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# Integration of IOT Sensors for Real-Time Monitoring of Machine Run Time

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**ABSTRACT:** The subject of Industrial machine run time monitoring is gaining lot of popularity and recognition in Industry with the advent of automation. Machines are valuable assets that need to be protected from damage and failure through proper maintenance measures. This paper proposes a system that automatically monitors the running time of machines and sends notifications regarding their preventive maintenance schedules.

The Internet of Things (IOT) is a fast evolving technology. IOT refers to a network of physical objects or things that are implanted with electronic software, sensors, and network connectivity, allowing them to collect and exchange data. The internet of things then deals with bringing control of physical devices through the internet. Using the IOT concept, we are designing a system that will automatically monitor industrial machines running time and displays it in the cloud memory thingspeak to make intelligent decisions. In our paper, a vibration sensor is used to monitor industrial machine run time. The sensor is carefully chosen based on the potential threats they could pose to the normal operation of the industry machine. The sensor will collect data and communicate it to the arduino controller that uploads the machine running time to thingspeak through the IOT device WiFi modem interfaced to the controller unit.

This paper implements machine run time monitoring system using the Thingspeak Iot cloud platform to store and monitor the data. The sensor estimate is continuously monitored using the finest analysis method using Thingspeak. This system logs all data in the cloud using data logging. This data is sent to a server that is managed by the administrator through Thingspeak cloud platform. The required power supply for the entire module to operate is directly derived from the mains single phase supply.

## I. INTRODUCTION

Safety is the most vital part of any type of industry. Negligence in the safety part may cause damaging of high quality equipment hampering of production or may cause loss of human life also in extreme cases. In the mining, chemical, petroleum, coal and other production processes, harmful leaking gas often occur, efficiently and reliably kinds of data collection, transmission and monitoring system has become the focus of scholars from various countries. In any industry, safety is a fundamental aspect of all. To avoid any types of unwanted phenomena all industries follows some basic precaution and phenomena. Communication is the most vital key factor today, to monitor different parameters continuously and to take necessary actions accordingly to avoid any types of hazards related to safety, production, security or managing of human resources.

Computers or Micro controllers are probably the only tool available that can help us in storage and organization of data and information. Since this paper work mainly focuses about Arduino micro controller, it is essential to understand basics about the Micro controller.

To avoid loss of material and damaging of human health security and safety system as well as reliable continuous faithful communication system is essential in the interior or the underground mines. To enhance security, safety and productivity in the industries mentioned above, a reliable communication system must be established between workers, working in and a fixed base station. The communication network must not be interrupted at any moment and at any condition. For example inside underground mines, the wired communication network system is not so effective.

Nowadays, coal miners suffer a lot from accidents in coal mines due to the complexity of mining environment. The number of accidents in coal mining is increasing day by day. There are many dangers in every mine. Environmental parameters are monitored to protect those who work in the mines. Miners are more susceptible to a variety of threats, including gas explosions, gas leakages and severe changes in temperature, etc. This project implements a gas leak

monitoring and alerting system using the Thingspeak IOT cloud platform to store and monitor the data. All sensor estimates are continuously monitored using the finest analysis method using Thingspeak. This system logs all data in the cloud using data logging. This data is sent to a server that is managed by the administrator through Thingspeak cloud platform.

The demo unit is built accordingly with a wireless system that is developed for workers safety monitoring which accurately measures flammable and poisonous gases and indicate it through an alarm/buzzer to acknowledge the workers as well as transmit the same information to the base station through WiFi module to cloud memory using Thingspeak. The required power supply for the entire module to operate is directly derived from the mains single phase supply.

The Internet of Things can be defined as devices that communicate with each other over the Internet. The Internet of Things is a cutting edge innovation that allows all sensor data to be stored in the cloud and easily accessed from the cloud. The IOT also features sensors and actuators for collecting and transmitting data over the Internet. The cloud is used not only for storing data, but also for analyzing, collecting and visualizing data. Nowadays, coal miners face a lot of accidents in coal mines due to the complexity of mining environment. Therefore, it is very important to regulate environmental conditions during mining. Adequate communication systems must be used to prevent damage to these lives and products.

In the 21st century, there were lots of inventions, but at the same time there were pollution's, global warming and so on are being formed. So it's too important to find the solution for fire monitoring & control system. IOT is a solution. In recent days, developments in computing and electronics technologies have triggered Internet of Things technology.

Internet of Things can be described as the network of electronics devices communicating among them by the help of a controller. The IOT is a collection of devices that work together in order to serve human tasks in an efficient manner. It combines computational power to send data about the environments. These devices can be in form of sensors, appliances, embedded systems, and data analysis microchips. This paper presents a low cost fire monitoring system, which is a solution for extinguishing the fire instantaneously. Microcontrollers and sensors are used for that system.

This paper presents a low power, cost-effective, and IOT based wireless sensor network that provides an intelligent surveillance and safety system for underground mine or industrial applications. This small size, low power device is easily interfaced with desired miniature size sensors (Gas). This network can be easily placed in underground mines and it provides an effectively surveillance and safety system for underground miners. Especially, it provides the real-time data communication between miners and surface control room through highly secure, reliable wireless IOT communication. The proposed system improves the existing miner's safety and early warning surveillance in underground mining operations.

## **II. RESEARCH METHODOLOGY**

### **1. System Design and Architecture**

The primary objective of this research is to create an efficient system capable of determining machine runtime using vibration sensors. The system architecture was designed to capture and process vibration data from machines, transmitting the collected information to a cloud platform for storage and analysis. The architecture comprises the following components:

- **Vibration Sensor:** A vibration sensor (e.g., SW-420 or accelerometer) is mounted on the machine to detect vibrations that indicate whether the machine is operational. The sensor is calibrated to capture the machine's unique vibration patterns during its runtime.
- **Microcontroller:** The vibration sensor is interfaced with a microcontroller that acts as the central processing unit. The microcontroller reads the sensor data, processes it to identify whether the machine is running or idle, and prepares the data for transmission.
- **Wi-Fi Module:** The microcontroller is equipped with a built-in Wi-Fi module, which enables connectivity to the internet. The system uses this module to transmit data to a cloud server, specifically ThingSpeak, for remote data storage and visualization.

### **2. Data Collection and Real-Time Monitoring**

The system is designed to continuously monitor the machine's vibration levels to determine its operational status. The

data collection process involves:

- The vibration sensor measures the intensity of vibrations produced by the machine. When the vibration level exceeds a pre-defined threshold, the system registers the machine as "running." If the vibrations fall below the threshold, the machine is considered "idle" or turned off.
- The microcontroller collects this vibration data at regular intervals and processes it to determine the machine's runtime status.
- The data is then transmitted in real-time to the ThingSpeak platform using the Wi-Fi module. ThingSpeak provides a convenient interface for storing time-series data and visualizing it in graphs.

### 3. Data Processing and Analysis

The raw data collected from the vibration sensor undergoes processing on the microcontroller to filter out noise and ensure accuracy. The data processing steps include:

- **Noise Filtering:** The sensor readings may contain noise due to environmental factors or machine-specific anomalies. A basic filtering algorithm is applied to smooth out the signal and focus on significant vibration changes.
- **Runtime Calculation:** By comparing the processed vibration data against a pre-defined threshold, the system identifies whether the machine is running. The microcontroller keeps a record of the machine's active periods, calculating the cumulative runtime over a specified period.
- **Cloud Integration:** Processed data, including timestamped records of machine status (active or idle), is transmitted to ThingSpeak. The cloud platform organizes the data into time-series format, allowing for historical analysis.

### 4. Cloud-Based Data Visualization with ThingSpeak

The integration with ThingSpeak allows for seamless cloud-based data visualization, enabling stakeholders to monitor machine runtime remotely. The methodology for this process includes:

- The system pushes data to ThingSpeak channels using HTTP POST requests. Each data point includes the machine status and timestamp, ensuring accurate tracking over time.
- ThingSpeak's built-in analytics and visualization tools are used to generate real-time charts and graphs, displaying key metrics such as total runtime, downtime, and operational efficiency.
- Alerts and notifications can be configured within ThingSpeak to notify users when machines have been idle for extended periods or when abnormal vibration patterns are detected, suggesting potential maintenance needs.

### 5. System Testing and Validation

The system was rigorously tested in a controlled environment to validate its accuracy in determining machine runtime. The testing involved:

- Deploying the vibration sensor on various machines and collecting data over extended periods to ensure reliability.
- Comparing the IoT-based system's recorded runtime against manual logs to assess its accuracy. The system demonstrated high consistency in detecting machine activity with minimal latency.
- Evaluating the stability of data transmission to ThingSpeak under different network conditions. The Wi-Fi module showed robust performance, with negligible data loss and stable cloud connectivity.

## III. RESULTS AND ANALYSIS

The IoT-based solution successfully demonstrated the ability to monitor machine runtime in real-time using vibration sensors and ThingSpeak for remote data visualization. Key findings include:

- **Accuracy:** The system accurately identified machine status with a high degree of reliability, reducing the need for manual monitoring.
- **Scalability:** The use of ThingSpeak enables easy scalability, allowing multiple machines to be monitored simultaneously by assigning each machine a unique channel.
- **Data-Driven Insights:** The visual dashboards on ThingSpeak provided actionable insights into machine performance, helping to optimize maintenance schedules and improve overall efficiency.

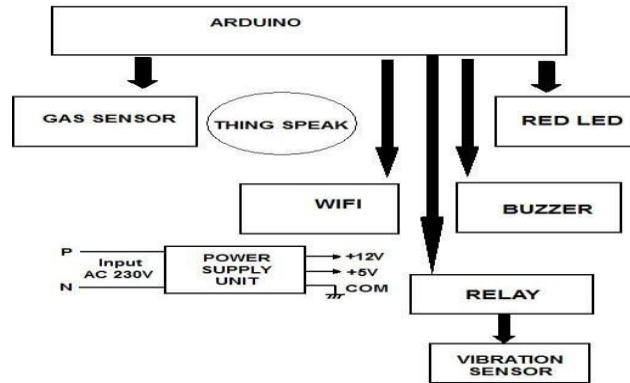


Fig 1: Block Daigram

RESULTS:

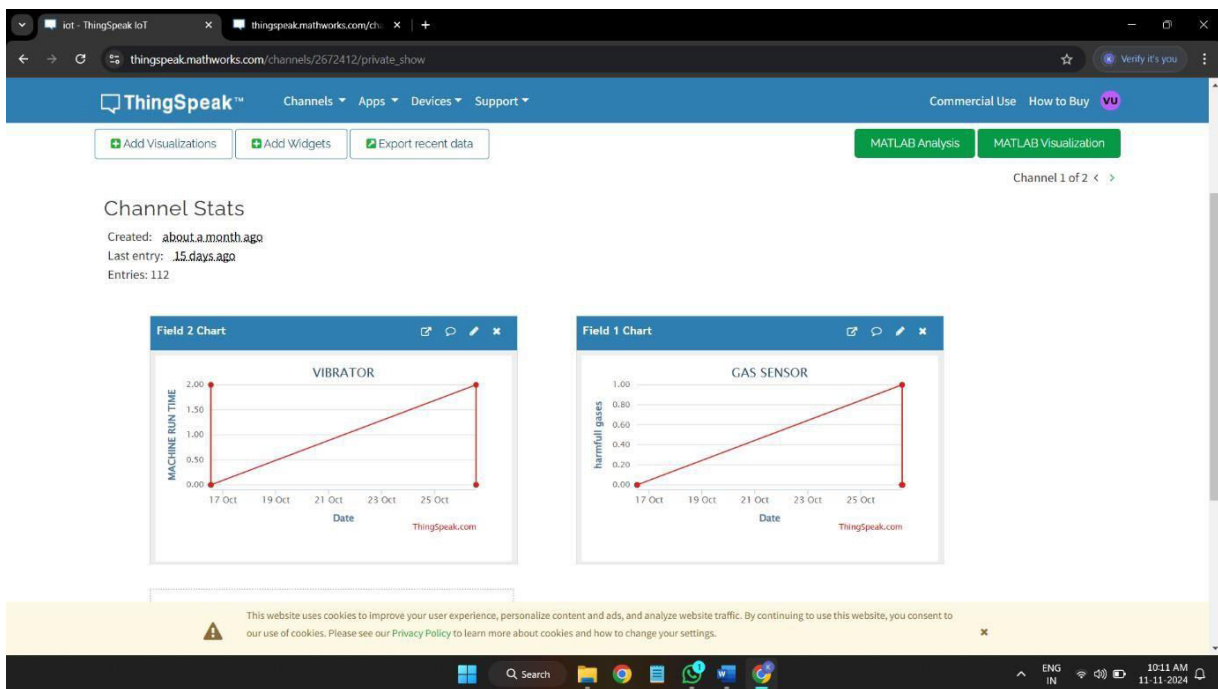


Fig 2: Output

IV. CONCLUSIONS

An IoT-based running time monitoring system (IRTMS) is proposed in this paper. Through this automatic monitoring, the system is successful in achieving two key objectives. Firstly, the system keeps the preventive maintenance (PM) schedules of multiple machines. Thus, the user can get the schedule overview anytime and anywhere. Secondly, the system generates reminder notifications at a certain remaining time. By this, the user can prepare the material, components, or tools required for the PM in advance. By scheduling the PM based on the actual running time, the efficiency of the PM will be increased. The PM is not scheduled based on the planned production time or projected production quantity anymore while omitting the downtime to the calculation. To the best of the authors' knowledge, the proposed system for PM scheduling represents a novel approach and mechanism that has never been done before by any researchers. A series of tests were conducted to simulate and prove the operability and the functionality of the IRTMS. The successful results encourage the real-life implementation of the system in industrial applications.

By keeping the embedded devices in the environment for monitoring enables self protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the Wi-Fi.

#### REFERENCES

- [1]. "Internet of things-based Hyderabad sensing for Real-time Enviromental Monitoring", Ali Yavari, Dimitrios Georgakopoulos, Paul R. Stoddart, Mahnaz Shafiei, Faculty of Science, Engineering and Technology, Swinburne University of Technology, Melbourne, Australia - 2019 IEEE 5th World Forum on Internet of Things (WF- IoT).
- [2]. "Low Cost IoT Sensor System for Real- time Remote Monitoring", Matteo D'Aloia, Annalisa Longo, Gianluca Guadagno, Mariano Pulpito, Paolo Forarelli, Pietro Nicola Laera, Dario Manni.
- [3]. "Industry 4.0 LabVIEW Based Industrial Condition Monitoring System for Industrial IoT system", 2019 Developments in eSystems Engineering (DeSE).
- [4]. "Design of an industrial IOT based Monitoring System for power substations" long zhao Matsuo Yuhao, University of Texas at Arlington.



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