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SMART OFFICE MONITORING SYSTEM USING IOT

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Abstract - *Smart office monitoring system shows very imperative part in our exists. It makes the work relaxed and modest so for shortened and informal alive, smart office monitoring system is considered in this system. This system is erected on subsystems like biometric, door-access, lighting, heating and buzzer systems are also present. The sensors are used to get the real time data from atmosphere. Sensors are accompanying to the ESP32 microcontroller. Its progressions the data and gives the output. Fan, bulb, buzzer is output components linked to the controller which will work when the system marks the threshold value. The sensors data is continuously recorded. Smart office system concentrated on biometric, door-access, lighting, heating, and reconfiguration is intended in order to save energy and encourage the approvals of the employees. This system offerings the study on how it is possible to guarantee the indoor office comfort, indoor ease is the important kinds of relief (visual, thermal, air quality, etc.) and how each of them could be analysed. This system has discussed thermal comfort. System summaries devices spontaneous interoperations into three groupings and present plan and execution of a context-attentive impulsive interoperation of information devices in building a smart meeting room. Fingerprint identification module is used for security purpose. Buzzer and emergency message are sent through the e-mails to security people.*

***Key Words*: R307 Fingerprint sensor, Servo motor, ESP32 microcontroller, PIR motion sensor, MQ2 gas sensor, LDR sensor, DHT11 temperature & humidity sensor, 5v 4-channel relay**

1. INTRODUCTION

A smart office monitoring system is to be considered with one entity in mind that is of full probable of workforce. It's not rocketry just innovative thinking and new technology that best fits people's needs. Office monitoring among other things facilitates easy documentation and real time communication. smart office monitoring system complete on biometric, door-access, lighting, enlightening, heating, and reinvigoration is construct in order to save energy and promote the satisfactions of the employees [1]. Office monitoring refers to the combination of office functions usually related to managing information the modern history of office monitoring began with the typewriter and the copy machine, which industrialize ahead manual tasks. Today's office monitoring system is progressively understood as a term that refers not just to the computerization of tasks but to the conversion of information to electronic form as well. The effective communication tools or use of automation in the output of an organisation that showcases the positive impact on the bottom line over a period of time. Nowadays furthermost of the people devote lot of time in offices. Office environment should be leisurely so that the employees can give their best as office environment directly affects the working efficiency of employees/workers. So, ease is must and it is required in office. A smart office is a residence that varieties life informal for employees and customers, which empowers it and increases their ability to stay connected. As the corporal limitations are being accompanying, a viable and complex world concentrations on innovation and creativity is being developed. Through a building automation or structure administration system, the automatic provincial regulator of a construction's diverse sub-systems i.e. lighting, heating, and other systems are accomplished. Objectives of building automation system are amended active operation of building systems, resident ease, and drop in energy feasting and functioning costs, and progress life cycle of efficacies. Building segment is one of the main motives of the global energy feasting. Smart building is like a smart home that optimizes productivity, ease and safety by collecting and analysing sensor data logically. Modern buildings contain composite mechanical devices, scholarly control systems and numerous structures to progress the care, effectiveness of occupants. The smart building needs connectivity amongst all the systems and equipment's in a building.

1.1 Research Motivation

IoT technology can and forming a new form of communication. Be applied in creating new concepts and wide development spaces that are implemented not only in homes to provide comfort, security, and improve quality of life but it can also be implemented in an office or company. The existence of IoT technology makes the implementation of smart office can be realized. A great company has employees in a synergy to achieve its maximum target. Then, it is reasonable for a company to improve its performance and productivity by supporting and providing the employees needs in work. Possible and expressive office is one of the belongings that company can afford to strengthen its employees to impression comfortable and motivated in giving their outstanding achievement in work.

1.2 Statement of The Problem

Nowadays most of the People allocate lot of time in offices. Office environment precisely affects the working efficiency of employees. So, comfort is essential in office. A smart office is a platform that varieties life informal for employees and customers to legitimize and its escalation their capability to stay connected through by accomplishing use of various progressive technology and different tools and solutions to improve the efficiency of users. As the corporal limitations are existence bridged, a complex and viable world focuses on innovation and creativity is being developed. The world is hastily experiencing the evolution of intelligent growth zones. So, smart office has rapid become the need of the hour. A smart office is one that guarantees the finest and active exploitation of physical infrastructure and IT resources. In further disputes, offices in today's cohort of information technology are automated. There is need for technological improvement environment which is very translucent. Thus, the office monitoring allows the systems to become more transparent, it enables information distribution more openly, which creates a convenience for accomplishing an informed decision which has a great impact across the functioning of the business. The effective advanced automation, use of various communication tools in the system shows the positive impact on the business and growth of company or any organization over a period of time. Dominance of smart office is the eradication of internal reporting development, i.e. in/out timings of the employees by an accessible office adjustment. It also surges the efficiency through improved communication among team members which affects in the output. A smart office is to be construct with one thing in mind to discharge adequate possible of workforce.

2. RELATED WORKS

Many research papers associated to office monitoring and smart monitoring systems are mentioned. Scholars have put emphasis on dissimilar controlling systems, subsystems and have controlled diverse restrictions of smart office. Several processing constraints and results of numerous papers are debated in this segment.

Hang Li, in this system an inclusive smart office system focused on door-access, lighting, illuminating, heating, and reconfiguration is planned in order to save energy and inspire the consents of the employees [1]. Catalian B. Et al, this system offerings the study on how it is possible to safeguard the indoor office ease, indoor relief is the vital types of well-being (visual, audio, thermal, air quality, etc.) and how each of them could be analysed. This system has debated thermal comfort [2]. Tangjian Deng et al, A smart conference room generally states to a working atmosphere, which offers conference attendees with a highly operative evidence attainment and discussion space, with a purpose to progress the working and decision-making effectiveness. System synopses devices impulsive interoperations into three classes and present plan and execution of a context-aware impulsive interoperation of information devices in building a smart conference room [3].

In the above-mentioned systems constraints like Temperature (Heating, ventilating systems), light is used. Also, in other papers the writers have focussed on single constraint seriously. While in this system Smoke sensor is used for fire alert and fingerprint proof of identity module is used for security purpose which is added.

PROPOSED METHODOLOGY

In this paper we proposed the solution for smart office monitoring system using R307 fingerprint sensor, servo motor, PIR motion sensor, MQ2 gas sensor, LDR sensor, DHT11 temperature & humidity sensor, 5v 4-channel relay and interface with ESP32 microcontroller which embedded with Arduino code. Arduino software is used for Arduino coding to monitor the office, display the output in serial monitor and send the sensed data to the Android Application which can be monitored by manager & security people.

A) Hardware Needed

1) ESP32

It is a sole 2.4 GHz Bluetooth and Wi-Fi composition chip intended with the TSMC extremist low power 40 nm technology. It is intended to accomplish the finest power and RF performance, viewing toughness, flexibility and dependability in an extensive variation of applications and power circumstances.

2) Servo motor

It is an electrical device which can impulse or alternate an entity with inordinate accuracy. If you need to alternate and entity at approximately exact distance or perspectives, then you use servo motor. It is objective made up of simple motor which route over servo mechanism. If motor is used is AC (Alternate Current) powered then it is named AC servo motor, and if it is DC (Direct Current) powered motor then it is termed DC servo motor. We can get a genuine high turning servo motor in a trivial and light bulk correspondences.

3) R307 Fingerprint sensor

This Module embraces of visual fingerprint sensor, high-speediness DSP processor, high-performance fingerprint alignment algorithm, high-dimensions FLASH chips and other hardware and software outline, steady routine, modest structure, with fingerprint access, image

processing, fingerprint matching, search and template storage and other functions.

4) 5V 4-channel relay

This is a LOW Level 5V 4-channel relay adventure point be accommodated, and to each station wishes a 15-20mA driver current. It can be used to regulator numerous appliances and apparatus with bulky current. It is furnished with high-current relays that work under AC250V 10A or DC30V 10A. It has a standard line up that can be precise right by microcontroller.

5) PIR motion sensor

It is generally an electronic automated sensor that dealings with infrared (IR) light radiating from objects in its arena of view. They are furthermost frequently used in PIR constructed motion indicators.

6) MQ2 gas sensor

This module is suitable for perceiving gas outflow exposure (home and industry). It is proper for sensing LPG, H2, CO, CH4, Alcohol, Smoke or Propane. Outstanding to its high compassion and reckless reply time, measurement can be taken as soon as possible. The sensitivity of the sensor can be accustomed by potentiometer.

7) LDR sensor

It is otherwise christened as photoconductor or photoresistor or a cadmium sulphide (CdS) cell. It is fundamentally a photocell that entirely works on the belief of photoconductivity. The passive portion is characteristically a resistor whose resistance rate decreases when the asset of light reductions. This optoelectronic device is typically implemented in light fluctuating sensor circuit, and bright and dark triggered swapping circuits. Roughly of its applications embrace light beam alarms, camera light meters, reflective smoke alarms, street lights, clock radios and outdoor clocks.

8) DHT11 temperature & humidity sensor

This Component is pre-delimited with resistive sense technology united with NTC thermistor, for the exhaustive understanding of the reasonable Humidity and nearby temperature DHT11 break-out boarding is a very prevalent, low-cost sensor, the breakout offers easy installation of the DHT11 sensor unit.

B) Software Used

1) Arduino IDE

Arduino IDE is used to generate the code and upload the code on microcontroller for Implementation and Testing. It runs on Windows, Mac and Linux. Arduino IDE is a frivolous, cross-stage application that presents programming to apprentices. It has both an online editor and an on-foundation application, for workers to have the choice whether they want to save their sketches on the cloud or locally on their own mainframes.

2) Blynk

Blynk Android Application is used for real time monitoring purpose. It generally intended for the Internet of Belongings. It can control hardware remotely, it can show sensor data, it can accumulation data, envision it and do several further cool things. Blynk app permits you to create incredible interfaces for your projects by means of numerous widgets we offer. Blynk Server accountable for entirely the transport network amongst the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It's open-source, could effortlessly knob thousands of diplomacies and can even be hurled on a nodeMCU.

3. SYSTEM DESIGN

1) Architectural Design

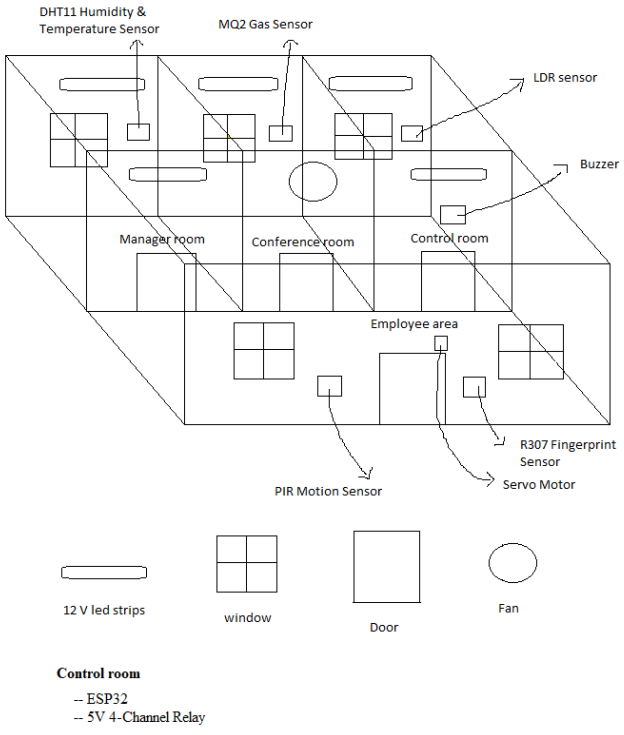

Fig -1: Architectural Design

In this architectural diagram as shown in the figure1 we have used 5 sensors such as R307 (Fingerprint sensor), PIR (Passive infrared sensor), MQ2 (gas sensor), LDR (Light Dependent Resistor sensor), DHT11 (Temperature & Humidity sensor). And the controlling unit are light & Fan. And in this architectural diagram we have shown about buildings which contains employee area, manager room, conference room, control room (where all the controlling units such as microcontroller and relay are kept in this room).

2) Circuit Diagram

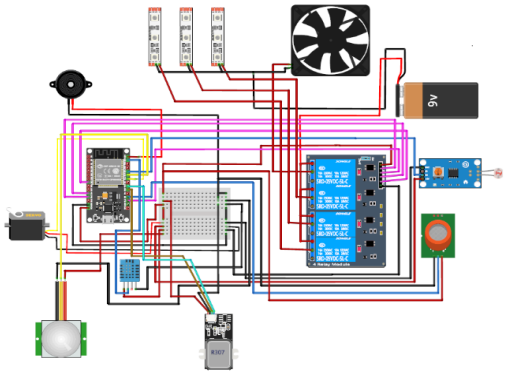

Fig -2: Circuit Diagram

The components are connected according to our project as shown in the above figure 2. As for easy identification colour code of the wiring is used that are red colour as VCC, Black as GND, Yellow and Blue as input, Pink to the relay1, relay2, relay3, relay4 of GPIO's, Ochre as RX of the fingerprint module, Cyan as TX of the fingerprint module.

3) Dataflow Diagram

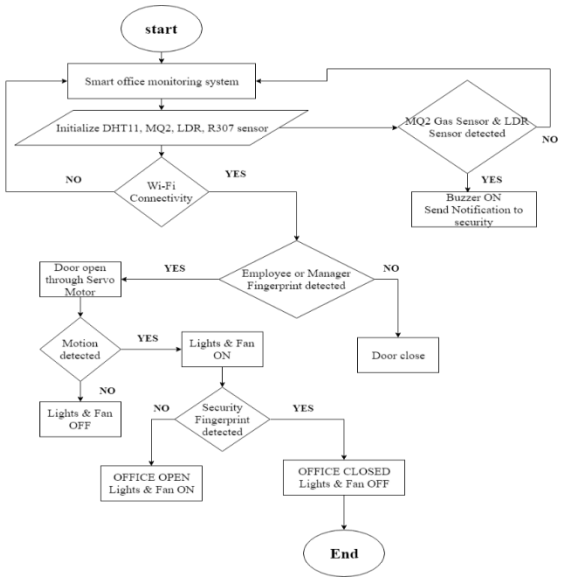

Fig -3: Dataflow Diagram

The completed working model of our project is as shown in the above figure 4.2 1. The working model of this project is at first the Wi-Fi should be connected and when an employee or manager enrols him/her fingerprint in the fingerprint module door will be open and they have the access to enter the office and the notification will be sent through the mail to the manger as this employee is present. As soon as they entered inside the office, motion is detected by the motion detector and all the lights and fan will be ON state as the presence of the person. If security fingerprint detected all the lights and fan will be OFF shows that the office is closed. Inside the office LDR and MQ2 Gas sensor detected buzzer will be ON and notification will be sent to the security people and mail will be sent to the manager. We can also control the lights and fan through Blynk android application.

4. RESULTS

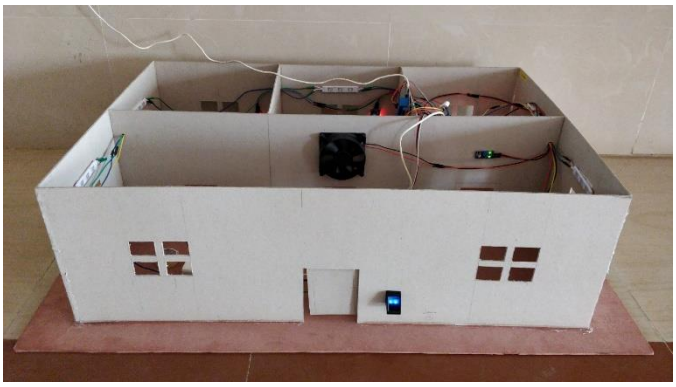

Fig -4: Hardware structure of office close

In the above figure 4, the status of the office will be closed. The fingerprint sensor will be waiting to get the authentication to open the office.

Fig -5: Hardware structure of office open

In the above figure 5 shows that after authenticating the person's i.e. Employee or Manager, the door will open and the motion sensor detects the presence of the person and all the lights and Fan will ON. Inside the

office we have used LDR Sensor and MQ2 Gas Sensor. If there is a chance of getting any short circuits inside the office the buzzer will be ON and the notification and email will be sent to the security people and manager as fire or smoke detected.

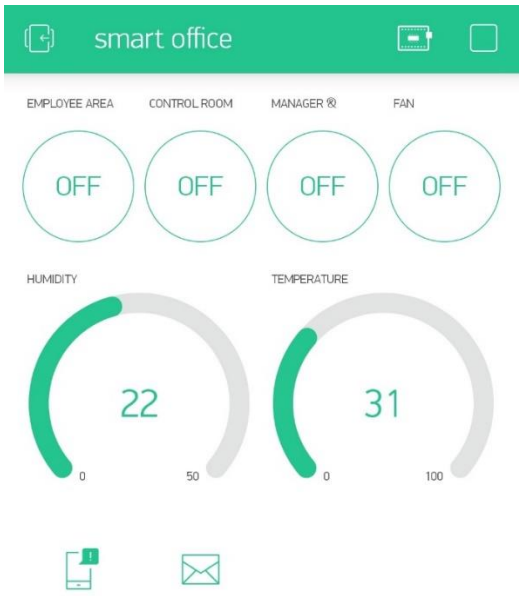

Fig -6: Blynk app

In the above figure 6 shows that the Blynk app is showing the widgets of Button, Gauge, Notification and Email. The controller widget such as the Button widgets are simply used for ON and OFF the lights and Fan. The Display widget such as Gauge widgets are displaying the Humidity and Temperature value inside the office. The Notification widget such as Notification and Email widget are used for sending the mail for the particular person and sending the notification. In this project we have used four rooms that are employee area, conference area, Manager area and control room. As mentioned in the controller widget, the labels of Employee area, Conference room, Manager room, Fan are responsible for ON and OFF of the lights and fan of the particular rooms.

5. CONCLUSION

In this system, close attentions are given to user's comfort and satisfaction. The biometric for door access, lighting, heating (temperature & humidity), smoke detection systems are being premeditated. Fingerprint biometric is used for security purpose. Other person cannot arrive the office area. Fire alarm system is used. Whenever the verge is crossed, buzzer will be ON in the control room and mail will be sent to the security peoples. The smart office system in the system is based on a sovereign smart office and then prolonged to the whole smart building. In this smart office system, two working modes automatic mode and manual mode are used. The manual mode is viewed as a complement of the automatic mode.

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