SMART STREET LIGHT CONTROL SYSTEM

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Abstract
Currently in the whole world enormous electric energy is consumed street lights are usually very costly to operate bad controlling of street lights lead to vehicle accidents. Today street lights system is not flexible most of the controlling is manual where as some are automated based on environment parameters. Biggest problem is to handle remote area locations manual mistakes result into power wastage. So there is a need of efficient street light system to provide wireless access for controlling it. Server which can be used to control whole city's street light and low cost internet technology can be used for remote access. Proposed system controls all the street lights using an android application all the street lights connected to a junction these junctions are controlled by an android application as per the need street lights can be switched on/off. The main motive behind implementing this project is to save energy.
Keywords: Street Lights; Raspberry-Pi; Android; lighting system; Wireless Network; Encryption

I. INTRODUCTION

Street lights are the key factor of any city to make it smart city. But we have seen such situation where our street lights are ON in presence of daylight. So we want to develop such a system which will operate street lights of the city at anytime. The motivation of this project is to design a smart lighting system which targets the energy saving and autonomous operation which is economical and affordable for the streets. Design a smart lighting system with modular approach design, which makes the system scalable and reliable. Design a smart lighting system which is compatible and scalable with other commercial product and automation systems, which might include more than one lighting systems.

This paper presents a new economical solution for street light control systems. The control system consists of a control circuitry and the electrical devices. This also includes client server mechanism where user can directly interact with web based application to control the Street lights from any place with the help of android application. A street light control system has been developed to control and reduce energy consumption of a town's public lighting system. This ranges from controlling a circuit of street lights and/or individual light with android application and network operating protocols. This includes sending and receiving instructions via separate data networks, at high frequency over the top of the low voltage supply or wireless. Street lights are connected to the junction. There are multiple junctions each junction covering some particular part of the city.

The main aim is to provide IP to every junction which can be controlled through internet. The main motivation behind implementing project is to save energy. It is an automated system designed to increase the efficiency and accuracy on automated time control,governed and pattern basis.

II. LITERATURE SURVEY

Smart street lamp monitoring system using Xbee wireless module. Their aim is to monitor the health of street lamps and forward monitored result to the control station. Inside the lamp module, it consists of light dependent resistors

(LDR) module, microcontroller module and transmission module. The lamp module communicates with the control centre through wireless using Xbee. The LDR module consists of two LDR. One of the LDR is install on top of the street lamp for the checking the day/night status condition while the other LDR is placed under the street lamp to monitor and check the lamp's health status. The results of the LDRs are sent to microcontroller, where the microcontroller will process the data and send the data to the transmission module. In the transmission module, there is wireless Xbee that transmit the data through wireless to the control centre. In the control centre, it will monitors each of the street lamp status, as well as controls the operation of the street lamps.

Automatic Street Light Control System Using Microcontroller This paper aims at designing and executing the advanced development in embedded systems for energy saving of street lights. Nowadays, human has become too busy, and is unable to find time even to switch the lights wherever not necessary. This paper gives the best solution for electrical power wastage. Also the manual operation of the lighting system is completely eliminated. In this paper the two sensors are used which are Light Dependent Resistor LDR sensor to indicate a day/night time and the photoelectric sensors to detect the movement on the street. The microcontroller PIC16F877A is used as brain to control the street light system, where the programming language used for developing the software to the microcontroller is C-language.

Intelligent Street Lighting System Using Gsm: The system comprises of server, GUI to display and nodes which are micro controlled processed with embedded sensors measuring different parameters. Each node in the network is linked to the main server via a protocol. The analog data sensed by the sensor is converted in digital form, processed by microcontroller and then sent to the server. The master controls all the slaves .The other nodes sends the data to master and the master collects the data and further sends to concentrator and server where the data is monitored and on necessary alterations process it to switch On/Off the nodes devices.

Intelligent Street Light System using RF Transmission The proposed prototype of intelligent street light can detect daylight and vehicles and vary the intensity of the LED based street lamps as per the traffic flow. It can also help in monitoring of street light system and fault detection through RF wireless technology. If intelligent street light is designed and installed in the cities, then, lot of power can be saved and this will also minimize the cost of maintenance over traditional wired systems. The system is versatile, and can be extended as per user needs.

III. METHODOLOGY

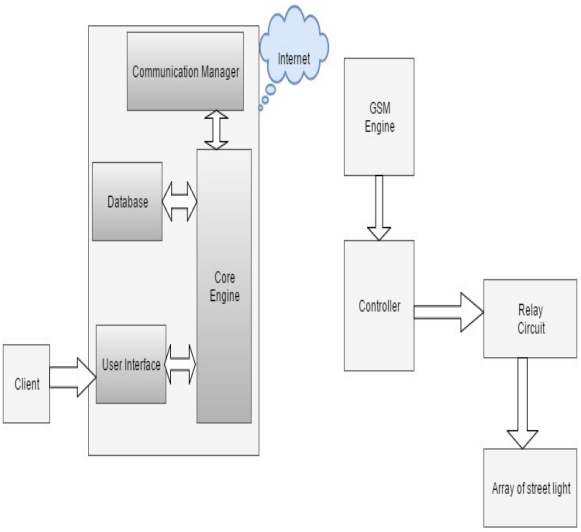

Fig. 1. Suppression technique

Architecture of the system is given in Fig.1. it comprises of several components, client, hardware and server are 3 main components.System is implemented using MVC architectural pattern. These components can be developed and tested independently.

Client is nothing but operational admin .There are 2 types of admin System admin operational Admin. System Admin has highest Authority. System admin can add operational admin location. Operational Admin will just use system to control Street light. Operational admin will interact with system through user interface. It is android application. Client interacts with Core Engine through this application. Core Engine is nothing but Server .Client Interaction with server is based on http protocol at application level and Socket Programming at Transport layer.

Core Engine has Database containing various tables .Each Table has different fields. It also has communication manager which communicates with controller side. It sends the encrypted message to controller side. Encrypted message contains junction id, lane no pattern .On junction side controller is present, example- raspberry pi .It has Internet connectivity feature. It receives

encrypted message by using GSM engine. GSM Engine is a component of Controller which connects controller to the internet. Message decryption is done by controller. At junction side a relay circuit is present. Controller is use to control relay circuit ,for each light one relay is present. Relay is an electrically operated switch for thousand of street lights thousand of relay are required iwhich is known to be a relay circuit. This relay circuit is connected to array of street lights. it controls street lights. It can switch OFF /ON the street light.

System admin operates on server side. System admin can add and remove operational admin. For adding operational admin,Full details of operational admin required i.e. Name ,Mobile No,Email id etc. For removing operational admin Name of operational admin is sufficient. Only System admin has that access to add or remove operational admin. Server is an interface between client hardware side.Server gets input from client side i.e. from Android app through web service.It transmit thats details to hardware side for operation of Switching light ON OFF. Server has responsibility to build an message. Message contains junction id,lane no,pattern. Then this message send to appropriate junction for actual working.Database is present on serve side. So when operational admin has to log in user ID password authentication is done on server side with the help of web service.

HTTP stands for Hypertext Transfer Protocol. It's a stateless, application-layer protocol for communicating between distributed systems, and is the foundation of the modern web. HTTP allows for communication between a variety of hosts and clients, and supports a mixture of network configurations .To make this possible, it assumes very little about a particular system, and does not keep state between different message exchanges. This makes HTTP a stateless protocol. The communication usually takes place over TCP/IP, but any reliable transport can be used. The default port for TCP/IP is 80, but other ports can also be used. Custom headers can also be created and sent by the client. Communication between a host and a client occurs, via a request/response pair. The client initiates an HTTP request message, which is serviced through a HTTP response message in return. The current version of the protocol is HTTP/1.1, which adds a few extra features to the previous 1.0 version. The most important of these, includes persistent connections.

A web service is any piece of software that makes itself available over the internet and uses a standardized XML messaging system. XML is used to encode all communications to a web service.Web services are self-contained, modular, distributed, dynamic applications that can be described, published, located, or invoked over the network to create products, processes, and supply chains. These applications can be local, distributed, or web-based. Web services are built on top of open standards such as TCP/IP, HTTP, Java, HTML, and XML.Web services are XML-based information exchange systems uses the Internet for direct application-toapplication interaction. These systems can include programs, objects, messages, or documents.A web service is a collection of open protocols and standards used for exchanging data between applications or systems. Software applications written in various programming languages and running on various platforms can use web services to exchange data over computer networks like the Internet in a manner similar to inter-process communication on a single computer. This interoperability (e.g., between Java and Python, or Windows and Linux applications) is due to the use of open standards. The basic web services platform is XML + HTTP. All the standard web services work using the following components

- SOAP (Simple Object Access Protocol)
- UDDI (Universal Description, Discovery and Integration) • WSDL (Web Services Description Language)

Socket provide the communication mechanism between two computers using tcp. A client program creates a socket on its end of the communication and attempts to connect that socket to a server. When the connection is made the server creates the socket object on its end of communication. The client and server can now communicate by writing and reading from socket. The following steps occur when establishing a TCP connection between two computers using sockets:

1) The server instantiates a ServerSocket object, denoting which port number communication is to occur on.
2) The server invokes the accept() method of the ServerSocket class. This method waits until a client connects to the server on the given port.

3) After the server is waiting, a client instantiates a Socket object, specifying the server name and the port number to connect to.
4) The constructor of the Socket class attempts to connect the client to the specified server and the port number. If communication is established, the client now has a Socket object capable of communicating with the server.
5) On the server side, the accept() method returns a reference to a new socket on the server that is connected to the client's socket.
6) After the connections are established, communication can occur using I/O streams. Each socket has both an OutputStream and an InputStream. The client's OutputStream is connected to the server's InputStream, and the client's InputStream is connected to the server's OutputStream.

The Raspberry Pi is a credit card-sized computer that plugs into your TV and a keyboard. It is a capable little computer which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheets, word processing, browsing the internet, and playing games.

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called ”protective relays”.

IV. FUNCTIONAL REQUIREMENTS

System should allow user to do authentication.System should support two types of users: System admin and Operational admin .System should allow System admin to create accounts of operational admin.System should allow System admin to manage accounts of operational admin.System should allow System admin user to add location.System should allow System admin user to delete location.System should allow System admin user to view street light status of any location.System should generate activity log message and track each and every event.System should allow Operational admin user to do authentication.System should allow Operational admin to switch streetlights using UI.System should allow Operational admin view status of streetlight of all junction.

V. SAFETY REQUIREMENT

1) Advanced Encryption Standard (AES)
   - AES is a block cipher with a block length of 128 bits.
   - This will be used to secure the communication channel between client and server.
2) MD5 hashing
   - Producing a 128-bit (16-byte) hash value, typically expressed in text format as a 32 digit hexadecimal number.
   - We encrypt users given password using MD5 while authentication of admin user.

VI. ANALYSIS OF PROPOSED SYSTEM

Today's existing system is controlled manually, which leads to various inefficiencies.Every time the human is responsible to look after the controlling of the system .Personally go to the work place and manage all the activities like ON/OFF the street lights.Today's Street light system is not flexible,biggest problem is to handle remote area locations and manual mistakes results into power wastage.This facilitated the idea to develop a smart system which could minimise the human intervention.It is not possible to use sensors for implementing the system as there are various issues like high maintenance cost, high initial cost,false interpretations.Thus taking into consideration all this sensors cant be used. The proposed system will be controlled using an

android applications which there by minimises the human intervention also the labour cost needed to operate the system.The system efficiently manages the ON/OFF of lights in turn making efficient utilization of energy avoiding wastage which is the case in existing system. various patterns are being designed to ON/OFF the lights depending upon the traffic conditions thus focusing on reduced energy wastage.

VII. CONCLUSION

In this paper Smart street lighting system is described that integrates new technologies offering ease of maintenance and energy saving. It tackles the problem of energy wastage which in turn reduces power consumption, increases road safety and gives efficient way to handle switching on/off streetlight by using automatic and time scheduling approach.

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