Smart building for smart cities

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ABSTRACT

Smart city is formed for the wellbeing of the citizen by providing them technology-based solutions to make their daily activities easy, fast, and optimized. In known smart city models, major city utilities are connected to the main control unit of the regulator authorities (governments) which collects data from various sources to take necessary actions when a problem arises, enabling the city to run smoothly. The "Smart building" concept is based on embedded system and IoT (Internet of Things) Technology. The presented model includes different features using which we can automate various tasks in our workplaces.

Keywords: IOT, *Pollution Monitoring, Light Intensity, Building fall Detection, Parking Detection, Smart Cities.*

1. INTRODUCTION

With the evolving technology, peoples are looking forward to automating various tasks at their homes as well as in the workplace. So, looking forward to easing work schedule, reduce manpower and at the same time reducing maintenance costs of various day to day facilities. The advancement in technology, further concentrate on sustainable development to ensure healthy environment as well. Arduino Uno is used as main part of the model; as all the events occur according to the actions specified within. The data collected from the units is used to plot graphs on a server which allows easy access of information to the user. Programming is done using Embedded C. The "Smart Building" is a model based on IOT technology. It follows the three-step methodology of IOT based systems. It makes use of various sensors to acquire data from the environment. In the model which includes separate modules, the IR sensors, NodeMCU content and sends corresponding data to Arduino.

2. EXISTING SYSTEM

The traditional parking systems such as multilevel or multi-store car parking systems (non-automated), robot car parking systems, automated multilevel car parking systems etc. have been implemented on a huge scale. But these systems have a major disadvantage of large space consumption which is successfully eliminated with the use of "Automatic car parking system". In an automated car parking, the cars are left at the entrance and are further transported inside the building with mechanical structure. Similarly, they are retrieved by mechanical structure and placed at the exit for the owner to drive away.

3. PROPOSED SYSTEM

In this proposed system we are constructing a smart city in which we will have parking detection by using IR sensor, MEMS to know the building collapses. LDR for lights management. All these values are uploaded to cloud server by using NodeMCU and by using Arduino.
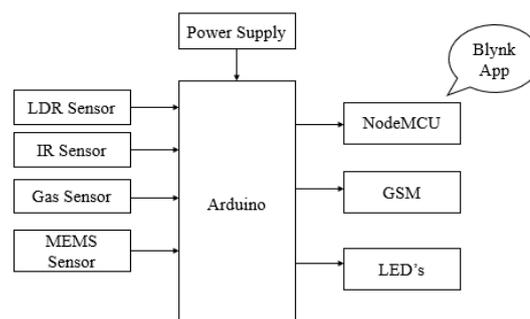
Block Diagram:

Fig1: Block Diagram

4. HARDWARE REQUIREMENTS

Arduino:
Arduino Uno is a very valuable addition in the electronics that consists of USB interface, 14 digital I/O pins, 6 analog pins, and Atmega328 microcontroller. It also supports serial communication using Tx and Rx pins.


Fig2: Arduino

It is an open-source platform, means the boards and software are readily available and anyone can modify and optimize the boards for better functionality.

NodeMCU:
NodeMCU is an open-source firmware and development kit that plays a vital role in designing your own IoT product using a few Lua script lines. Multiple GPIO pins on the board allow you to connect the board with other peripherals and are capable of generating PWM, I2C, SPI, and UART serial communications. The interface of the module is mainly divided into two parts including both Firmware and Hardware where former runs on the ESP8266 Wi-Fi SoC and later is based on the ESP-12 module.
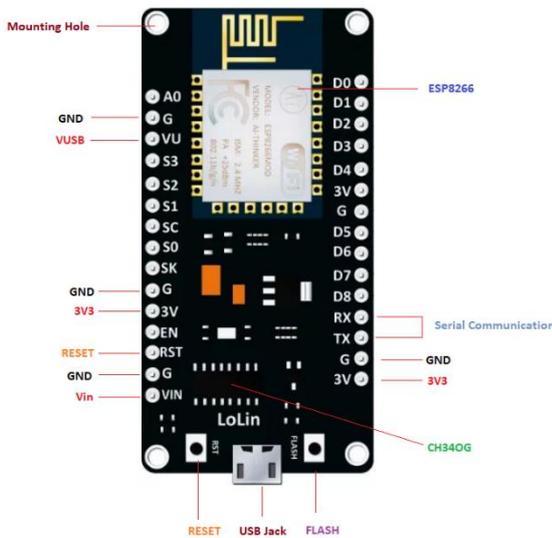

Fig3: NodeMCU

IR sensor:
An infrared sensor is an electronic device, which radiates to identify a couple of parts of the ecological components. An IR sensor can evaluate the force of a thing as well as recognizes the development. Such sensors measure simply infrared radiation, rather than delivering it that is called as a uninvolved IR sensor. For the most part, in the infrared reach, all of the articles send a warm radiation of some sort or another. Such radiations are impalpable to our eyes, which can be perceived by an infrared sensor. The maker is basically an IR LED (Light Emitting Diode) and the identifier is basically an IR photodiode which is sensitive to IR light of the very recurrence as that released by the IR LED. Exactly when IR light falls on the photodiode, the securities and these outcome voltages, change corresponding to the significance of the IR light got.
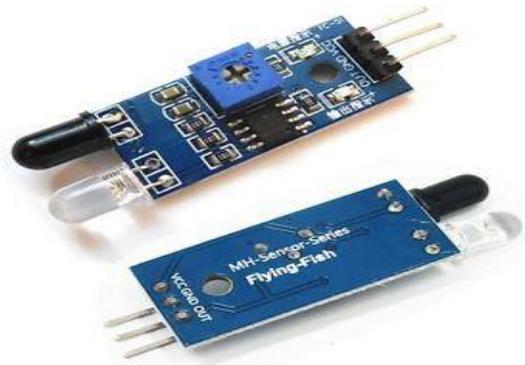
Fig4: IR Sensor

MEMS Sensor:
MEMS are minimal expense, and high exactness inertial sensors and these are utilized to serve a broad scope of modern applications. This sensor utilizes a chip-based innovation specifically miniature electro-mechanical-framework. These sensors are utilized to identify as well as measure the outer upgrade like strain, after that it answers the tension which is estimated strain with the assistance of a few mechanical activities.
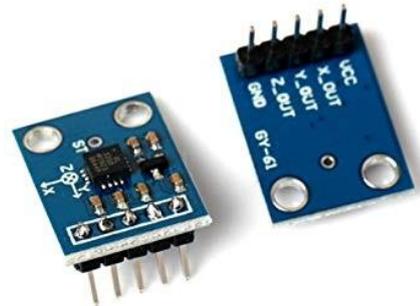
Fig5: MEMS Sensor

MQ2 sensor:
Gas sensors are accessible in wide particulars relying upon the responsiveness levels, kind of gas to be detected, actual aspects and various different elements. This Insight covers a methane gas sensor that can detect gases, for example, smelling salts which could get created from methane. At the point when a gas collaborates with this sensor, it is first ionized into its constituents and is then adsorbed by the detecting component. This adsorption makes an expected distinction on the component which is passed on to the processor unit through yield pins in type of current.


Fig6: MQ2(Gas) Sensor

LDR Sensor:
A Light Dependent Resistor (otherwise called a photoresistor or LDR) is a gadget whose resistivity is a component of the episode electromagnetic radiation. Subsequently, they are light-touchy gadgets. They are likewise called as photoconductors, photoconductive cells or basically photocells.

They are comprised of semiconductor materials that have high obstruction. There are various images used to demonstrate a photoresistor or LDR, one of the most generally utilized images is displayed in the figure beneath. The bolt demonstrates light falling on it.
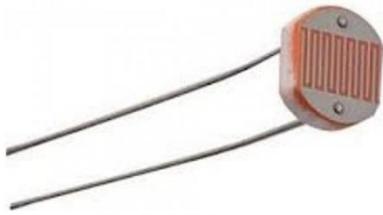
Fig7: LDR Sensor

Light Emitting Diodes (LEDs):
The lighting emitting diode is a p-n junction diode. It is a specially doped diode and made up of a special type of semiconductors. When the light emits in the forward biased, then it is called as a light emitting diode.

Fig8: LED's

GSM
GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.


Fig9: GSM

5. SOFTWARE REQUIREMENTS
Arduino IDE:
Arduino IDE where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

6. RESULTS
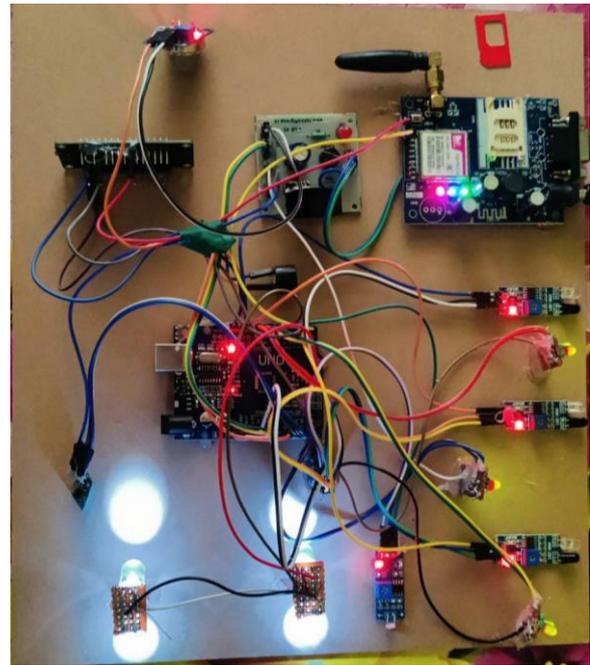
Fig10: Hardware of the Project
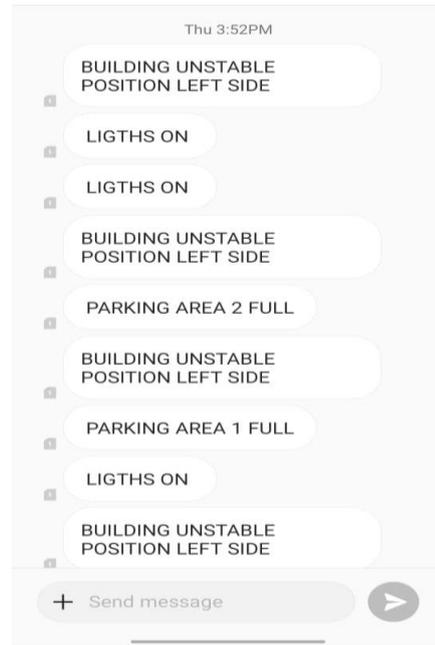
Fig11: SMS Alerts

7. ADVANTAGES
- Reduction in time spent to find the parking space.
- Reduction in wastage of electricity for lights.
- Reduction in traffic congestion.
- Can monitor the pollution.
- Revenues and profitability

8. APPLICATIONS
- Parking places
- Offices
- Industries etc.

9. CONCLUSION
In this paper, we have implemented smart buildings concept successfully. This technique is more secure than the other ordinary techniques. These buildings will have proper water, parking and light management system and it can be widely

adopted and can change in more. Smart building initial setup cost is higher, but energy savings and cost-cutting on manpower overall sum up to 20 to 25%.

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