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Android Based IOT Data Acquisition & Monitoring System

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Abstract: In recent years there has been a vast technological improvement in industrial control rooms for monitoring the entire field of Industrial plants. High-end microcontrollers are being implemented for controlling the entire process of fields. But a problem is that even though automation takes complete control of total plants few authentication and manual actions are needed from the user side to complete the control action. Hence there is a must situation for users present at all times in the control room to take some time needed control actions. Due to the static nature of the control room environment, the user should always be static to monitor the process. In this project, we propose a system that promotes the control engineer to obtain the data values anywhere and everywhere within the control room. This new system is suited for acquiring the control parameters. The main objective of this proposed work is to acquire sensor data and store it in the Data Acquisition Cloud which can be accessed from the Android App specially designed for this purpose.

Keywords: IoT, Light Sensor, Humidity Sensor, Temperature Sensor, Gas Sensor, ESP32 Microcontroller

I. INTRODUCTION

The Internet of Things (IoT) portrays actual items (or gatherings of such articles) that are installed with sensors, handling skills, programming, and different advances, and that associate and trade information with different gadgets and frameworks over the Web or different interchanges organizations. The field has developed because of the combination of numerous advances, including universal registering, item sensors, progressively strong implanted frameworks, and AI. Customary fields of installed frameworks, remote sensor organizations, control frameworks, and mechanization (counting home and building computerization), freely and aggregately empower the Internet of Things. The Internet of Things (IoT) describes physical objects (or groups of such objects) that are embedded with sensors, processing ability, software, and other technologies, and that connect and exchange data with other devices and systems over the Internet or other communications networks[8]. The field has evolved due to the convergence of multiple technologies, including ubiquitous computing, commodity sensors, increasingly powerful embedded systems, and machine learning. Traditional fields of embedded systems, wireless sensor networks, control systems, and automation (including home and building automation), independently and collectively enable the Internet of Things. In this processes some quantities like temperature, pressure, gas discharge, production achieved etc got to be controlled in period from remote location. There are few trained persons within the industry; they have to touch in each moment concerning the parameters like temperature, pressure, gas outflow, production achieved etc.By concerning this a fully automation system is developed in a such a way that update and control the standing of that particular plant with the assistance of automaton mobile. Different sensors are mounted to induce the info from plant surroundings. The obtained different signals are given to microcontroller and according to the necessity controller is programmed and produces the control signals to manage the operation. Different researchers have been worked on industrial automation and controlling and suggested many methods using different technologies and also research is going on to improve more and more[2].

II. PROBLEM STATEMENT

In semi-open or closed loops, the IoT will often be considered and studied as a complex system due to the huge number of different links, interactions between autonomous actors, and its capacity to integrate new actors. At the overall stage (full open loop) it will likely be seen as a chaotic environment. As a practical approach, not all elements in the Internet of Things run in a global, public space. Subsystems are often implemented to mitigate the risks of privacy, control, and reliability. For example, domestic robotics running inside a smart home might only share data within and be available via a local network. Managing and controlling a highly dynamic ad hoc IoT things/devices network is a tough task with the traditional networks architecture, Software Defined Networking (SDN) provides the agile dynamic solution that can cope with the special requirements of the diversity of innovative IoT applications.

III. MOTIVATION

In the customer market, IoT innovation is generally inseparable from items relating to the idea of the "smart home",

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including gadgets and machines (like lighting apparatuses, indoor regulators, home security frameworks and cameras, and other home machines) that help one or more normal biological systems, and can be controlled by means of gadgets related with that environment, for example, cell phones and brilliant speakers. The IoT can likewise be utilized in medical services frameworks[5]. There are various worries about the dangers in the development of IoT advances and items, particularly in the space of protection and security, and thusly, industry and legislative moves to address these worries have started, including the improvement of worldwide and neighborhood principles, rules, and administrative structures. The broad arrangement of utilizations for IoT gadgets is frequently partitioned into shopper, business, modern, and framework spaces. A developing piece of IoT gadgets is made for shopper use, including associated vehicles, home computerization, wearable innovation, associated well-being, and machines with remote checking capacities. Hence for proper control and monitoring of IoT Devices connected at various places, a Dashboard is a must. An IoT Dashboard allows the controlling and monitoring of IoT Devices remotely from anywhere in the world. Here we plan to design and develop Android App for IoT Data Acquisition & Monitoring[6].

IV. OBJECTIVES

To design and develop a secured IoT App which can be used for remotely monitoring and controlling devices over the internet. The main objectives of the system are as follows:

1. To develop an app with secure data storage that maintains data integrity, and confidentiality.
2. To provide a user interface to the user.
3. The dashboard should be able to display data received from the cloud and update it after fixed intervals to show the current data.
4. The dashboard should be able to get data from users and send to the cloud for controlling devices.

V. LITERATURE SURVEY

Previous research has presented that many condition monitoring rooms like servers and office room are monitored which most applications were monitored online on temperature, pressure, flow rate, capacity, acceleration, and many more. There are different monitoring methods to acquire the measurements between those developments such as to decreased electricity consumption [1], energy conservation and comfort in the office system helps people to manage electricity consumption. Another assistance of this system is to monitor energy consumption for combi boilers. Also, this system benefits from a user-friendly interface. The application is also can send a notification when the room temperature is higher than the default. [2] environmental physical parameters such as temperature, humidity, and air quality based on people's subjective sensations to yield satisfactory feelings of comfort. Furthermore, electricity consumption could be reduced by minimizing unnecessary use of heating and cooling equipment based on precise knowledge of comfort levels in industries, fire alarms, and IoT system-designed concepts [5]. Nowadays, temperature monitoring system is widely used in various processes like in freezers, hospitals, automotive industries, air conditioning systems and other industries where data collections are analyzed and evaluated. Today, most research are developing the Internet of Things (IoT) research where the network of physical objects devices, vehicles, buildings, and other items is embedded with electronics, software, sensors, and network connectivity. IoT development enabled its sensors to collect data and the controller played the brain of central connectivity. Arduino controllers are mostly used which its makes development easier especially for small IoT research projects [6]. Arduino usually Uno or Mega are used in the electronic project which is divided into two parts. The first part is the physical program and the second part is the software part. The second part which is an important part of Arduino is the part that has been used to upload coding from a computer into the board. Arduino does not need the other components to complete the upload coding which is Arduino having their USB port. Many IoT systems development used the C++ language for the interface configuration. Besides Arduino Uno or Mega, some research used ESPresso Lite V2.0 which acts as the internet board for the project to connect the software to hardware. ESPresso Lite V2.0 uses the ESP8266 Wi-Fi platform as a Wi-Fi module. The ESP8266 is prepared to do either facilitate an application or offloading all Wi-Fi networking capacities from another application processor. ESP8266 accomplishes low power consumption with a mix of a few exclusive advances. Its high level of on-chip incorporation takes into consideration negligible outer hardware, including the front-end module, which is intended to involve an insignificant PCB range [7]. This internet board allows anyone to learn, experiment and build their IoT projects easily, quickly, and remotely access [8]. The core hardware inside ESPresso Lite V2.0 is ESP8266 with the development of Information Technology, network, and automatic control technology, the safety of the environment can be monitored gradually. Adaptive IoT room condition monitoring system used one type of temperature recorder that monitors temperature in a server room and displays the current temperature on the website through a web server and smartphone application. ThingSpeak web is an example of a website using the open-source data platform of IoT [9]. A device that connected with ThingSpeak was advertised and displays its result on the ThingSpeak website and the data is saved in private or as public data. Besides, the data that are

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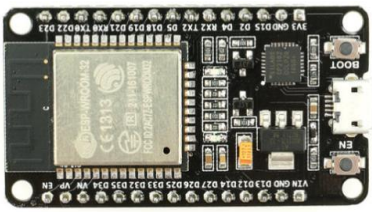
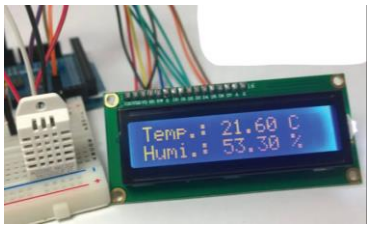
saved using ThingSpeak, data also is taken sampled to be analyzed. ThingSpeak gave the online text editor to perform data analysis and real-time data collection[10].

VI. PROPOSED SYSTEM

The proposed work includes the gathering of information from different sensing elements like temperature sensors, humidity sensors, light sensors, and gas sensors that are placed in the production working environment. Out of all some sensors provides analog information and some provide digital pulses. Analog signals undergo signal acquisition to convert them into digital. The controller used is ESP32 which belongs to the ESP family. Relays are used for controlling and switching purposes. The controller takes the sensing element values and displays them on the digital display and as conjointly at the same time sends it to Android mobile using cloud storage (real-time database). If the sensing element value exceeds the predefined then the user will control the process by passing the commands through the Android application.

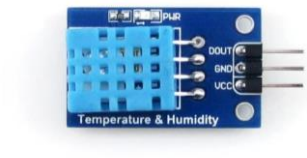


ESP32 Microcontroller

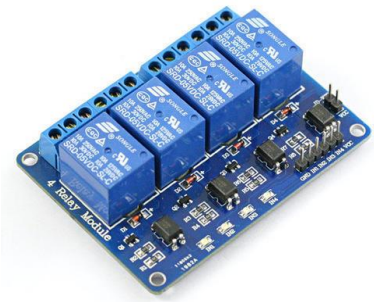


LED Display(16x2)

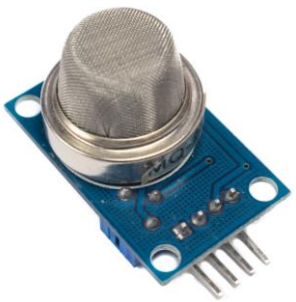
MQ5 Gas Sensor



DHT11 Temperature & Humidity Sensor



4 Channel Relay Module



MQ135 Air Quality Gas Sensor

VII. BLOCK DIAGRAM

The entire system is divided into two parts. The first part consists of the collection of data from different sensors like the DHT11 temperature and humidity sensor, LDR light sensor, etc. These sensors are mounted at the different desired location in the plant to measure the parameters like temperature, Light, Co2 gas detection, production achieved, etc in real-time and give this data[6]. In the Second section, microcontroller collects the all the sensor values and compares them with predefined values in the program. If the sensor values exceed the predefined then it takes the necessary action to control the parameters by switching the relays i.e. ON/OFF. At the same time controller send the information to alert the user who is at a remote location. Users may send the control command using the Android application to control the parameter if needed. LCD is used to display the parameter details.

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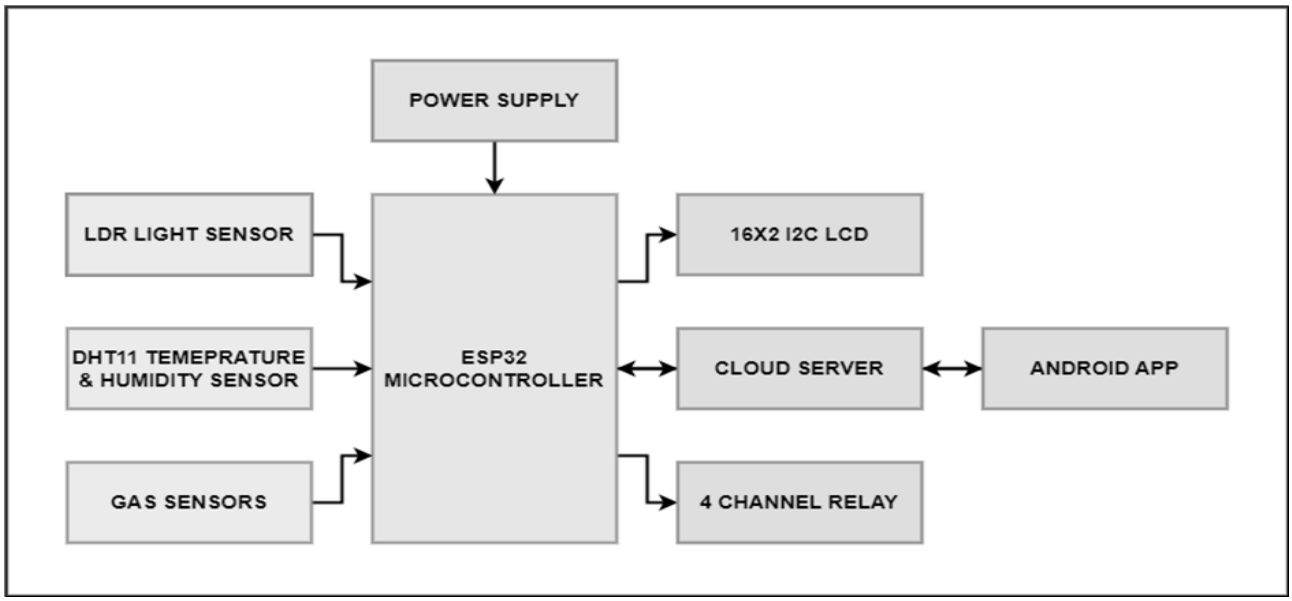

Fig. Block Diagram

VIII. Flowchart

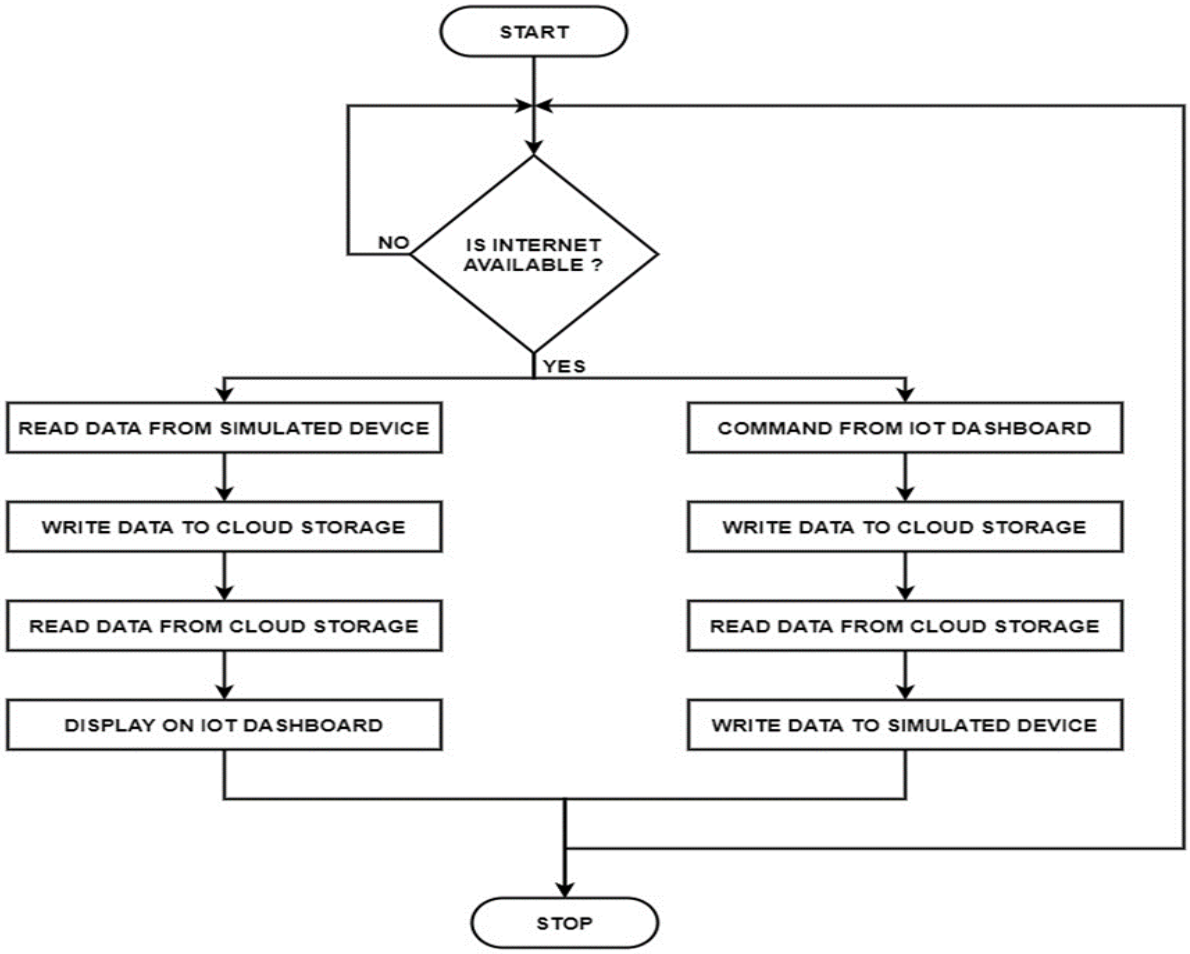

Fig. Flowchart

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IX. RESULT

In this work, the sensors successfully implemented data or values received from the sensors were displayed on the 16X2 LCD display and also controlling the corresponding devices according to the plant operation on the basis of received data. The snapshots show the optimized results. The figure shows the values of temperature measured, and light intensity on liquid crystal display(LCD). Figure shows the snapshot of the Android application showing sensor values.

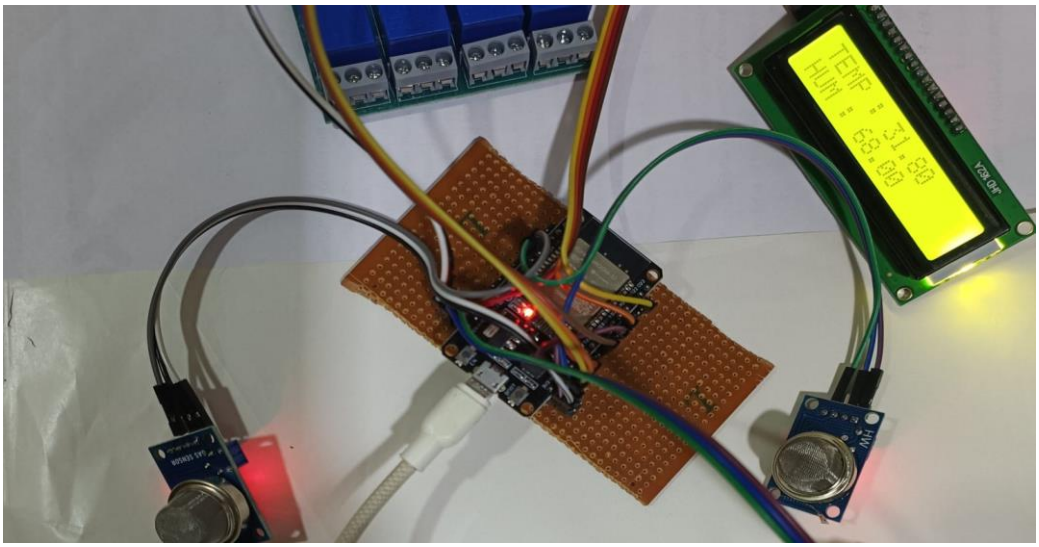

Fig. Hardware Connections

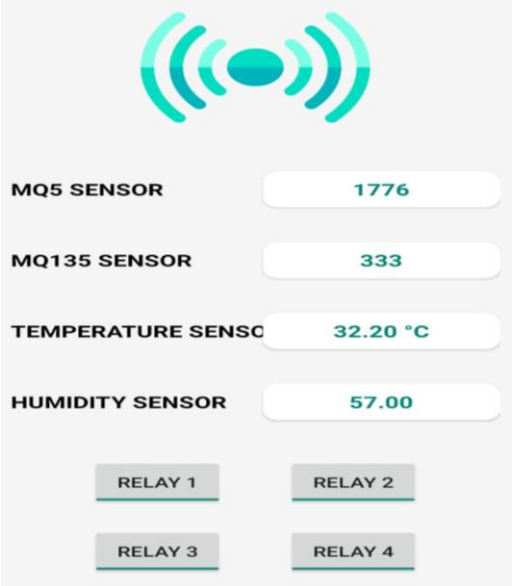

Fig. Android App Readings

X. CONCLUSION

This paper has presented a method to measure the environmental parameters using a mobile robot. Serial communication is done between ESP microcontroller and sensors. Sensors will obtain the measurement and the data is send to the microcontroller. The microcontroller processes the data and displays it on the Android App. The prototype of this project has been successfully completed. Here this system is to acquire sensor data and stores it in the Data Acquisition Cloud which can be accessed from the Android App specially designed for this purpose. The Proposed devices are created for consumer use, including connected vehicles, home automation, wearable technology, connected health, and appliances with remote monitoring capabilities. The system will include the gathering of information from different sensing elements

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like temperature sensors, humidity sensors, light sensors, and gas sensors that are placed in the production working environment

XI. FURTHER ENHANCEMENT

At remote end android application specially designed for this pIn this paper we present beginning tests towards natural checking with a versatile stage. Numerous fascinating future expansions are attainable with our current arrangement. Something such is transferring the framework yield (ecological boundary) in suitable modes, for example, mists. Likewise, the utilization of Bluetooth safeguard can be modified by utilizing Wi-Fi or another hardware with higher control range.This app will also include a control window by using that we can send commands to control robot wirelessly[6].

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