AN INTEGRATED ARCHITECTURE BASED INTELLIGENT AND ADAPTIVE STREET LIGHT CONTROL SYSTEM WITH CLOUD STORAGE

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Abstract- 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. The ON/OFF can be accessed anywhere anytime through internet. a real-world proven solution for intelligent and adaptive street light control and management which relies on an open and flexible integrated architecture. 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, arduino, cloud account, CCTV camera.

1. INTRODUCTION

The Internet of Things (IoT) technology establishes a communication between all things and the Internet through sensing devices. The sensing devices include Radio Frequency Identification Devices, infrared sensors, GPS etc. A cloud centric vision (using Aneka) of ubiquitous sensing using IoT and Wireless Sensor Network (WSN) technologies. This cloud implementation was done using Aneka based on private and public clouds interactions. The project is mainly used to track the crimes happening at the road using panic button and to prevent energy in providence. 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 authorized. 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 to save radio energy consumption.

2. RELATED WORK

In the recent years, many efforts have been taken to automate the existing streetlight system. For any intelligent streetlight system, it should operate in a systematic way to maximize the quality and productivity. So by implementing a

more reliable system can cut off major street lighting expenses and reduce human effort as well. But many methods are still operating with traditional light sources, therefore, it may reduce the human effort but the energy wastage and light pollution still exist. 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 switch ON in the evening and switched OFF in the morning. Hence there is a lot of energy wastage between the ON/OFF.

3. PROPOSED WORK

The street light control with cloud storage system is implemented through an arduino program. Nowadays, the street lamps are operated manually. But, the street light control with cloud storage system operates the street lamps ON/OFF and finds the fault in the street lamps automatically. The system will check weather in ON/OFF state. The LDR (light dependent resistor) is used to check the weather condition. If weather is light/dark check through a LDR. If weather is bright the system identifies it as the day time. If the weather is dark the system finds it as the night time. So, the system allows to switching ON the street lights. 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.

Advantages of the Proposed System:
• Automated switching ON/OFF of the street lights.
• The CO2 emission is reduced.
• The light pollution is reduced.
• 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.
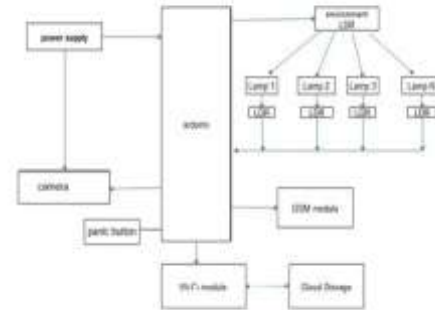
4. SYSTEM DESIGN

Fig 1.System Architecture

A. LDR

Light Dependent Resistors are light sensitive devices. They are made up of semiconducting materials with high resistance. LDR works under the principle of photoconductivity in which conductivity of the material gets reduced by the absorption of light. The theoretical concept of the light detector resistance lies behind, which is used in this circuit as a darkness detector.
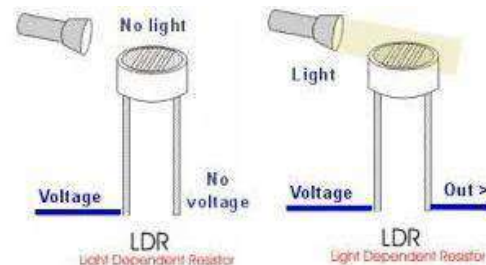

Fig 2.LDR System

B. Arduino Nano

The Arduino Nano is a small board based on ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove but in a different package. It lacks only a DC power jack and works with a Mini-B USB cable instead of a standard one. The Nano was designed and is being produced by Gravitech. Arduino is an open-source prototyping platform. We can perform various operations with the knowledge of Arduino programming language. It is an easy to use hardware and software. It is easy to code and upload it to the board.

C. Relay

Relays are like remote control switches. It is highly used due to its simplicity, long life, and

reliability. Relays can take electrical inputs and gives mechanical output or vice versa. It is normally an electromechanical device that is actuated by an electric current.

D. 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.

Fig 3.Panic Button

E. 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 antivibration, anti-shock, anti-collision, and anticorrosion resistance. Its lightweight and compact size allows for flexible mounting. All of the I/O connectors and cables are fully IP65 rated.

Fig 4. IP65 CCTV Camera

5. WORKING PRINCIPLE

The system is designed exclusively for three main purposes

• To reduce power consumption.
• To reduce energy/power 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.

6. IMPLEMENTATION RESULT

6.1 Transmitter module

This module provides the user interface for knowing the status of present light system and operate (switch on and switch off) using android application. It works on android OS 4.0 and above. The status of lights is represented to user, so that user can have full control over the light automation system. This system solves the issue by interfacing a unit with street lights that switches these loads based on the input received from android device. The android device may be any android based phone or tab having an android OS. The app also provided an effective GUI for providing this functionality.

Operations performed by this module are:
1. Register operator: In this the operator has registered to use android application.
2. Login: The operator has to login into the application with his account to control streetlights.
3. View Light Status: In this the operator can view the Status of streetlights weather they are ON/OFF.
4. Modify Light Status: In this the operator can edit the status of streetlights.
5. View Count: In this operator view the number of lights that are ON/OFF.
6. Logout: The operators can logout from his account.

6.2 Controller Module

This module acts as an interface between transmitter and receiver modules. Here web application takes input from android app and stores one set of response in database for providing status to the user on street light system. Another set of response is send to the receiver module (SIM900A GPRS MODEM). Status of street light is provided to the user on request.

This controller module acts as a mediator between android app and receiver module .It is responsible for maintaining the data about streetlights.

Operations Performed by this module are Receives messages from Android app, Sends messages to receiver module, updates the data in database, android app and receiver module.

This module contains Admin and the operations performed by admin are

1. Login: The admin login into his/her account.

2. Add Operator: The admin can add the details of operator.

**3. Logout**: The admin can logout from the system.

6.3 Receiver Module

An Arduino microcontroller is used in this system. The SIM900A GPRS receiver takes commands from GPRS modem and this GPRS is interfaced with microcontroller in order to accept the commands and then react accordingly to switch on/off street lights. It operates the loads through a set of relays using a relay driver IC. Relays are used between loads and the control unit. This system is to be used in various applications controlling as well as in industrial setups. The system power supply setup contains a step down transformer of 230/12V, used to step down the voltage to 12V AC. A bridge rectifier is used in order to convert it to DC later. A capacitive filter is then used in order to remove the ripples and then regulate it to +5V by making use of a 7805 voltage regulator, that is needed for microcontroller and other components operation. This property appears on the off chance that the electric supply provided to the miniaturized scale controller is expelled even it can store the information and can furnish results in the wake of furnishing it with the electric supply. Besides, ATmega-328 has 2KB Static Random Access Memory (SRAM). Different qualities will be clarified later. AT mega 328 have a few distinct highlights which make it the most mainstream gadget in the present market. These highlights comprise of cutting edge RISC engineering, great execution, low power utilization, genuine clock counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for programming security, throughput up to 20 MIPS and so forth. ATmega-328 is for the most part utilized in Arduino.

Present Status of lights
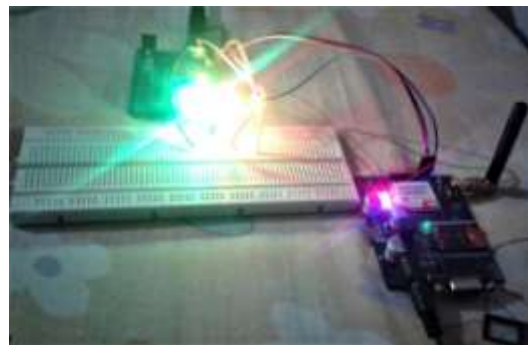
WI-FI Initiation Commands of the system

Complete Working Board

7. CONCULSION

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.

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