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IOT Based PC Monitoring System for Labs

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Abstract: *The Information and technology (IT) sector has experienced a significant growth throughout the years. Thus, it has been the trend of the market and has generated a lot of other domains which provide numerous job options for people. As a result of this, top educational institutions have been providing best quality programs in the field of computer science. These institutions feature highly equipped computer labs that provide students with hands on experience in new technologies. To ensure these labs operate efficiently, it's crucial to regularly monitor the computers. This paper includes the discussion on different monitoring systems made using Internet of Things (IoT) for the computers and computer labs present in different institutions.*

Keywords: Educational institutions, computer labs, monitoring system, Internet of Things (IoT).

I. INTRODUCTION

Internet of Things, commonly known as IoT has been in the boom since many years now, and many huge tech companies have used this technology in there projects, to enhance their technology. So, what is actually IoT? This might be a question for many. To put in simple words, IoT is a combination of both software and electronic sensors. It can also be said as network of different devices/ things grouped using sensors. It is used to send and receive data from different devices over the internet.

The IoT has a wide range of applications in different fields and industries like:

- Smart homes
- Health-care
- Smart cities
- Agriculture
- Industry IoT(IIoT)
- Smart retail
- Automotive
- PC monitoring system
- Transportation

In this survey paper we are going to study about the monitoring of the computers or PCs that are present in the educational institutions. In today's era, computers have become crucial parts of our lives. Computers are used in each and every field because of the advancements in technology. Thus, it is very important for us to regularly monitor these computers to understand the issues related to them and fix them to ensure efficiency. To do this we can integrate IoT to develop monitoring systems. The process of monitoring the computers based on different parameters like CPU usage, disk usage, memory usage, temperature monitoring, cooling monitoring, etc. is called as PC monitoring or computer monitoring.

Earlier, the computers were monitored and maintained manually. In this process, the person had to check each and every computer individually. If any computer had issues, they had to resolve these issues one by one. This consumed a lot of time and efforts of the person.

The PC monitoring system for labs will be beneficial for all the educational institutions as the PCs will be monitored regularly and if any defects occur they can be solved immediately. This will help in keeping the computers in the best working state so that students will not face the problems like system failure, or machine out of order. This will reduce the dependency on the manual computer monitoring.

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II. LITERATURE SURVEY

In this literature survey section we will study and analyze few of the research papers related to this topic.

The application of a computer monitoring system using IoT technology Author: Zhu Zhao and Qian Hu

Journal: Computational research and neuroscience.

This paper mainly focuses on Internet of Things i.e. IoT along with the RFID(Radio Frequency Identification) technology. It states that IoT technology enhances computer monitoring systems by providing intelligent condition monitoring and real-time data recording, facilitating better management and response to operational issues.

The paper states the use of sensor technology, integration of cloud computing and 5G.

The methods used are:

Platform designed with intent to maintain security, using authorization and verification management to protect the system. The computer monitoring system employs a structured approach to data acquisition and processing, ensuring efficient management of monitoring tasks through a unified modelling process.

process of auto-addressing and data polling, ensuring accurate identification and communication between system components. Conclusion: Overall, the research is centered on leveraging IoT technology to enhance computer monitoring systems, with a specific focus on applications in smart highway management and the integration of various technological advancements to improve operational efficiency and safety.

Design and implementation of micro-environment intelligent monitoring system in computer rooms based on Internet of Things Technology.

Author: Zhengqian Feng, Mingle Zhou, Qingfeng Meng

Journal: International Conference on Advances in Mechanical Engineering and Industrial Informatics.

This paper emphasizes on importance of maintaining the air quality in the computer labs, to avoid equipment corrosion, increased energy consumption, and higher failure rates.

Current situation: the air quality fluctuates from G1 to G2 level. This increases by 4 times in winter. Without air purification, SO2 levels can corrode the IT equipments. Due to this it is very difficult to maintain the equipments in highly polluted areas.

Solution: the solution involves using wireless data collection methods to avoid excessive energy consumption and interruption in airflow in the computer room. This approach aims to prevent local hot spots that could lead to equipment downtime by maintaining optimal airflow.

Conclusion: The designed microenvironment monitoring system enables real-time tracking of SO2, temperature, humidity, and other critical environmental factors in the computer room.

Continuous online monitoring is vital for maintaining the integrity and reliability of the computer room's microenvironment.

The above two papers broadly specify the application of PC monitoring in labs and the methods by which we can maintain the environment in the labs, which will not affect and damage the computers and their parts.

III. EXISTING SYSTEM

Below are the few existing popular Iot based computer monitoring systems. These systems typically provide real-time data collection, analysis, and alerts, often through cloud platforms or dedicated mobile apps.

Atera:

It is a cloud based monitoring platform that uses IoT technologies to monitor devices. It monitors system health, CPU usage, memory, and disk space. It also provides real-time alerts and automated maintenance tasks. The target audience is IT professionals and businesses.

Pulseway:

It monitors the computer based on the parameters like disk usage, cpu usage, RAM and network connectivity. It's target audience is IT administrators, businesses, and enterprises.

Paessler PRTG:

It monitors temperature, cpu, fan speed, network bandwitdth. Its target audience is again IT professionals and network administrators.

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IV. PROPOSED SYSTEM

As we saw in the existing system section, all of the monitoring systems are mainly developed for IT professionals or businesses. But, our pc monitoring system mainly focuses on the labs of different educational institutions. These labs also need such monitoring systems as the computers are used by numerous people in a single day.

The proposed PC Monitoring System is an IoT-enabled solution designed to provide real-time monitoring and analysis of various parameters related to a computer's performance and environmental conditions. The system focuses on providing actionable insights and alerts to administrators through a user-friendly dashboard

Key Features:

Real-Time PC Monitoring: Continuously tracks the operational status of PCs (On/Off/Idle) and performance metrics.

Temperature and Fan Speed Monitoring: Monitors the ambient temperature around the PC and the cooling fan's speed to ensure optimal operating conditions.

User-Friendly Dashboard: Provides an intuitive and interactive dashboard for viewing data in real time and generating historical reports.

System Power Usage: Tracks the current power consumption of the PC to identify energy usage patterns and potential inefficiencies.

Alert Systems: Sends notifications via email or mobile push alerts in case of anomalies such as high temperature, abnormal power usage, or system failures.

System Components:

IoT Sensors:

Collect data on:

Outer environmental temperature.

Current usage of the PC.

Fan speed and system status.

Microcontroller (ESP8266 NodeMCU):

Acts as the central processing unit to collect data from sensors and transmit it to the server.

Local Server:

Purpose:

Stores real-time and historical data.

Processes and analyzes the data for meaningful insights.

Hosted on a local PC or dedicated machine within the premises, ensuring data security and accessibility without relying on the internet.

Dashboard Application:

Web or Mobile Application:

Enables administrators to monitor real-time data.

Provides historical data visualizations through graphs, charts, and tables

Notification System:

Sends proactive alerts to users via:

Email notifications.

Push notifications on mobile devices.

System Workflow:

Data Collection:

Sensors gather real-time data on temperature, current usage, fan speed, and system status.

Data Transmission:

Microcontroller transmits the collected data to a local server using Wi-Fi or other communication protocols.

Data Processing:

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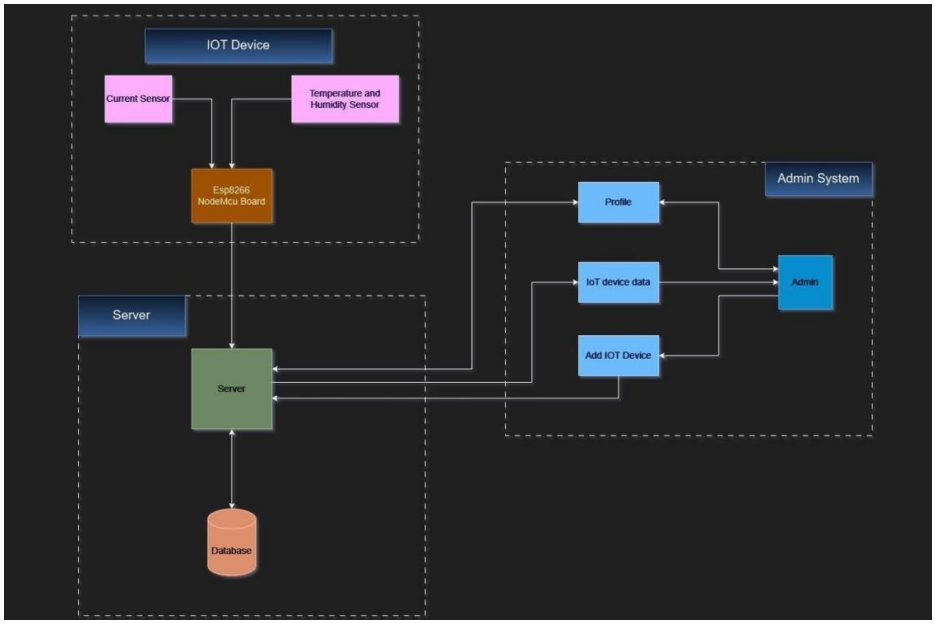
The local server processes and analyzes the data to detect anomalies or generate reports.
Data Display:
The dashboard application retrieves and displays the processed data to the user in an intuitive format.
Alert Mechanism:
Alerts are triggered for predefined thresholds (e.g., high temperature, excessive power usage).

V. SYSTEM DIAGRAM FOR PROPOSED SYSTEM



The diagram represents a system architecture for an IoT-based solution, where sensors and devices communicate with a server, and the data is managed through an admin system. Here's a detailed explanation of each component:
IoT Device
Contains sensors and an IoT development board (ESP8266 NodeMCU).
Current Sensor: Measures electrical current data.
Temperature and Humidity Sensor: Captures environmental data like temperature and humidity.
These sensors send their data to the ESP8266 NodeMCU board.
ESP8266 NodeMCU Board
Acts as a microcontroller and a Wi-Fi module.
Collects data from the sensors and transmits it to the **Server** via Wi-Fi.
Server
Responsible for receiving, processing, and storing the data sent from the IoT devices.
Database: Stores data from the IoT devices, such as current measurements, temperature, and humidity.
The server communicates with both the IoT devices and the admin system.
Admin System
Used to manage and monitor the IoT devices.
Profile: Manages user or device-specific profiles, allowing for personalization or tracking.
IoT Device Data: Displays data from the sensors in real-time or historical formats.
Add IoT Device: Allows adding new IoT devices to the system.
Admin Panel: Provides controls to manage the system, monitor devices, and ensure system functionality.
Workflow
Sensors: Collect data and pass it to the NodeMCU board.
NodeMCU Board: Sends sensor data to the **Server** over Wi-Fi.

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Server: Processes the data and stores it in the **Database**. The data can also be used for analysis or visualization.
Admin System: Allows administrators to view and manage the data and devices through various interfaces like Profile, IoT Device Data, and Add IoT Device.

VI. BENEFITS OF PC MONITORING SYSTEM

Talking about the benefits of this system are listed below:
Improved Efficiency: By tracking system performance in real-time, administrators can prevent system failures and optimize PC usage.
Efficient Resource Management: Monitoring will help in optimizing the usage of CPU, RAM, and disk space.
Energy Efficiency: System will monitor idle PCs that will help in reducing energy consumption by turning them off when not in use.
Preventive Maintenance: Monitoring temperature and fan speed will prevent overheating and prolong the life of hardware.

VII. FUTURE SCOPE

This PC Monitoring system can be modified in the future to obtain more enhanced performance, few of the options are given below:
1. Integration with Artificial intelligence and machine learning:
Future versions of the system could leverage AI and ML algorithms to predict potential hardware failures, optimize resource usage, and detect abnormal behavior in system performance. Predictive analytics could allow for proactive maintenance, minimizing downtime and extending the life of lab equipment.

2. Mobile application development:
Developing a dedicated mobile app would enable lab administrators to monitor and control systems on-the-go. Push notifications and real-time alerts could be sent directly to smartphones, allowing for faster response times in case of critical system issues.

3. Enhanced Data Analytics and Visualization:
The system could provide more advanced data analytics features, allowing administrators to gain deeper insights into lab usage patterns, energy consumption, and system performance trends. Enhanced visualization tools, like heatmaps or 3D models, could help identify underperforming machines or hotspots in the lab.

VIII. CONCLUSION

In conclusion, the development of PC monitoring system for labs proves to be very beneficial for the educational institutions as it becomes very difficult for institutions to maintain the performance of the computers.
As technology continues to make advancements, it has become very important to monitor the health of the system, its performance and its efficiency.
By integrating sensors with real time monitoring, the system enhances the overall performance of computer by regularly monitoring it.
This survey highlights the growing need of automated monitoring systems in today's era. It includes the analysis of the existing systems and the features they provide.
It also casts a light on the research that have taken place on/ related to this topic, which helps us understand the previous or existing works in this domain.

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