IOT BASED SMART AND ADAPTIVE LIGHTING IN STREET LIGHTS

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1. ABSTRACT:

The system is mainly used for smart and weather adaptive lighting in street lights. The project is implemented with smart embedded system that controls the street light based on detection of sunlight. During the night time the street light gets automatically ON and during the day time it gets automatically OFF. The ON/OFF can be accessed anywhere anytime through internet. A camera is placed on top of the street light to track the actions performed on the road where the footages are stored in a server. In addition to this, a panic button is placed on the pole, in-case of any emergency or danger, the person in danger can press this button which raises an alarm at the nearby police station. Whenever the panic button is pressed, the footage at that time recorded by the camera is sent directly to the cloud account. The access of the account is given to the particular police station by which they can view the incident's spot. Each area's street lights are connected to the particular area's police station and each of them has a cloud accessible account. The manual operation using GSM technology is completely eliminated.Thus the system is mainly designed to ensure safety and to prevent energy wastage.

Keywords- Street light, panic button, sensor, microcontroller, cloud account, CCTV camera.

2. INRODUCTION:

The largest expense of a city is mainly because of street lights. A smart street light can be used to cut the municipal waste up to 50-70%.The project is mainly used to track the crimes happening at the road using panic button and to prevent energy improvidence. Whenever the sunlight is detected the light will be automatically made OFF and the same information can be accessed through internet, which can be made ON/OFF using iot. The street light (ON/OFF Status) can be accessed from anytime, anywhere through internet based on the real time system.The street light controller is installed on the pole lights along with a microcontroller, sensor and communication between the street lights is based on the controller installed on the pole of the street light.The controller controls the LED street lights. The sensor senses the sunlight and sends the information to the microcontroller which acts upon, based on the given condition. Here the operation of manual mode is avoided and everything is automatized. According to the requirements the control system will be made to switch on-off the lights at required timings. The camera is present inside the system to capture the entire happenings on the street when outsiders pass the road. The footages recorded by the camera are stored in a separate server. When an emergency situation like theft, harassment is found to happen, a panic button is provided at the reachable height which can be pressed by the person. In reaction to that the present video footage is sent directly to a cloud account along with an alarm sound to the nearby particular police station. Each police station is provided with a cloud accessible account. The main idea of this system is to ensure safety and energy consumption.

3. PROBLEM DEFINITION:

The street light is one of the huge expenses in a city.The cost spent is huge that all the sodium vapour lamps consume more power.The expense spent on the street light can be used for other development of the nation .Currently a manual system is used where the light will be made to switched ON/OFF i.e the light will be made to switched ON in the evening and switched OFF in the morning. Hence there is a lot of energy wastage between the ON/OFF.

DISADVANTAGES OF THE EXISTING SYSTEM:

- Manual switching ON/OFF is done on the street lights
- More Energy Consumption due to the sodium vapor lamps.
- Expensive ,since light is made to be ON the entire night.
- More man power is required and periodic check is a must.

ADVANTAGES OF THE PROPOSED SYSTEM:

- Automated switching ON/OFF of the street lights.
- The cost significantly reduced because sodium vapor lamps are replaced by LED energy is consumed more.
- The CO2 emission is reduced.
- The light pollution is reduced.

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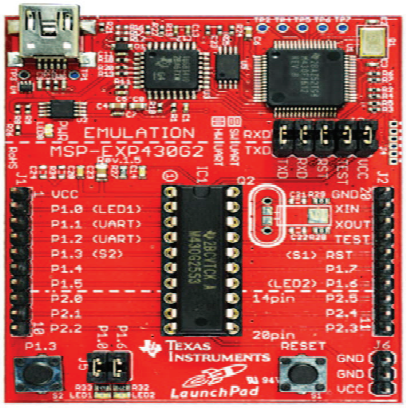
- The communication is made wireless.
- Man power is entirely eliminated.
- At present there is no system to safeguard the people but our system forges a step for it.

4. MATERIAL:

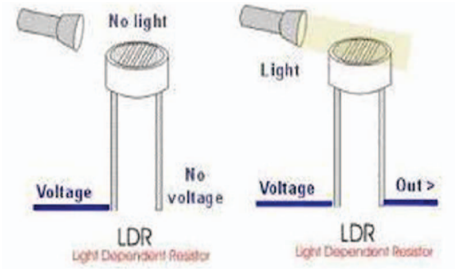
a) MICRCONTROLLER MSP430

- ✓ The MSP430 is a mixed-signal microcontroller family. Built around a 16-bit CPU, the MSP430 is designed for low cost and, specifically, low power consumption embedded applications.
- ✓ The MSP430 can be used for low powered embedded devices.
- ✓ The MSP430 16-bit microcontroller platform of ultra-low power RISC mixed-signal microprocessors from TI provides the ultimate solution for a wide range of low power and portable applications.
- ✓ TI provides robust design support for the MSP430 16-bit MCU, including technical documents, training, tools, and software.



b) LDR SENSOR

- ✓ A Light Dependent Resistor (LDR) also termed as a photo resistor is a device whose resistivity factor is a function of the electromagnetic radiation. Hence, they are light sensitive devices which are similar to that of human eyes.
- ✓ They are also named as photo conductors, conductive cells or simply photocells. They are made up of semiconductor materials with high resistance.
- ✓ A LDR works on the principle of photo conductivity. Photo conductivity is an optical phenomenon in which the materials conductivity gets reduced when light is actually absorbed by the material.



c) PANIC BUTTON

- ✓ A panic alarm is an electronic device designed to assist in alerting somebody in emergency situations where a threat to persons or property exists.
- ✓ These buttons can be connected to a monitoring center or locally via a silent alarm or an audible bell/siren.
- ✓ The alarm can be used to request emergency assistance from local security, police or emergency services. Some systems can also activate closed-circuit television to record or assess the event.
- ✓ Many panic alarm buttons lock on when pressed, and require a key to reset them.

d) IP65 CCTV CAMERA

- ✓ The IP rating for CCTV cameras is the “Ingress Protection” rating.
- ✓ It is a scale that indicates the level of sealing for devices against foreign bodies including tools, dirt, dust, etc. plus moisture.
- ✓ With a wide range temperature, it has anti-vibration, anti-shock, anti-collision, and anti-corrosion resistance.
- ✓ Its lightweight and compact size allows for flexible mounting.
- ✓ All of the I/O connectors and cables are fully IP65 rated.

5. WORKING PRINCIPLE:

The system architecture of the adaptive system consists of LDR sensor, MSP430 micro controller, relay switch, IP65 CCTV camera and panic button. In this system msp 430 acts as the brain of the entire system.

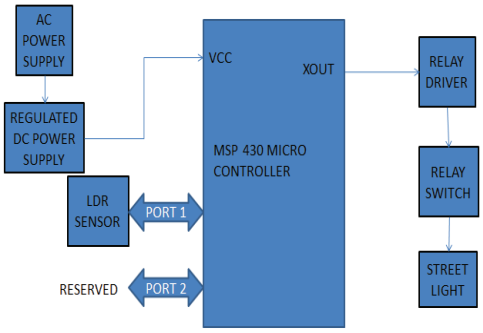
LDR sensor used in the system is connected to micro controller. LDR is light dependent resistor. When the sunlight falls on it, its resistance decreases and makes the light to switch off. When the sun set, light do not fall on the sensor, so its resistance decreases and triggers the light to switch on.

Relay acts an automatic switch which is connected to the micro controller by relay driver. It is highly reliable and automatically switches ON and OFF the lights.

IP65 CCTV camera is connected to the controller which is used to capture the movements. The camera is water, dirt and corrosion resistant. '6' indicates the level of dust protection .and '5' is fluid protection. Panic button is corrosion resistant and used in case of emergency.

The footages recorded by the CCTV camera are stored in a server. When the button is pressed, the footage at that time recorded by the CCTV is directly sent to the specified cloud account with an alarm signal rising at the nearby police station.

ARCHITECTURE DIAGRAM



6. IMPLEMENTATON:

The system is designed exclusively for three main purposes.

- To provide energy consumption.
- To prevent energy wastage.
- To ensure security to the people, especially to prevent women harassment.

The above three purposes are implemented by

- Automatic switching ON and OFF of street lights.
- Panic button is provided at the reachable height of humans.

As soon as the sunlight goes away from the visible region, LDR sensors will trigger the light to switch ON.

Street lights communicate with each other through Zigbee network.

Panic button is fixed at the street light to trigger the system by raising an alarm signal at the nearby police station.

Ip65 camera is installed to capture the entire movements of people moving on the particular street.

A Cloud account is maintained to store the footages of camera whenever the panic button is pressed by the people.

Panic button is present at the reachable height i.e., 5 feet of human beings. If a person who is in need of emergency can press the button, which raises an alarm at the nearby police station. Immediately the officer can check his account to get rid of the happening at the road.

7. CONCLUSION:

The main aim of the system is to cut down the two important problems that our country is finding difficult to tackle.

- Energy wastage
- Crime detection

As the LED bulbs are used, it emits less heat when compared with mercury lamps. This system cuts down the cost of conventional system by 50-60% which improves the economy of the country and saves a huge amount of investment as it can be utilized in useful ideas.

The system ensures the security to the people and it provides a great security exclusively for women.

The system can prevent women harassment,thefts and other threats.

The system provides the evidence for the police to catch hold off the culprits.

The system creates a safety environment where the women can walk out of their homes without any fear.

The system is

- Cost efficient
- Reliable
- Prevents manual ON and OFF of lights
- Prevents energy wastage.

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