A Survey on Intelligent Office Automation System Based on IoT

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Abstract- ***Smart technologies are increasingly being utilized in all areas to improve our lives. The Internet of Things (IoT) is revolutionizing the way we live and work. This intelligent office system is connectivity solutions to improve productivity, collaboration, and space management. We are human beings, and we tend to forget a few essential things like switching off the lights, printers, coffee machines, AC, etc. This increases energy consumption which leads to paying more electricity bills. The office automation system will enable us to manage our daily routine in the workspace without any human intervention. These technology-based systems help to collect, organize, and analyze everyday tasks. This system is based on subsystems like lighting, heating. Security and alarming systems are also present. The sensors are used to extract the real time data from environment. Biometric fingerprint is used for security purpose. Fire alarm and emergency call is given to the service room. At the entrance, employees don't have to manually mark their presence in the office every day. Instead of this, it gets done as soon as they enter the office using the RTLS tags without touching or standing in the queue as it prevails in most of the offices. Also, the employees can check the availability of meeting room and can schedule a slot for their meeting by just a click.***

Indexed Terms- ***Internot of Things (IoT), automation system, sensors, technology, biometric, Real Time Locating System (RTLS).***

I. INTRODUCTION

Intelligent offfice systems are powered by the Internet of Things (IoT), incorporating a combination of hardware and software solutions. Cloud-based technology is central to the smart office, as are some key intelligent devices. Many hardware devices can help to support office automation. Conventional office devices such as computers, phones, and mobile devices will, of course, be required. However, these must be up-to-date and capable of supporting the software, features, and level of connectivity which an office automation requires. Internet of Things (IoT), and the main agenda of this technology is to interconnect the smart devices and reduce the workflow, streamline routine jobs, and make the work environment more reliable and convenient for employees. IoT technology allows several devices in the office to connect with smart devices, letting IoT control them. As we know, automation in daily tasks can reduce human intervention; therefore, using smart technology like IoT will surely increase efficiency. There are various methods to take advantage and transform it into a smart office system using IoT.

Cutting Down on Energy Consumption: Use devices that work on a timer. Businesses choose to incorporate LED lights located on the floor and walls that switch on when someone enters a particular area and automatically switches off when they leave. This helps in tracking energy consumption significantly. Similarly, there are smart switches used in companies where control is just a tap away. Factories and manufacturing units can control this device with an app.

Weather Control: Where every office is equipped with air conditioning and heating, IoT-based smart automation can manage the office's climate. Remotely operated devices will operate and adjust the temperature according to the time of day. It is also

possible to control the blinds according to the heating and cooling.

Security Solutions: Security solutions can go beyond just surveillance. You can now manage cameras remotely using voice and face commands. This helps businesses to track the in and out of every individual visiting the office. Hence, security systems will save costs for security personnel. So, office aotomation system generates reports and warnings for real incidents, if any. Along with smart security systems, it eliminates the risk of physical theft. This is the major advantage for major industries.

Scheduled Systems: Using IoT technology, optimizing several people with their compliance and safety practices becomes easy. This means offices can be more efficient allowing the employees to automate the manual tasks.

Nowadays most of the people spend 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, comfort is must and it is needed in office. In earlier decades technology at its best meant a fax machine and an electronic typewriter; today it's an iPad connected to the cloud solution. An intelligent office automation system is a place that makes life easy for employees and customers, which empowers it and increases their ability to stay connected. This is achieved by making use of various advanced technology and different tools and solutions to improve the efficiency of users. As the physical boundaries are being bridged, a competitive and complex world focuses on innovation and creativity is being developed. The world is greatly experiencing the emergence of intelligent growth zones so smart office- has fast become the need of the hour. A smart office is something that ensures the effective and optimal utilisation of IT resources and physical infrastructure. In other words, in today's generation of information technology offices are automated. There is need for transparent technological advanced environment. Thus, the office automation allows the systems to become more transparent, it enables sharing of information more openly, which creates an opportunity for making a great impact across the functioning of the industrial sector and business. The use of various communication tools in the system and effective advanced automation, shows the positive impact on the growth of company or any organization and business over a period of time. The elimination of internal reporting processes, i.e. in/out timings of the workers by an open office arrangement is the advantage of smart office. The productivity can be increased through enhanced communication among team members which affects in the result. A smart office is to be designed to release full potential of employees and the workforce. It’s not a miracle just innovative thinking and new technology that best fits people’s needs. Office automation among other things facilitates real time communication and easy documentation.

We are human beings, and we tend to forget a few essential things like switching off the lights, printers, coffee machines, AC, etc. This increases energy consumption which leads to paying more electricity bills**.** This paper proposes an intelligent, resource efficient office that uses IOT based network system to send data to the database that senses real-time data coming from the sensors deployed in the office. As shown in figure, right from the entrance, the system uses RTLS tags for the employee to provide access into the office and thereby preventing any intruder to enter. Also using the RTLS based entry system, the owner of the company can restrict the entrance of the workers from entering classified areas and snooping into the information. The system uses current, temperature, light and PIR sensors to maintain the room facilities as soon as the appliances are turned on or to power them if any person is detected in the room. The meeting rooms have additional occupancy sensors to thoroughly check for the vacancies and gets updated in the database from time to time.

II. PROPOSED SYSTEM

A. Working

Power Supply Unit: An electronic component required little amount of voltage and current. The power supply section in this paper constitute components such as the step down transformer of rating 220/12V which was used to reduce the input voltage of 220V to 12V, silicon diode (IN5932) for rectification, capacitor-input which is attached in parallel with the output segment of the rectifier in other to reduce the ripple

voltage of the output and increase the DC voltage, a voltage regulator was used to pick the actual 5V needed by the entire system.

Microcontroller Unit: The system was developed through the Arduino Uno open-source microprocessor. Arduino Uno is an integrated development environment (IDE) with a piece of software and it is a microcontroller board based on the ATmega328 (datasheet). It is equipped with 14 digital input/output pins, of which 6 out of the 14 pins can be utilized as pulse width modulator outputs, 6 analogue inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

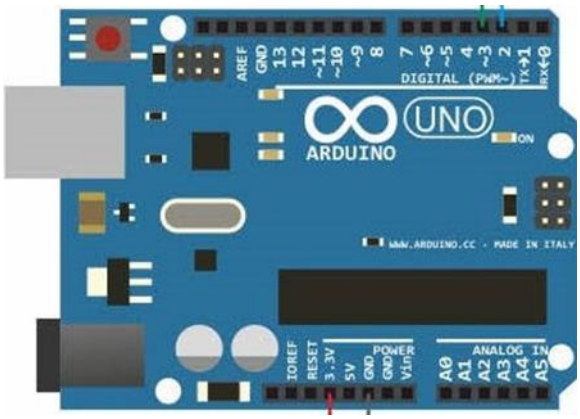

Fig: Arduino Uno

The signal from the microcontroller was sent to Wi-Fi module operating on TCP/IP protocol stack for sending information. It was also pre-programmed with an AT command, which gives it an ability to hook straight to Arduino devices.

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi - ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

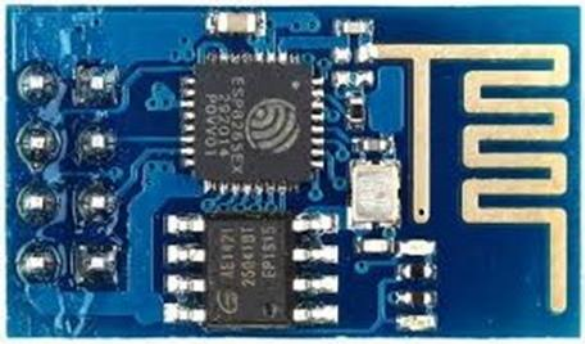

Fig: Wi-Fi Module ESP8266

B. BLOCK DIAGRAM

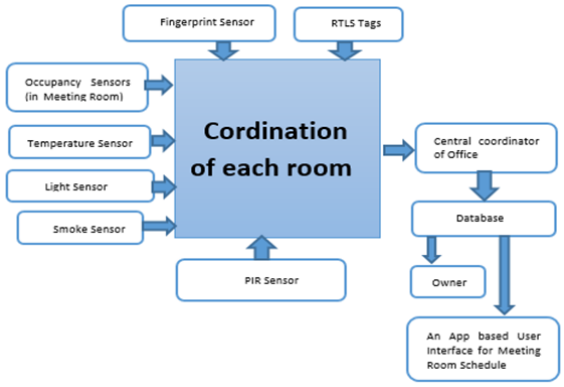

Fig: Architecture Diafram

Entrance Access through RTLS Tags: RTLS is a Real Time Locating System. RTLS technologies include three main components - software, reader and location tags. RTLS is currently used by companies for finding the location of employees. We are using it for providing entry access. At entrance, RTLS tags checks whether the person is authorized and has access or not and then lets him enter the office. The entry time, employee id, exit time and thermal scan temperature of the employee will be directly entered into the database. Also, owners can restrict the entrance for some interns and employees in classified area to avoid any information leakage. We are using the RTLS tags as an indoor location system, which will be helpful in case of emergency for tracking a location of an injured employee. In such cases RTLS tag will reduce the time of finding the employee and more time would be given to save him.

Occupancy Sensors for Meeting Rooms: Occupancy Sensor is an efficient motion-detecting sensor used for

controlling appliances automatically. These sensors use IR, ultrasonic, microwave and other technology. This sensor precisely tells us how many people are present exactly inside a meeting room unlike a basic PIR sensor which only tells if a region is occupied or not. It gives us accurate real-time occupancy data and also alerts when the occupancy limit is reached for a particular room. Its sensitivity can be defined by what distance it can successfully detect major and minor motions. Since meeting rooms require high precision data the above four sensors would not provide the required result in a large meeting room hall, therefore the system uses these sensors.

Light sensor: If light intensity increases or decreases below or above some value, the bulb will glow. The system will then automatically adjust the light intensity according to the atmosphere.

Temperature sensor: LM 35 is the temperature sensor used to sense the surrounding temperature. If the temperature increases/decreases the fan will be ON.
Smoke sensor: MQ-7 smoke sensor is used to detect the presence of smoke/fire. Alarm/buzzer will get activate in presence of smoke/fire. If there is presence of smoke/fire message will be send to the Fire extinguisher and to the service rooms so that mmediate service can be provided.

Fingerprint sensor: Fingerprint Identification Module is used for security purpose. The finger prints of all employees in the office can be taken and enrolled in it. This will only allow the office employees to enter the area. If other person tries to enter, it will show No match and that person will not be allowed to enter in the office. Thus a fully secured system is designed. All the sensed data is send to the Controller. The data is displayed on LCD display.

This data sensed through different sensors is then send to computer and is stored in Office's database. This data is then send to other computers in service room from where the data is being monitored. The data can be controlled and monitor from service rooms. Other computers are connected to the main computer via Network switch. The office data can be remotely monitored through Android or any internet enabled device .Call will be given to the office admin if there are any changes in the parameters of office. If there is any accidental emergency, the system calls the ambulance and call is given to the service room.

III. PURPOSE

An office space equipped with wireless embedded devices connected to the internet represents an intelligent ecosystem that automatically relies on various operations and monitors controls. Office automation is a tool that enables us to manage our daily routine in the workspace without any human intervention. These technology-based systems helps to collect, organize, and analyze everyday tasks. The primary purpose of office automation includes:

- Minimizing human errors.
- An increase in productivity and areas of opportunities improved.
- Faster TAT for complex tasks.
- Providing ease to employees from non-automated task.
- Preservation and traceability of compliance.

IV. ADVANTAGES OF PROPOSED SYSTEM

- An Intelligent office automation system helps to improve efficiency and productivity amongst staff. This is because it makes tasks much easier. It can also help automate many processes, freeing people to work on higher value tasks rather than repetitive, menial ones. This, in turn, allows people within a workspace to achieve their professional goals much faster and focus on higher-level skill development, which is suitable for both the organization and the individuals working within it.
- It can be much more secure. This is because security devices such as WiFi sensors and security cameras can be incorporated. Data from these is easily accessible in real time to those who need it. In addition, cloud-based solutions can help boost security and compliance within the workplace because they are managed by specialist companies that invest heavily in security.
- It gives greater convenience to those working within it, making the space more customizable and comfortable. This is because smart technology can allow staff to control aspects of their working environment, such as temperature control and advanced workspace booking.

- It can help to enhance collaboration and facilitate flexible working in a way that doesn't compromise teamwork and productivity. This is achieved by using remote collaboration tools, which enable teams to connect and collaborate regardless of physical location.
- This system enables workers to have greater control over their schedules, working environments, and communications with colleagues. This helps to support greater autonomy and ownership over their work, leading to a happier and more productive workforce with a higher output level.
- Office automation system helps to reduce operational costs in several ways. Firstly, workplaces access technology that allows them to manage real estate and space utilization. This provides valuable data on how space is being used and where space could potentially be redundant and sold off. In addition, it will reduce energy usage, benefiting the environment and reducing utility bills. Lighting and heating can be set to automatically turn off when a space is not in use, making a workplace much more energy efficient.

CONCLUSION

Internet of Things has enabled the process, store, management and access of information on different platforms via the internet from anywhere thus, the idea of scheduling a meeting with an app would make a lot of work easier for the meeting host who would not have to waste his time drafting emails and waiting for everyone's availability and approvals. The intelligent office automation system will not only make the employees work better and faster but will also provide a good ambiance to work smarter. This system is suitable for remotely and manually controlling of the appliances in the offices. It can be deployed to places like hospitals, banks, labs, homes, industries for energy management and conservation.

FUTURE WORK

These days, most of the firms are inclining towards storing their databases on a cloud-based platform which completely solves the problem of data loss even when a computer/laptop is damaged. With the facilities of a cloud-based API services directly linked to the deployed database on the cloud, other features can also be added in the app for example in a pandemic scenario, the owner can keep a check on the employees' temperature as well with deployment of a few temperature sensors at the entrance. The app can also be made useful to locate the office or cabins of a senior authority or boss. The system can also deploy OfficeIQ sensors which would send an alert message if an employee has been sitting or standing for too long.

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