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IoT Based Home and Industry Monitoring and Security System

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A B S T R A C T

We present a low-cost and flexible IOT-based home and industry monitoring system by using the ESP-32 with internet connectivity through local wi-fi for accessing and controlling devices by formal users remotely using an Android smartphone application. This system is self-governing and uses IOT applications to control human-desired appliances in both industrial and domestic domains. The use of IOT not only saves human efforts but also energy and time. Here, we present a home and industrial monitoring Monitoring System based on the ESP-32 module, which can monitor fire, gas leakage, and trespasser detection using a PIR sensor and a connected camera. The generated data is relayed to the user directly through Telegram. The said system can help prevent fires, theft, and gas leakage, thus preventing loss of life and property. The system plays the role of real-time monitoring and early warning by utilising IOT and cloud technologies. This is a low-cost apparatus that focuses on medium- and small-scale workplaces and domestic safety and monitoring. An important advantage of using this system is that it can be modified depending on the requirements of the client.

Keywords: IOT: Internet of Things.

1. Introduction

A security system is very important for the protection of domestic as well as industrial assets; this is underlined by the US Department of Justice in the following statement: "80 percent of thieves said they would carefully search for evidence of a security system before trying a break-in, according to a new study and poll of convicted burglars done by the US Department of Justice and the University of North Carolina. If a security system was detected before the attempted crime, 60% of people would instantly rule out the house as a target. Just 13% of poll participants stated they would even contemplate continuing their illegal effort if they discovered a security system while the crime was being committed. Half of the respondents said they would return home, while others claimed they would flee and try to hide elsewhere."

Even though the importance of these systems is undeniable, their cost makes them difficult for everyone to use. To try to overcome this issue, IOT can be a game-changing technology as it does not need an expensive infrastructure and needs very little to no maintenance. Therefore, we have proposed to use IOT to build a Home and Industry Monitoring System that can monitor various parameters in real time and send alerts across the globe to the user's smartphone.

This system's low cost makes it possible to install more household appliances. We can save time and energy by having a system that monitors our homes and controls specific gadgets without the need for human intervention. Here, we're employing four sensors and four appliances-related devices to monitor and control various aspects of the home, respectively. The data may be sent to an open source cloud storage system to be stored there, and a mobile application can be used to display the sensor status.

From automated machines to consumer items, innovation improved day by day. IOT is another pattern development that enables us to monitor and manage hardware over the web. Here, we suggest using the internet of things (IOT) to monitor and manage household appliances, computerising modern houses over the web in this way.

The project suggests a useful use for IOT that utilises the web to inspect and control home appliances. The framework for home robotization uses practical devices as a user interface. Additionally, they may communicate with a home computer network via an Internet connection and techniques for low-power communication protocols like Zigbee, Wi-Fi, etc. This project involves utilising a smartphone to control household appliances using Wi-Fi as a communication mechanism and ESP 32 as a server setup. . The IOT-based Monitoring and Controlling System for the house is a development that enables remote monitoring and control of any real-world appliances as well as devices for home mechanisation. It offers the ability to assure security and have control over a variety of household appliances. In this project, we demonstrate how to construct a home automation system utilising an ESP32-based

webpage server, mobile app, and Wi-Fi module. This project uses a regulated system based on the threshold value defined in the ESP 32 to monitor gas leaks, water level and trespasser alarm.

2. Proposed Methodology

Various solutions to this challenge have been put up in the literature, but they all demand complicated circuitry and high-level understanding to run these systems. But a thorough understanding of the hardware or software is not necessary for the suggested endeavour. There are certain shortcomings in them when you summarise all of the earlier work that has been done. Employing esp32, connecting them to the cloud, and downloading the data via a mobile app is an effective strategy we are adopting to get over those drawbacks. The current technology makes it simple to monitor and manage household appliances, update open source cloud data, and then automatically update mobile devices with the same information. Four sensors—a magnetic door sensor, a PIR sensor, a gas sensor, a Flame sensor, and an ESP32 module—make up the system. The ESP32 sends the commands to cloud storage utilising IOT. The cloud storage system will take in the instructions and display the results.

The programme is a mobile app. To display a sensor's status. The intended framework screens sensor data from devices including flame, gas, and motion sensors. The sensor data is further kept on the cloud. The customer will benefit from knowing the status of several parameters in the home at any time and from any location. The hardware implementation and the software implementation are the two main components of the system. The system uses a variety of sensors, all of which operate similarly but with differing operating principles. Each of these sensors has its own connection to the esp32.We power the various devices using a MB102 power supply . In this project, we're utilising a mobile app coupled to an open source cloud storage system. The sensor blocks keep track of readings for things like flames, gas presence , PIR values, and reed sensor. The answer and values should be shown on the mobile app from the cloud storage. The measurements are detected and provided to ESP32 if there is a rise in those values. Values are continually updated in the cloud by this block and then retrieved for the operator dashboard. An alert is shown on the operator dashboard if the recorded value exceeds the threshold level.

Hard Ware:

1 ESP32:

It is a less-cost, little power system on a chip microcontroller with included Wi-Fi and dual mode Bluetooth. The ESP32 is the heart of the project. It is a microcontroller board used to connect all the sensors. The board is programmed with the source code in order to perform the operations of the project. The source code is stored in the on-chip memory available on the ESP32. This block can be considered as an interface between the programmer and the user. So, it is considered as the heart of the project. The ESP32 operating voltage range is 2.2 to 3.6V. Under normal operation the ESP32 thing will power the chip at 3.3V. The pin description of ESP32 is shown in fig.3.

Fig 3:esp32

2 Gas Sensor:

The MQ-6 Gas Sensor identifies gas leakage in home and industry. The MQ-6 arrangement of gas sensors utilizes a little radiator inside with an electrochemical sensor. They are delicate to a scope of gasses and are utilized inside at room temperature. These are utilized in gas spillage uncovering of LPG, propane, methane, i-butane, alcohol, Hydrogen, and smoke. It is a low cost semiconductor sensor which can detect the presence of gases at concentrations range from 0.05 mg/L to 10 mg/L.

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Fig 4: MQ 6 gas sensors

3 PIR sensor:

Passive Infrared sensor identifies a human or animal moving within about 10m from the sensor facet. In this project, the sensor is employed for detecting presence of humans in the room and send signal to the ESP32. It is used to detect the infrared light radiated by a warm object.

Fig.5 PIR sensor

4 Flame Sensor

Flame sensors are utilised in a number of hazardous environments, such as hydrogen stations, industrial heating and drying systems, industrial gas turbines, domestic heating systems and gas-powered cooking devices. Their primary purpose is to minimise the risks associated with combustion

Fig,6 Flame Sensor

5 magnetic reed switch

The reed switch is an electrical switch operated by a magnetic field. In it's most basic form, the switch consists of a flexible ferromagnetic metal contacts inside a sealed glass tube. When a magnet is brought close to the 'reeds', the reeds move so that they come into contact, closing the switch.

Fig.7 Magnetic reed switch

6 BreadBoard :

A breadboard is a solderless construction base used for developing an electronic circuit and wiring for projects with microcontroller boards like Arduino
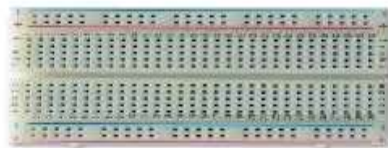
Fig.8

7 MB102 Power Supply module

This power supply board is designed to plug into a Breadboard panel with 2 power Distribution strips. The module can be powered by a USB port or an external power supply 7-12V. The module has two independent power lines, which can be set to output voltage of 5V or 3.3V, or completely remove power from the line. The module has ON / OFF switch to turn on and off module. It comes with reverse polarity and short circuit protections, which greatly helps during building and testing circuits on the breadboard.

Actual Output:

The output of this system comes as images and alert messages in Telegram App. Whenever the sensors detect any increase in their respective parameters, they send a Alert on the telegram app with the prefixed message for each sensor . When the PIR sensor detects any motion it takes a image of the object with the camera attached to ESP32. In this way IOT is utilized to provide real time monitoring and providing security against Fire, Intruders ,Gas leakage, etc.

3. Conclusion

IOT is a very important technology as it facilitates to interconnect various devices and sensors without having a human operator in between all the time. This saves valuable time and efforts and thus money. An important application of IOT is Autonomous and Real Time monitoring Systems. The presented system is an excellent Example of it. This system can monitor the given area for various parameters such as Intruders, Fires ,gas leakage , etc and these parameters can be changed as per necessity without changing the entire system by doing necessary additions or subtractions to the system. These type of system are very beneficial as they provide real time monitoring and alerts and are also relatively very cheap to produce with little to no maintenance . This system has been tested and dose provide expected outputs.

4. Acknowledgements

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