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IOT BASED REAL TIME REMOTE PATIENT MONITORING SYSTEM

P.ANUPAMA[1], A.V.SAI NANDINI[2], V.SUDHEER[3], P.MANIKANTA SATISH[4], P.B.S.SUJEETH[5]

[12345]UG Students, Dept. of ECE, PRAGATI ENGINEERING COLLEGE

ABSTARCT

Healthcare technology is one of the most popular studies nowadays. With the development of healthcare technology, the lifespan of people has successfully extended. However, people in the rural area are still having a hard time to obtain professional healthcare services due to the barrier of distance and lack of doctors. A remote patient monitoring system is one of the best solutions to overcome this issue. This paper proposes an Internet of Things (IoT) based real-time remote patient monitoring system that is able to guarantee the integrity of the real-time heart beat (pulse) sensor and temperature sensor. The results will be displayed on the LCD.

The doctor can access the web server via smart phone or computer to monitor the real-time or previously recorded pulse data and temperature data. The proposed system has been tested in both Local Area Network and Wide Area Network environments. The results show that the proposed system has no package loss and packet error in both Local Area Network and Wide Area Network.

INTRODUCTION

The ratio of doctors to the population in India is improving from year to year. However, it is still lacking doctor in rural areas. The report from the Ministry of Rural Development India showed that 65.97% of the population are staying in rural area. According to the statistic from the Ministry of Health India, the ratio of doctor to the population in India is 1:1456 against the WHO recommendation of 1:1000. A remote patient monitoring system is one of the solutions to overcome the barriers of health service. It provides professional health care services to the rural population through information and communication technologies (ICT). Remote patient monitoring system allows the doctor to observe the patient's health condition remotely at any time and any place. The prevention can be done during the early detection of the disorder.

This document proposes an IoT based real-time pulse sensor and temprature sensor

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monitoring system that is able to support both real-time and store-and-forward modes. The store-and-forward mode has no data integrity issue and it also does not require high network quality.

NODE MCU

The NodeMCU (Node Micro Controller Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains all crucial elements of the modern computer: CPU, RAM, networking (wifi), and even a modern operating system and SDK. When purchased at bulk, the ESP8266 chip costs only $2 USD a piece. That makes it an excellent choice for IoT projects of all kinds. NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits.

Both the firmware and prototyping board designs are open source.

The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS. Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.

HARDWARE COMPONENTS

The power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an ac voltage, a steady dc voltage is obtained by rectifying the ac voltage, then filtering to a dc level, and finally, regulating to obtain a desired fixed dc voltage. The regulation is usually obtained from an IC voltage regulator unit,

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which takes a dc voltage and provides a somewhat lower dc voltage, which remains the same even if the input dc voltage varies, or the output load connected to the dc voltage changes.

The MAX232 is a hardware layer protocol converter IC manufactured by the Maxim Corporation. Commonly known as a RS-232 Transceiver, it consists of a pair of drivers and a pair of receivers. At a very basic level, the driver converts TTL and CMOS voltage levels to TIA/EIA-232-E levels, which are compatible for serial port communications. The receiver performs the reverse conversion.Used in embedded microcontroller systems, and computers, this IC has been one of the most popular components in production for well over two decades. If you have a microcontroller circuit that requires communication through a serial port, then this is the chip to use. This is a versatile IC, which is one of those wonderful components that solve so many signal conversion problems.A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an controller is an LCD display. Some of the most common LCDs connected to the contollers are 16X1, 16x2 and 20x2 displays. This means 16 characters per line by 1 line 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively. Many microcontroller devices use 'smart LCD' displays to output visual information. LCD displays designed around LCD NT-C1611 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 5X7 dots plus cursor of the display. They have a standard ASCII set of characters and mathematical symbols. For an 8bit data bus, the display requires a +5V supply plus 10 I/O lines (RS,RW, D7, D6,D5,D4,D3,D2,D1,D0).

SOFTWARES

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are:

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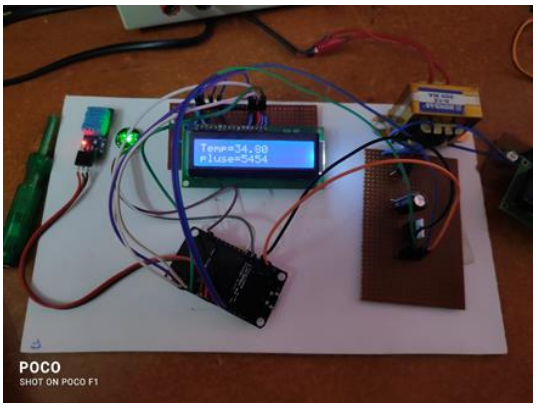
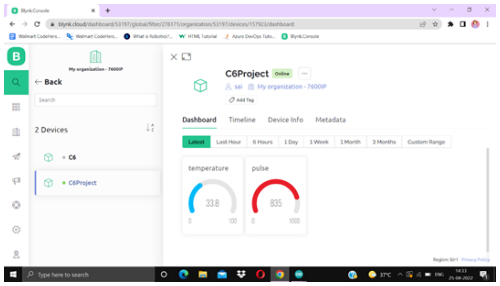
- by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.

After learning about the main parts of the Arduino UNO board, we are ready to learn howto set up the Arduino IDE. Once we learn this, we will be ready to upload our program onthe Arduino board.

RESULT





CONCLUSION

The IOT based patient monitoring system has been successfully developed. This system is able to measure the body temperature and respiratory rate and the measured data sent wirelessly to android apps using IOT platform. This system is able to provide alert for any abnormal condition to the user/nurses through the android apps. The results of patient in LCD display does not have a lot of problems, while there is some instable result in the android apps where the internet issues play important role in the IOT implementation. The type of

temperature sensor used to measure breathing temperature also plays crucial role in getting the accurate results for respiratory rate measurement. In future, high sensitivity sensor can be used to provide more accurate result. The future scope of this project is:

Multiple parameters like retina size, age and weight can be induced as controlling parameters in the future. More than a single patient at different places can be monitors using such systems. In future diagnosis can be performed via the same system. This system also developing using advanced GSM and GPRS technology in future.

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