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Real Time Remote Sensor Monitoring

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Abstract: *The purpose of "Real Time Remote Sensor Monitoring" is to provide web- based application for remotely monitoring various electrical devices. This is possible in order to develop this system various parameters are taken into consideration such as, ambient temperature, humidity levels. Which can be co-related with current and voltage ratings to establish this entire system sensors are connected to the microcontroller and the data will be saved in micro secure digital card and sent all the gathered information to the synchronized web page using the services. This collected data will be enabling to for user on the website which can be even downloaded and the report for the same can be prepared. The system will help user to monitor the devices condition and ambient changes with ease. The system is successfully developed, tested and has been installed at residential area.*

Keywords: GDP (Gross Domestic Product), Data collection, Platform development, user enablement.

I. INTRODUCTION

India is country is whose Gross Domestic Product (GDP) is mainly contributed by sectors like agriculture, medical, manufacturing / production processes etc. In above mentioned industries remote monitoring of parameters like temperature, humidity and moisture etc. In cost effective way is the need. As they are directly impacting on performance, efficiency, wastages, repetition etc. "Real Time Remote Sensor Monitoring" can be established using sensors, microcontroller and user interface. The sensor data shall be converted into electrical, signal conditioned, and processing it will send to cloud server over various connectivity like Wi-Fi / 2G / 4G. After sending the real time data to cloud server periodically, the sensor data can be monitor from any location at client side or mobile app.

II. LITERATURE REVIEW

Paper: Low Cost IOT Sensor System for Real-time Remote Monitoring
Author: Pietro Nicola Laera
Description: Over the past few years, remote monitoring based services are developing in different domains such as traffic monitoring, healthcare, emergency management and environment protection. These applications presuppose the system ability to manage a lot of data coming from different systems. In this paper, the design of a module for remote and real- time monitoring of environmental parameters is indicated. The conceived architecture is based on the micro service paradigm and adopts the 2G data communication network

Paper: Remote Condition Monitoring Simulation of Multi-unit Architecture on the Internet of Things
Author: Qiu Wen-Yan
Description: Multi-unit vibration frequency is low, the state information exist mutual interference problems, the traditional state monitoring method mainly analyzed the signal equipment unit stability, once the state signal equipment units appeared significant volatility, the status of equipment unit monitoring information is unable to obtain accurately. This paper presented the remote condition monitoring method of multi-unit multi sampling frequency signal operation technology, signal acquisition unit respectively for each device by different sensors, the equipment unit state signal by pre-processing and converted into discrete device status signal, according to the equipment state signal sampling factor, the discrete device status signal multi rate sampling, processing, through the wide area network to a multi rate processing equipment after the state signal, transmitted to the remote receiver, analysis the equipment state signal

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correlation in the remote receiving end, realize remote real-time monitoring state of equipment unit. Simulation results show that, under the internet of things, the proposed method for multi-unit state monitoring efficiency and accuracy are better than the traditional method, is an efficient remote condition monitoring method for multi -unit.

III. PROJECT METHODOLOGY

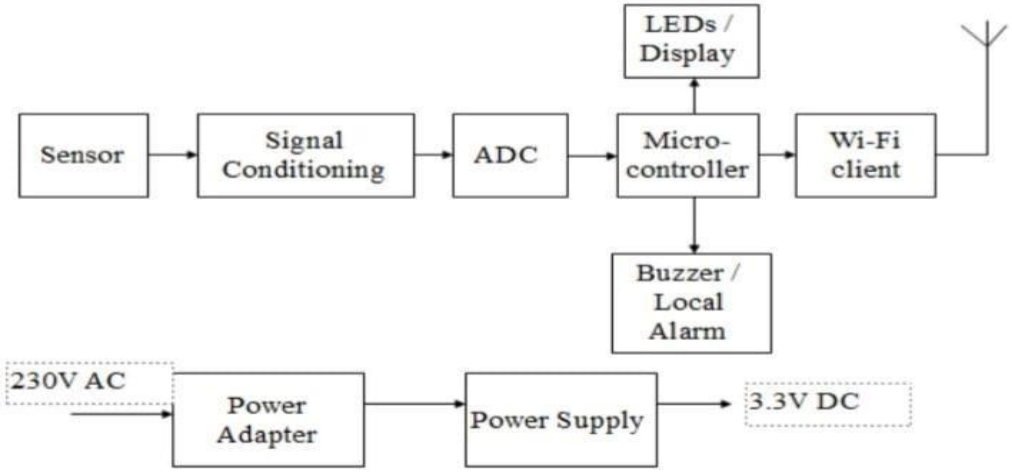
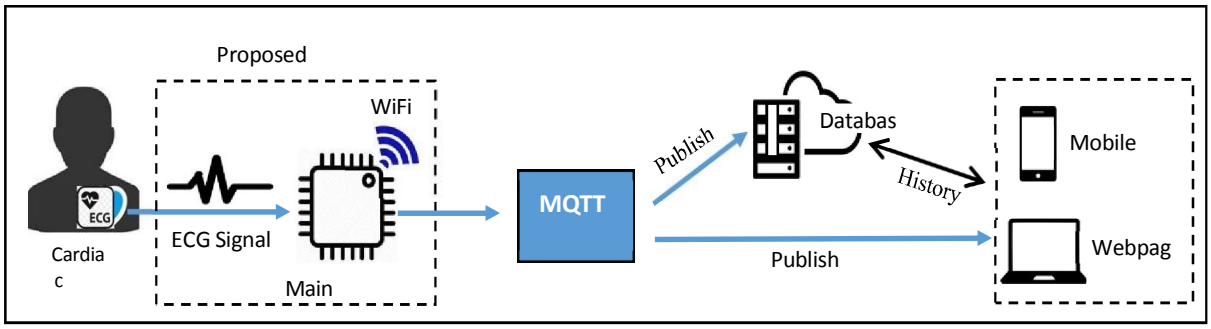


Figure.1

The AD8232 is used to obtain ECG data from cardiac patients. Based on the electrical activity of the heart muscle, it measures and amplifies the ECG signal. The main controller in the proposed system is an arduino ESP 32 integrated with Wi-Fi. The main controller will process the collected real-time ECG data before sending it to the MQTT broker via the Wi-Fi module. The ECG data is published to the webserver via the Raspberry Pi 3's Mosquito Message Queuing Telemetry Transport (MQTT) broker.



In this work, a MQTT-DB relay is used. It subscribes to the same Topic in the MQTT broker as the webserver, buffering the ECG JSON data and then storing it in the database. This enables the proposed system to display the real-time ECG signal on the webpage while also storing it in a database. Aside from the webserver, the doctor can also view the real-time ECG signal using an Android mobile application. App(The App can show both the heartbeat rate (BPM) and an ECG chart in real time. The BPM is calculated from real-time ECG data and is updated every 3 seconds. Doctors and nurses can view the recorded history ECG data on the database server.

This work use the MQTT network protocol rather than the Hypertext Transfer Protocol (HTTP) because MQTT requires less bandwidth, consumes less power, and is more suitable for IOT development [10]. Before being sent to the webserver and database, the ECG signal data is compressed into a JSON Format string. Because both the webserver and the database have built-in functions that can process JSON format data, this considerably enhances the efficiency of data conversion at the client side.

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IV. ELECTRONIC CIRCUIT

Real-time remote sensor monitoring systems typically require electronic circuits to process and analyze the data collected from the sensors. The electronic circuitry can vary depending on the specific requirements of the monitoring system, the sensors used, and the data communication method. However, here are some common components that may be used in the electronic circuitry of a real-time remote sensor monitoring system.

- **Microcontroller:** A microcontroller is the central processing unit (CPU) of the monitoring system, responsible for collecting, processing, and storing data. It can also be programmed to perform specific tasks and control the overall operation of the system.
- **Sensor Interface:** A sensor interface circuit is used to connect the sensors to the microcontroller. It typically involves signal conditioning, amplification, and analog-to-digital conversion to convert the analog sensor signals into digital signals that can be processed by the microcontroller.
- **Communication Module:** The communication module enables the transmission of data from the microcontroller to a remote monitoring station. The communication module can be wired or wireless, and may use technologies such as Ethernet, Wi-Fi, Bluetooth, or Lora WAN.
- **Power Supply:** A power supply circuit is used to provide the necessary power to the electronic components of the monitoring system. This can be achieved using batteries or an external power source.
- **Display:** A display module can be used to show real-time data and status information, such as sensor readings, system status, and alert notifications
- **Memory:** A memory module can be used to store historical data, allowing for trend analysis and troubleshooting.
- **Control Circuit:** A control circuit may be used to implement automatic control of the system or equipment being monitored, based on the real-time data and analysis.

The electronic circuitry of a real-time remote sensor monitoring system can be designed and built using various technologies and components, depending on the specific application and requirements. The ultimate goal is to create a reliable and efficient system that can provide accurate real-time data for effective monitoring and control of mechanical systems and equipment.

V. HARDWARE COMPONENTS

- Microcontroller
- Alarm
- Wi-fi module
- ADC
- DHT11 Soil Moisture sensor

A microcontroller is a tiny computer on a single VLSI integrated circuit (IC) chip, often known as an MCU (microcontroller unit) or MC, UC, or C. One or more CPUs (processor cores), memory, and programmable input/output peripherals are all included in a microcontroller.

Specification

- It is an 8-bit microcontroller.
- It has 8-bit by directional data bus.
- 16-bit unidirectional address bus.
- In-built 128-byte data memory (RAM).
- In-built 4kb program memory (ROM).
- 8051 microcontroller has two 16-bit timer oblique counter.
- 5 Interrupts (2 internal, 3 external).

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Figure.2

Alarm

Local alarm refers to an alarm system that, whether it was installed by an alarm company or a user, emits a signal at an alarm site that is audible or visible from the exterior of a structure and is not watched over by a distant monitoring centre. When the reserve pump is in use, local alarm functions ought to be announced.

Specification

- Principle: automatic conversion of energy from one form to the other due to variation in parameters such as motion.
- It detects intrusion, fire, burglary, and carbon monoxide presence.

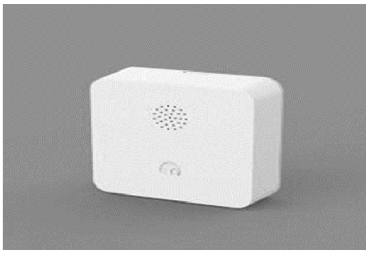

Figure.3

Wi-fi Module

A gadget that joins a wireless Wi-Fi network. A Wi-Fi client is any gadget that sends and receives wireless signals, such as a laptop, printer, smartphone, or camera. Check out Wi- Fi Protected Setup.

Specifications

- 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2).
- Inter-Integrated Circuit (I²C) serial communication protocol.
- Pulse-width modulation (PWM).
- Serial Peripheral Interface (SPI) serial communication protocol.
- Analog-to-digital conversion (10-bit ADC).

Figure.3

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Analog-to-digital converter (ADC)

An Analog-to-digital converter (ADC, A/D, or A-to-D) in electronics is a device that transforms an Analog signal into a digital signal, such as sound captured by a microphone or light entering a digital camera. An electrical device that transforms an Analog input voltage or current into a digital number reflecting the magnitude of the voltage or current is an example of an ADC that can offer an isolated measurement. Although there are alternative options, the typical digital output is a two's complement binary value that is proportionate to the input.

Specifications

- Type of Accuracy: offset error, full-scale error, differential nonlinearity (DNL) and integral nonlinearity (INL) .
- The resolution of the ADC is the number of bits it uses to digitize the input samples.

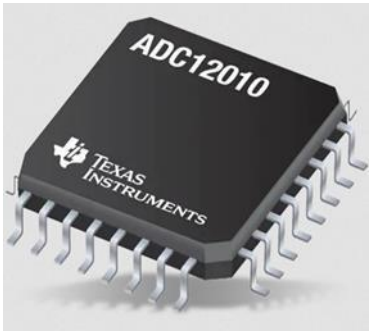

Figure.4

DHT11 Soil Moisture Sensor

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed).

Specifications

- Humidity Measuring Range(%) - 20 to 90.
- Humidity Measurement Accuracy(%) – Â±5.0.
- Length (mm) – 23.
- Response time - <5.

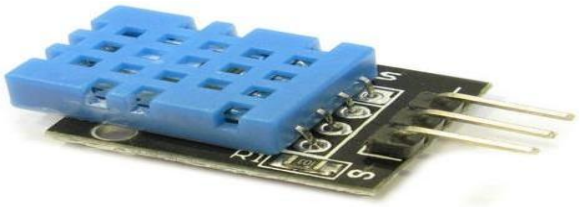

Figure.5

VI. CONCLUSION

This model was used to consider a sensor node as a real-time system. We presented various strategies for managing idle periods in such systems and powering down the processor during this time. Using slack stealer methods, we proposed aggregating this idle duration to increase the period of cutting off. Following the presentation of several slack stealer strategies, we recommended using an approximate algorithm and described when to power down the processor. Using this monitoring system various industries, economy can be monitored and improved by taking corrective actions Contributing to technological growth.

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