

SMART OFFICE

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Abstract— Smart office is a work space well equipped with IoT devices like different sensors connected through internet. It enables people to work better, faster and in a smart manner. Features of smart office enables people to communicate better, for e.g. Sensors can tell person where he or she is right now, how he or she can reach at particular location, what is route for the same etc, so smart office is called as offices of future.

Keywords—IoT, Sensor, HVAC, LED, PIR motion sensor, Biometric sensor.

1. INTRODUCTION

A smart office system is a one entity that is fully automated with sensors that gives comfortable environment to employees. Smart office has different features like biometric, door-access, lighting, and enlightening, heating, and temperature control in order to save energy and increase comfort level of employees [1]. Smart office reduces all paper work with help of computer and digital information. In smart office there is computerization of tasks as well as conversion of information to electronic form. If office environment is comfortable then employees can give their best as office environment directly affects the working efficiency of employees.

The automation in office and use of various communication tools shows the positive impact on the business and growth of company. Smart building is just like a smart home that optimizes productivity, ease and safety by collecting and analyzing sensor data logically[2]. Smart office is a second home for employees where they can work efficiently in a very comfortable environment. The safety feature is also taken in consideration very well so we can say smart office is offices of future.

2. Literature Review

The research papers referred to design smart office systems are as follows.

Hang Li, has proposed a smart office system focusing on different aspects in order to save energy and increase comfort level of employees [1]. Catalian B. Et al, has given solution to increase indoor ease and safety [2]. Tangjian Deng et al, has given example of smart conference room which offers highly comfortable environment to conference attendees, increase in comfort level results in effectiveness in decision-making [3]. Arun S has proposed a smart office monitoring system that gives all the aspects of smart office. This paper has given complete idea about smart office like what are different sensors used, architecture and data flow diagram. This system has different features like biometric for door access, lighting, heating (temperature & humidity), smoke detection systems. Fingerprint biometric is used for security purpose so that third person cannot enter in office. Fire alarm system is used in order to increase security level whenever the verge is crossed, buzzer will be ON in the control room and mail will be sent to the manager and security persons [4].

3. SMART FACILITIES PROVIDED BY SMART OFFICE

Better employee productivity: Smart office increases comfort level of employees so it results in more productivity.

Increased workplace safety: Safety of office can be increased with a number of IoT devices like security cameras, connected sensors, access control systems, and smart locks. As safety increases ultimately it declines criminal activities.

Smart lighting: Smart lighting is often taken into consideration while modernizing office environment. As smart lighting has the potential to reduce energy costs by 90 percent. It consists of five key features: LED lighting, IoT sensors and controls, connectivity, analytics, and intelligence.

Intelligent climate control: Smart climate control system detects usage patterns within the office and automatically regulates temperature accordingly. This increases the system's efficiency and increases comfort level of employees. An office temperature can have significant impact on employee productivity. Sometimes it is difficult to find optimal working temperature for all. HVAC system has solved this problem as it allows employees to make temperature adjustment requests at their place from their smart phones or desktop.

Smart conference rooms, Screen: The meeting process for employees can be improved using intelligent conference room and intelligent screens. A conference room is one of the shared resources in the office so for efficient utilization of it employees of office must know who is currently using it and for how long, when it will get free. Any employee of office can book the conference room from his/her smart phone by setting at their desk. Intelligent screen can be displayed outside of each conference room that will be useful to know who is currently using the room, who has an upcoming reservation, for what purpose, and for how long it will take to finish.

Smart parking: This facility enables employees and visitors to find which space is vacant in parking where they can park their vehicle. It also provides security to parked vehicles with high resolution cameras.

Indoor way finding: It helps people to find correct way to reach at their point of interest within less time using smart phone. This reduces time required to reach at particular point.

4. ARCHITECTURE

The sample architecture is as shown in the figure1. This architecture includes 5 sensors such as Fingerprint sensor, PIR motion detection sensor (Passive infrared sensor), MQ2 (gas sensor), LDR (Light Dependent Resistor sensor), LM35 (Temperature & Humidity sensor). This architecture represents essential parts of smart office containing different sensors, employee area, manager room, conference room, control room with all controlling units.

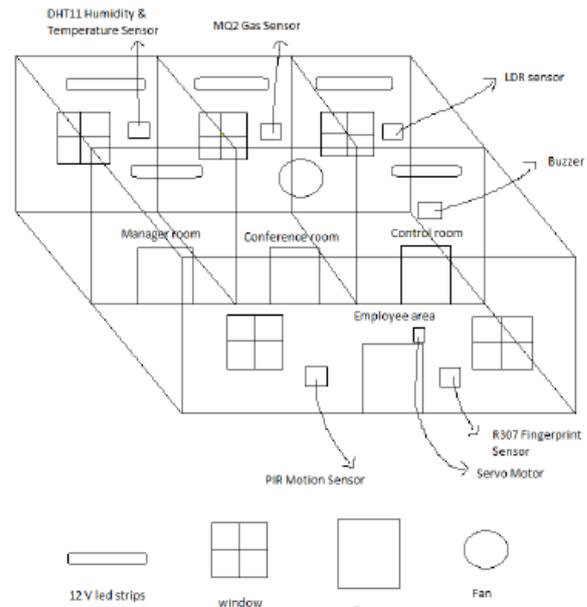


Fig. 1 Architecture

4.1. DATA FLOW DIAGRAM

Data flow diagram is as shown in fig 2. This system requires connection with internet. When an employee or manager has to enter in office they have to verify their finger print if it got verified then they have an access to enter the office and that will be considered as presence of that employee as notification will be sent to the manger through the mail. When they will enter inside the office, motion will be detected by the motion detection sensor and lights and fan will get ON. If security fingerprint is not detected then all the lights and fan will be OFF showing office is closed. In presence of a flammable gas or smoke the red light glows showing danger and the buzzer beeps to alert the security people. The same notification will be sent to the security people and mail will be sent to the manager.

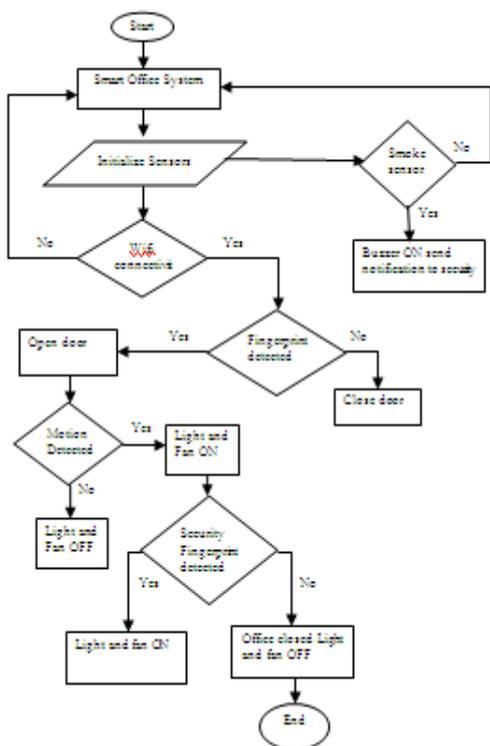


Fig. 2 Data Flow Diagram

4.2. TYPES OF SENSORS

Smart office can be implemented using different sensors. Details of these sensors are as follows:

PIR Motion Sensor: A passive infrared sensor (PIR sensor) is as shown in Fig. 3. These sensors are used to detect motion. PIR sensors are commonly used in security applications. Once movement is detected the PIR sensor automatically turns on lights. Electric appliances such as tube lights, fans will remain ON only in the presence of human beings so it reduces wastage of electricity. PIR can also be used in security systems, if no motion is being detected, the relay contact is closed and there is no triggering of alarm but if motion is detected, the relay will open the circuit, and alarm will be triggered to intimate security people.

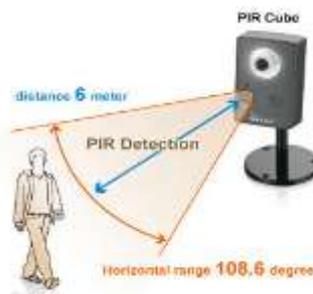


Fig. 3 PIR Motion Sensor

Temperature Sensor:-

LM35 is a Temperature sensor, used to measure temperature around it. It can measure temperature anywhere between -55°C to 150°C. It is like shown in Fig. 4. It helps to automatically control temperature inside the office according to the surrounding temperature. This sensor is required in a smart office as it automatically adjusts temperature according to the temperature around it. It helps employees to feel comfortable at their workspace.



Fig. 4 Temperature Sensor

Smoke/Gas/Fire Alcohol Sensor

In the presence of a flammable gas or smoke, the red light of the sensor glows and the buzzer beeps. If there is no presence of a flammable gas, the green LED glows. This sensor MQ2 is important as the security of employees is concerned. It looks like as shown in Fig. 5.



Fig. 5 Smoke Sensor

Biometric Sensor: This is important part of smart office, biometric sensor captures the finger prints of employee and compare it with data stored in database if match found then only it is considered as presence of employee so it reduces paper work. It also reduces proxy cases as every person has his unique finger prints. The view of biometric sensor is as shown in Fig. 6.



Fig. 6 Biometric Sensor

5. CONCLUSION

This system has considered all aspects of smart office including security, comfort of employees. It has also considered energy utilization using PIR motion detection sensor we can detect the presence of human being if any person is there then only lights, fans will remains ON so it leads to energy saving. If any flammable gas or smoke is detected then the buzzer beeps and notification will be sent to the security people and mail will be sent to the manager. This system also focuses on comfort of employee as employees in office can have control

over the temperature or humidity in the workplace. They can control it directly from their smart phone. It has also provided security to employees using high resolution cameras, smoke and gas detection sensor so smart office is offices of future.

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