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Implementation Of Smart City Applications Through IOT

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***Abstract:**The word Smart is an acronym for the 5 elements of specific, measurable, achievable, relevant, and time-based. IOT describes the large and growing set of digital devices as now numbering in the billions which operate across networks of potentially global scale. As the world is growing a bit faster people are being attracted to this word smart.India is one of the fastest growing economies in the world taking this as a factor we are implementing smart city having two modules-Namely Smart street light and smart building. As energy is the major concern, we people need to save energy as much as possible. This can be done with the help of LDR sensor. Considering the intensity of light we can turn a light on/off This project consists of other module called Smart building where a light will turn on/off based on the presence of a human in a room. This can be done using PIR sensor. A reliable system can be made using these components. Every city need to have street light system which is essential. So in order to save energy this project also deals with automatic street light system using IoT. As the world is rapidly growing everything is changing into automation so, to increase the security of the people we introduce smart building where data is stored like what is happening inside the building. These all are smart control and intelligent decision making devices based on accurate real time field data.*

***Keywords—** IoT,Arduino UNO, LDR, Relay, LED, Automation, Energy Efficency, Monitoring, PIR (passive induced sensor), Microcontroller, ESP8266 Wifi Module.*

1. INTRODUCTION

The Internet of Things (IoT) is a collection of interrelated computing devices, mechanical or virtual machines, objects, animals and individuals that have unique identifiers (UIDs) and the ability to transfer information over a network without needing of human to human or humantocomputer interaction.Thanks to the integration of various innovations, realtime analytics, machine learning, commodity sensors, and embedded systems, the concept of the Internet of Things has evolved. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation) and others all contribute to the Internet of Things[1]. In this project there are two modules, they are smart street light, smart building. Challenges of the Iot:

- Security & Data Governance
- Data and analytics complexity

- lack of data protocol standards
- diversity of niche providers and solutions
- confusion on where to get value (ROI).

The current lighting system has been limited to only two ON and OFF options, and it is not effective, as this type of operation has resulted in power loss due to continued research on peak voltage[2]. The diversion of electricity from street lights is therefore one of the obvious power losses, but with the use of automation, this results in many new energy and money savings methods[3].LDR is used as a sensor in this module. The main goal is to provide an efficient & energy-saving lighting system by determining the existing lighting condition and then changing the lights accordingly. The circuit consists mainly of a sensing component known as LDR, followed by the Arduino processing unit, which takes input for the sensing element and gives the LEDS (lighting units) as output. Street lightening is an essential infrastructure for cities in order to assure the security of citizens and goods.This infrastructure has however a high economical and ecological cost. Thus, municipalities are looking for innovative solutions to master the costs of their streetlights, which represent up to 60% of their electricity expenditure[4].
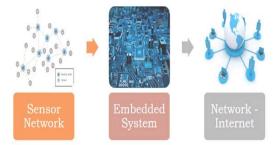

Figure1: Process to monitor the operations of the Smart Street Light System.

A smart building is an device that uses automated processes to monitor the operations of the building, including heating, ventilation, air conditioning, lighting, safety and other systems, automatically[5]. Smart buildings offer solutions, improve performance, reduce consumption and reduce energy costs. Use sensors installed into infrastructure and data collected in smart buildings allows a significant improvement in building management.The smart building uses sensors, actuators and microchips to collect and manage data[6].
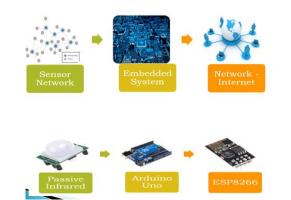

Figure2: Process to monitor the operations of Smart Building

2. METHODOLOGY

Module-1: Smart Street Light – In this module we use Arduino Uno, ESP8266 WIFI-Module, LDR sensor, RelayESP8266 wifi module is connected to arduino board and then it is powered up.Tx and Rx pins of ESP8266 wifi module are connected to the aurdino board from there data will be exchanged vcc and ground pins are powered up[7]. Vcc and ch_pd pins are connected to 3.3v pin of arduino board. As we use passive infrared sensor they work entirely by detecting energy from other objects.PIR Sensors detect objects emitting infrared radiation.pyro electric materials allow them to detect levels of infrared radiation objects above absolute zero(-273) emit heat energy in the form of ir radiation[8]. ir radiation is not visible to human eye electronic devices designed for this purpose and use to detect ir radiation.materials that detect ir radiation or heat energy are called as pyroelectric materials. They are internally connected to a field effect transistor which is used to amplify the week signal.The signal from FET is sent to an amplifier and comparator.A fresnel lens captures more IR radiation and focuses it to a small point into filter window[9]. This helps in more stable detection and increase in detection range. The fresnel lens are grafted to be opaque so that it can capture only ir radiations with out getting any un wanted radiations from visible spectrum of light. There are 2 potent meters on PIR sensor. one is to adjust sensitivity of the sensor and the other is to adjust the time delay between two measurements[10]. A jumper is present in order to adjust the modes of operations. Setting the jumper to High will lead to re-triggering where as setting to Low leads to non-re-triggering mode. Vcc and ground pins of PIR sensor are connected to 5v pin of arduinoboard and ground pin respectively[11]. Since relay acts as a operational switch it is connected to arduino board.When the code is dumped in the arduinoboard data will be generated and thus will be seen in thingspeak app.

Arduino Uno:
- Operating Voltage: 5V.
- Input Voltage (recommended): 7-12V.
- Input Voltage (limits): 6-20V.

Relay:
- A relay is an electromagnetic switch which is used to switch High Voltage/Currentusing Low power circuits.
- Relay isolates low power circuits from high power circuits.
- A relay should not be directly connected to a microcontroller, it needs a driving circuit.
- For that purpose we need to add ULN2003 driver.
- Relay acts like a Switch.

ESP8266:
- Leading platform for Internet Of Things
- Low Cost
- Dual Functionality
- Type: 32 bit Microcontroller

LDR(Light Dependent Resistor):
- Also called as photo resistor.
- Light controlled variable resistor .
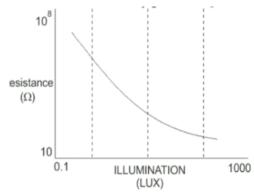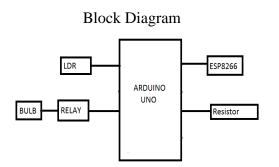- Applications of LDR: Night lights, Street Lamps, Light meters.
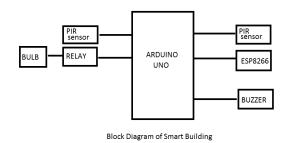
Figure3:A Graph between illumination and resistance

Block Diagram

Block Diagram of Smart Street Light

Figure4: Block Diagram of Smart Street Light

Module-2: Smart Building – In this module we use Arduino Uno, ESP8266 WIFI-Module, PIR sensor, Buzzer , Relay

Keen structures coordinate and check data from various gadgets or incorporated hotspots for insight, control, materials and development as a total structure framework. This is to upgrade flexibility to meet the brilliant structure esteem drivers: energy and effectiveness, life span and solace and fulfillment. Brilliant structures give a protected, profitable, and agreeable climate for their inhabitants without trading off operational and energy execution. A keen structure will have diverse foundation segments that keep up the solace level of the tenants Global energy utilization in structures, both business and private, has expanded consistently arriving at figures somewhere in the range of 20% and 40% in created nations, and it has far outperformed the remainder of the significant areas: transport and modern. The development of the populace, the more prominent interest for levels of solace and building administrations, along with the expansion in the occupation season of the structures, mark a developing pattern in energy interest.

PIR Sensor:
• PIR Sensors detect objects emitting infra red radiation
• Pyroelectric materials allow them to detect level of infrared materials.
• A PIR-based motion detector is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms and automatically-activated lighting systems.
• PIR Sensor is mainly used to detect the presence of an human beings or animals. In this project we kept PIR Sensor to detect the presence of an object.

Block Diagram of Smart Building

Block Diagram

Figure5: Block Diagram of Smart Building

3. RESULTS & DISCUSSIONS

Smart Building: This Graph represents count of individuals entering the room and moving away from the room and the status of bulb. Using API key data is generated in the thingspeak app where u can refer for the further uses.

Smart Street light: This Graph represents no. of vehicles passing and intensity of sunlight. Using API key data is generated in the ThingSpeak app where u can refer for the further uses.

4. CONCLUSION

Conserving theenergy has been the huge task in our generation by converting the manual process into automation we can save enormous amount of energy. These also reduce man power and prevent energy
wastage. The efficiency of automated systems is more than the manual systems. We can reprogram these devices with respect to our needs. By using the API key the generated data is stored in Thingspeak database which we can use for future references

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