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SMART BUILDING MANAGEMENT USING ARDUINO

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Abstract - *A smart home is one which incorporates automation systems and also has advanced sensing to provide the inhabitants by monitoring and controlling. Taking an example, a smart home may be used to control lights, temperature, multi-media, door and window operations and so on. A smart home may be defined as a building with equipment which could be remotely controlled and then operated from any location in the world by which means of some Smart devices, Smart home usually comprise of devices that provide comfort, security, convenience, energy efficiency and enhance intelligent living. Smart home is most of the times understood as an automated home but the actual capabilities which are beyond automation.*

Key Words: **Sensors, Remote monitoring, Energy saving, Smart gate.**

1. INTRODUCTION

Smart buildings are lot more efficient and reduce consumption and reduce energy costs. The use of sensors which are built into infrastructure and data collected in smart building allows for a significant improvement in the management of buildings. Monitoring machinery and equipment allows for more efficient management of equipment lifecycle. Smart buildings offer a more comfortable, efficient and advanced option for homes and offices.

2. DESIGN DIAGRAM

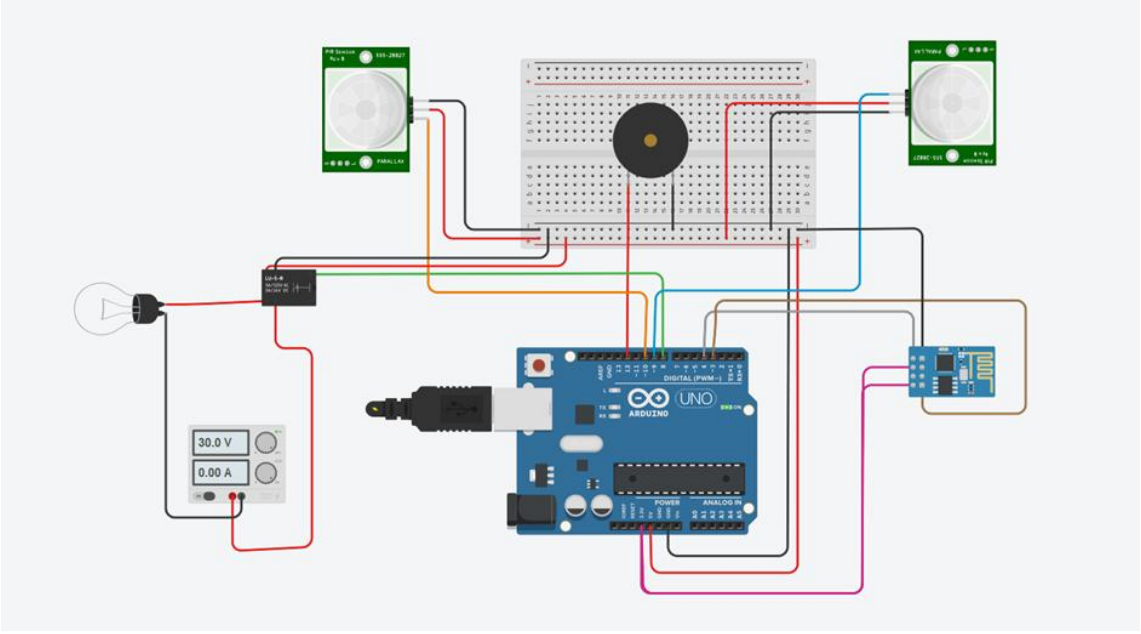

Fig -1: Design Diagram of the proposed project

A design diagram reveals how Smart Building Management works. The PIR sensor is employed in the door for sensing the person entering and exiting the house. The sensor is integrated with the s ingle chipped microcontroller which is used to calculate and process the data from the sensor. The sensed information is send to the microcontroller in the form of digital signals. The microcontroller processes the digitalized data and takes relevant actions. In the similar manner the other hardware components namely ESP8266, Relay Module, Buzzer and Bulb are interfaced to the microcontroller which is Arduino. Arduino is the main

controller of the whole system which controls all these hardware components. This is how the design diagram is designed of the Project.

A. PIR Sensor

PIR sensor detects a human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection range is between 5m and 12m.PIR are fundamentally made of a pyro electric sensor, which can detect levels of infrared radiation. For numerous essential projects or items that need to discover when an individual has left or entered the area. PIR sensors are incredible, they are flat control and minimal effort, have a wide lens range, and are simple to interface with. The PIR acts as a digital output so all you need to do is listening for the pin to flip high or low. The motion can be detected by checking for a high signal on a single I/O pin. Once the sensor warms up the output will remain low until there is motion, at which time the output will swing high for a couple of seconds, then return low. If motion continues the output will cycle in this manner until the sensors line of sight of still again. The PIR sensor needs a warm-up time with a specific end goal to capacity fittingly.

Fig -2: PIR Sensor

B. ESP8266

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.

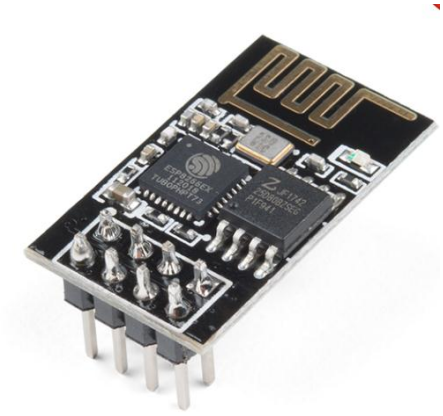

Fig -3: Wifi Module ESP8266

C. Relay Module

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.

Fig -4: Relay Module

3. METHEDOLOGY

The system containing the PIR sensor will be used to detect the presence of people. It can also differentiate among a number of people and can count the number of people in the building. The sensor uses a Fresnel lens which emits light and any person crossing that area will be detected. The data will then send to the relay driver module.

With the help of relay drivers, we can control the channels over the system. It will be used to indicate light whenever a person passes by. The LED light is connected to this driver which will light up on signal from the PIR sensor. The system thus will need IOT system also as the data will be sent to the server in Think Speak. The internet of things will send the data over the internet.

To send the data, a ESP 8266 Wifi module is used. This module is compatible with the Arduino board. To gain access on this module we must set up a connection using Arduino programming language. The Arduino port is used to gain control over the entire system. The Arduino port will manipulate all the signals and keep an eye on the regulation of sensors, drivers, modules, etc. The system will be set up on an Arduino board. The Wifi-module is important as it sends the data to the server. The administrator can gather information about the building from anywhere in the world. This will facilitate him/her to keep a track of activities going in his/her building. Such type of application can be used in many places such as offices, libraries, etc.

Thinkspeak Cloud:

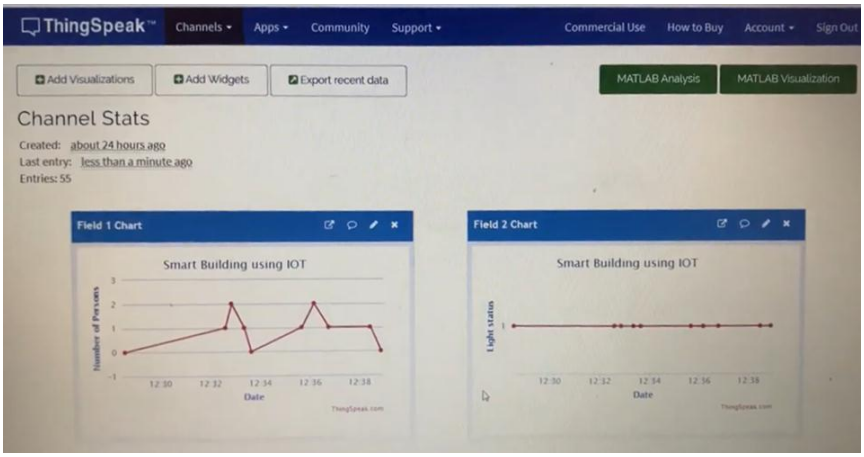

Fig -5: Cloud Interface

FLOW CHART

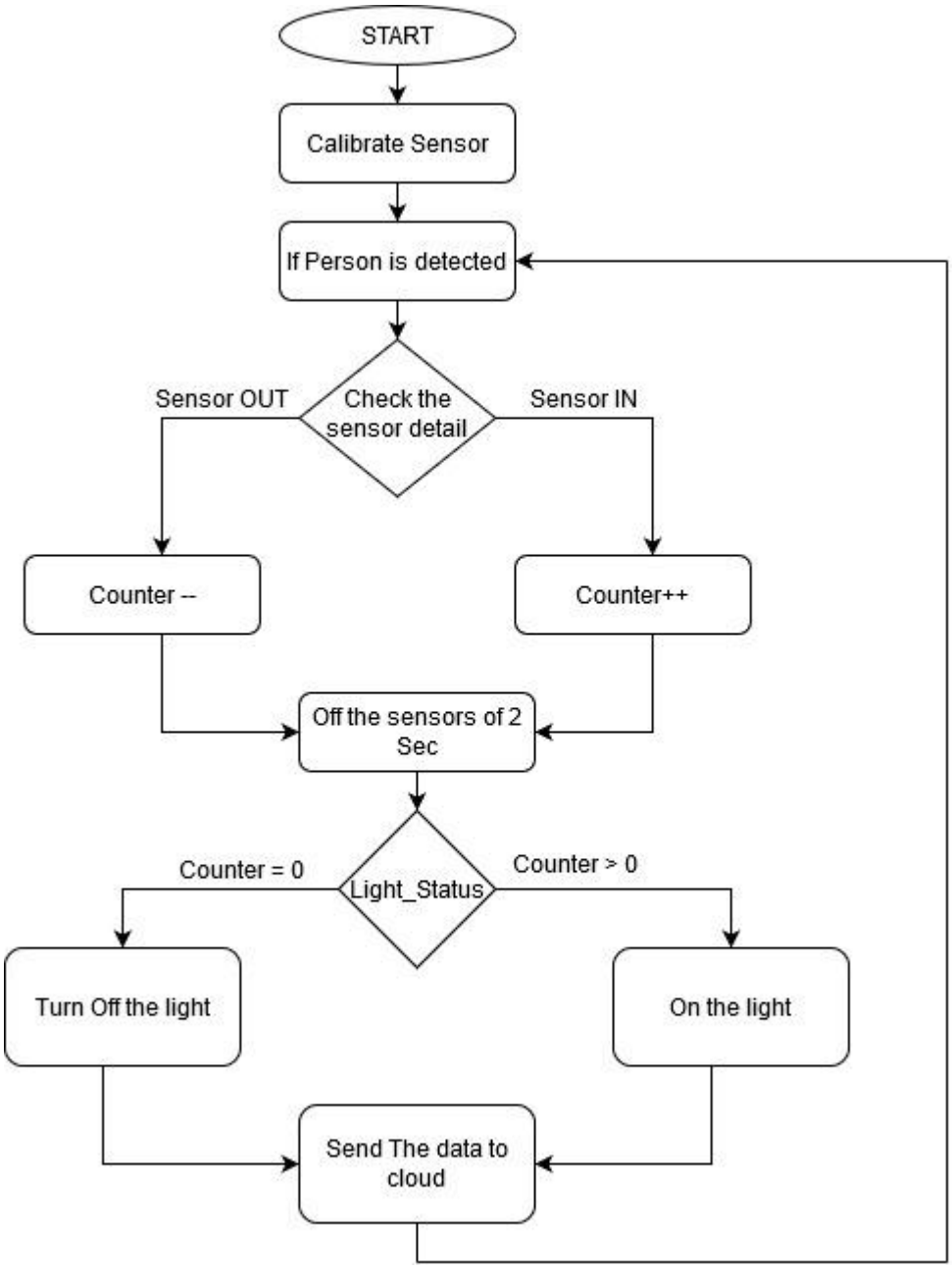

Chart -1: Flowchart for the procedure

4. CONCLUSION

There are a lot of uses for smart buildings and it has many advantages. It reduces energy consumption on a very large. It basically means its financially efficient as well. It improves building efficiency. Sensors help to identify overused and underused areas in the building, providing the opportunity to optimise space utilisation, which in turn can facilitate growth. It can also predict when maintenance is required. Maintenance costs can be substantial when handled manually. However, without maintenance building equipment requires far more frequent replacement, which takes chunks out of budgets. Smart buildings enable simpler predictive maintenance. Sensors can detect building performance and activate maintenance procedures before an alert is triggered. When you have a more insightful overview of how the building is operating – and used - it's far easier to implement maintenance at the right time. It increases productivity and also makes better use of resources.

SCOPE

Smart buildings are the ones where various parameters are taken for example light, temperature etc. These parameters are monitored and analysed so as to make it highly efficient. This project will demonstrate how a system can be developed to send data to the cloud for analysis. The project developed can sense the number of occupants in the meeting room with the help of PIR sensors and automatically switch the lights ON or OFF based on the occupancy.

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