the potential future directions for non-invasive glucose monitoring [4].

3. Implementation:

The Components typically used in this project for implementing includes Arduino, Load Cell, Solenoid valve, switch, motor, pulse sensor, relay , Temperature sensor, Wifi esp8266 and GSM, Buzzer.



Drip bottle weight is measured using an load cell and value of load cell will be sent to doctor using a WIFI Module. For demonstration purpose message is sent though GSM . When bottle gets

to threshold level it intimates to doctor and hospital faculty through GSM get message like if below 150 mean we will get glucose is below 150 and if below 100 means we will get message as glucose is below 100 and if glucose is below 50 means we will get message as glucose is below 50 and buzzer will ON. The instruction is sent to the phone through GSM by the Arduino controller when the bottle weight is entirely emptied. After a drip injection, a temperature sensor measures the patients' body temperatures. Doctors will be informed if the temperature registers low readings, and a notification will also be sent to mobile devices. Pulse sensor is used for measuring the pulse of heart or heartbeat of the patient.

4. Related Work:

The brief introduction of the modules used in this project is given below :

Adapter (DC 5v Constant Current PowerAdapter for 220V AC)

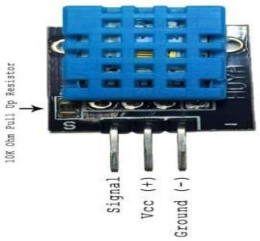
A DC5v constant current power adapter for 220V AC is an electronic device that converts the alternating current (AC) from a 220V power source into direct current (DC) with a constant voltage of 5 volts and a constant current. This type of adapter is commonly used to power electronic devices that require a constant voltage and current, such as LED lights, sensors, and micro controllers.

ARDUINO UNO:

Arduino Uno is an open-source microcontroller board based on the ATmega328P microcontroller chip. It is a popular board used in many electronic projects.

The Arduino Uno board comes with various input and output pins, including digital I/O pins, PWM pins, analog input pins, UART pins, and SPI pins. These pins allow the board to interact with various sensors, actuators, and other electronic components.

DHT11 Sensor:



The DHT11 is a inexpensive digital temperature and humidity sensor that is frequently used in electronic projects. It is designed to provide accurate readings of temperature and relative humidity, and is easy to use with micro controllers such as Arduino.

The DHT11 sensor consists of a capacitive humidity sensor and a thermistor to measure temperature. It has a single-wire interface, which means that it only requires one digital pin to communicate with a micro controller. The sensor provides a 5V DC output, which can be directly connected to the micro controller.

GSM (SIM800A):

The SIM800A is a quad-band GSM/GPRS module that allows electronic devices to connect to the internet via cellular network. It is commonly used in IoT (Internet of Things) applications, such as remote monitoring and control systems. The SIM800A module features a built-in TCP/IP stack that allows it to establish a data connection with a remote server. It also has a serial interface that allows it to communicate with a microcontroller, such as Arduino or Raspberry Pi. The module requires a SIM card with an active data plan to connect to the cellular network.

LCD Display :

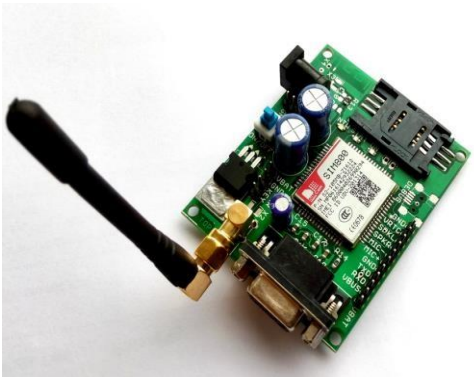
LCD display is a flat-panel display commonly used in electronic objects such as calculators, watches, and mobile phones. LCDs are also commonly used in electronic projects, especially those that involve displaying information such as sensor readings or that can be used to add Wi-Fi connectivity to electronic devices.

Buzzer- Indication

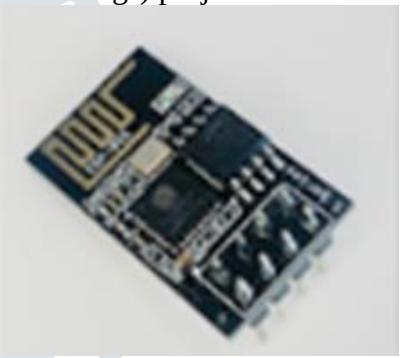
A buzzer is a simple electronic component that produces a loud, audible sound when an electrical current is applied to it. It consists of a coil of wire and a metal diaphragm or plate that vibrates rapidly when the current passes through the coil, producing a sound.

Buzzer components are available in different sizes, shapes, and sound frequencies, and can be used in a wide range of electronic devices and applications. For example, they are commonly used in alarms, doorbells, games, and musical instruments

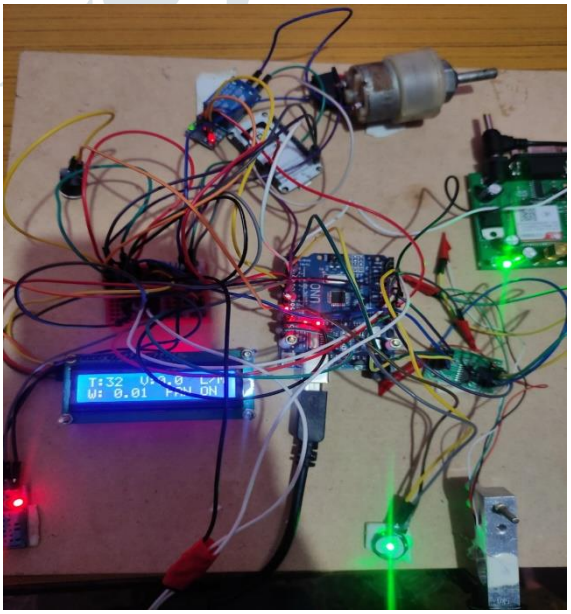
ESP8266 Wi-Fi



The ESP8266 is an inexpensive Wi-Fi module that can be used to add Wi-Fi connectivity to electronic devices. It is a highly integrated module that combines a micro controller and a Wi-Fi radio into a single chip, making it a cost-effective solution for IoT (Internet of Things) projects.



5. Result



A smart glucose monitoring system mainly uses GSM, electronic valve, Arduino Uno, Load sensor, and temperature sensor. GSM typically consists of a continuous flow of the glucose that uses sensors to measure the glucose level and wireless communication system that the data to a remote

server using GSM technology. Then the remote server can then transmit the data to a smartphone app.

GSM also offers several benefits over real time data tracking, automatic data sharing and remote monitoring capabilities

6. CONCLUSION:

This paper presented load values with Quantitative control system, in order to realize for flow rate in drip, as a small, compact and advanced technology in the medical field. By leveraging modern technologies such as wireless connectivity, sensors, and cloud computing, this system can provide real-time monitoring and analysis of glucose levels, which can help patients and healthcare providers make informed decisions about managing the condition.

The system can also provide alerts and notifications in case of abnormal glucose levels, ensuring timely action to prevent any potential health complications. Additionally, it can enable patients to track their glucose levels over time, providing valuable insights into their condition..

Overall, an IoT-based glucose monitoring system offers a significant improvement over manual process of providing patients with a more convenient, efficient, and effective way to manage their condition, leading to better health outcomes and an improved quality of life.

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