Street Light Automation using IoT

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Abstract – The Automatic Street Light Control System is a simple yet powerful concept, which uses transistor as a switch. By using this system manual works are 100% removed. It automatically switches ON lights when the sunlight goes below the visible region of our eyes. This is done by a sensor called Light Dependant Resistor (LDR) which senses the light actually like our eyes. It automatically switches OFF lights whenever the sunlight comes, visible to our eyes. By using this system energy consumption is also reduced because now a days the manually operated street lights are not switched off even the sunlight comes and also switched on earlier before sunset. In this project, no need of manual operation like ON time and OFF.

Keywords – IoT, LDR and IR Sensor

I. INTRODUCTION

In the recent years, the device processing power and storage capacity are increasing while at the same time technology is making devices pervasive, mobile and wearable. In addition, networking technologies are evolving and communication electronic systems are becoming smaller and cheaper. Devices are increasingly fitted with sensors and actuators, creating environments where the former are connected to various networks. Devices can sense, compute, act and thus intelligently become parts of the so-called 'Internet of Things'.

There are several definitions for the Internet of Things (IoT) that also explain what are the main functionalities of it and what this work should expect from when connecting 'Things' with each other and with the Internet. Some people suggest, that the "Internet of Things can be seen as a potentially integrated part of the 'Future Internet'. Wikipedia defines IoT as: "A part of a dynamic global network infrastructure with self-configuring capabilities based on open and interoperable communication protocols where physical and virtual 'Things' interact with each other. These 'Things' have specific identities, physical attributes, virtual 'personalities' and use intelligent interfaces. They are able to interact and communicate among them-selves and with the environment by exchanging data and information 'sensed' about the environment, while reacting autonomously to the 'real/physical world' events and influencing them by running processes that trigger actions and create services with or without our direct intervention. Interfaces in the form of services facilitate interactions with these 'smart things' over the Internet, query and change their state and any information associated with them."

To people like hobbyists, electronic enthusiasts or sensor researchers the IoT is new opportunity and at the same time a new challenge for managing the data this work acquire from our embedded electronics projects and controlling their outputs. Imaging having a small device at the size of a matchbox, that can senses temperature, humidity and light conditions of your room, and can report them directly to a web-based service. The readings by the sensors can be accessed only by you through your favorite browser, by your mobile phone and by other

Devices in you place, like the central heating /air conditioning system or the indoor lights control system.
An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a microcontroller-based, software driven, reliable, real-time control sys-tem, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market.

Street Light Automation means Remotely Monitor and Control Street Lights. Reduce power consumption, maintenance costs and environmental impact. this work need to save or conserve energy because most of the energy sources this work spend on, like coal and natural gas can't be replaced. Once this work use them up, they're gone forever. Saving power is very important, instead of using the power in unnecessary times. It should be switched off. In any city "STREET LIGHT" is one of the major power consuming factors. Most of the time this work see street lights are ON even after sunrise thus, wasting lot of energy.

Automatic Street Light Control System is a simple yet powerful concept, which uses transistor as a switch. By using this system manual works are 100% removed.

II. RELATED WORK

Jayashri A.Bangali, Arvind D.Shaligram [1] they proposes a Home Automation system that employs the integration of multi-touch mobile devices, cloud networking, wireless communication, and power-line communication to provide the user with remote control of various lights and appliances within their home. This system uses a consolidation of a mobile phone application, handheld wireless remote, and PC based program to provide a means of user interface to the consumer.

Deepak Kapgate, G.H. Raisoni [2] The main objective of this Paper is to design and implement a control and monitor system for smart house. Smart house system consists of many systems that controlled by Lab VIEW software as the main controlling system in this paper. Also, the smart house system was supported by remote control system as a sub controlling system. The system also is connected to the internet to monitor and control the house equipment's from anywhere in the world using Lab VIEW.

Tan, Y.K.; Huynh, T.P.[3] Wang, Z.Z. Smart personal sensor network control for energy saving in DC grid powered LED lighting system. [4]They discussed that integrated lighting controls for demand-side energy management in building can significantly improve its overall performance increase energy efficiency, and enhance occupant comfort and satisfaction with the built environment.

III. PROPOSED SYSTEM

Street lights are a major source of revenue drain for all cities and if not properly maintained, can result in lot of inconvenience to the citizens. Also, street-lights, if left ON for long times, can adversely impact the environment. It is a total centralized street light management solution that is powerful yet economical enough to provide quite ROI based on the following:

- Reduce energy costs by as much as 40% or more energy costs by as much as 40% or more
- Reduce maintenance costs by as much as 50 % or more
- Low cost Wireless control
- Energy Monitoring
- Increased bulb life

we are avoiding the problem by having an automatic system which turns ON & OFF the street lights at given time or when the ambient light falls below a specific intensity. Each controller has an LDR(Light dependent resister). which is used to detect the ambient light. If the ambient light is below a specific value the lights are turned ON.A light dependent

sensors is interfaced to the pic18f452 microcontroller it is used to track the sun light and when the sensors goes dark the led will be made. When the sensor founds light the led will be made OFF.

Automation, Power consumption and Cost Effectiveness are the important considerations in the present field of electronics and electrical related technologies. Industry of street lighting systems are growing rapidly and going to complex with rapid growth of industry and cities. To control and maintain complex street lighting system more economically, various street light control systems are developed. These systems are developed to control and reduce energy consumption of a town's public lighting system using different technologies. The Proposed work is to control switching of street light automatically according to light intensity to develop flow based dynamic control statistics using infrared detection technology and maintain wireless communication among lamppost and control terminal using ZigBee Wireless protocol.

This proposed system utilizes the latest technology for the sources of light as LED Lamps instead of generally used street lamps such as High Pressure Sodium Lamps, etc. The LED technology is preferred as it offers several advantages over other traditional technologies like energy saving due to high current luminous efficiency, low maintenance cost, high color rendering index, rapid start up speed, long working life etc. This proposed system makes use of infrared sensor for vehicle detection

Advantages Of Proposed System

1.Power saving
The switching ON/OFF of the street lights can be re-motely programmed and re-programmed as per requirement so as to save valuable power. Intelligent interface devices can optimize the energy requirements by recording the changes in nightfall in different seasons.

2.Reduce operating cost
The system utilizes wireless communication techniques and offers real time surveillance of individual group of junction boxes and lamps.

3.Low annual maintenance cost
The unmatched precise and accurate in-formation on electricity consumption helps to plan preventive maintenance and reduces maintenance cost per pole to an enviable level.

4. Future additions made easy
The system utilizes wireless mode of data communication and saves the cost and labour of cable laying through ,out the busy roads. This improves the scalability of the system to a new height. Any number of new street lights can be added to the existing network with simple and easy modifications.

5. Low Initial Cost

Absence of cable laying brings down the execution cost and saves initial installation cost.

VI. SYSTEM ANALYSIS AND DESIGN

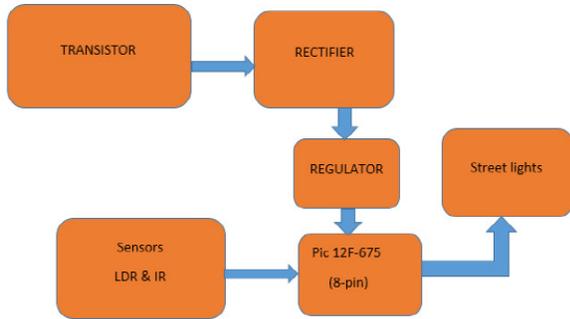The block diagram of the design system is showing below

Fig1: Block diagram of the street light automation system

Components Description
1.IR Sensor

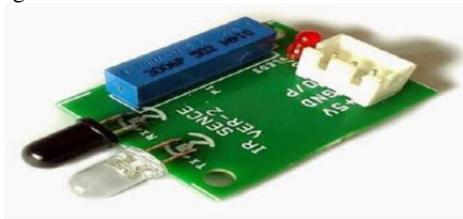Which is used to detect the light means it sense the day and night.

Fig. 2 IR sensor circuit.

2. Microchip PIC12F675

A microcontroller is a single chip, self-contained computer which incorporates all the basic components of a personal computer on a much smaller scale . The code is written in C language and it is stored in the PIC12F 8-pin microcontroller and this microcontroller is connected to the system.
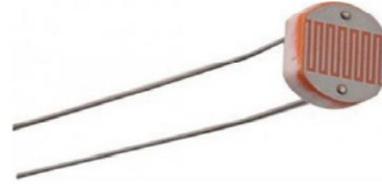

Fig. 3 Microchip PIC12F675.

Fig. 4 LDR Sensor.

3. LDR Sensor

A photo resistor (or light-dependent resistor, LDR, or photo-conductive cell) is a light-controlled variable resistor. The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light-activated and dark-activated switching circuits.

V.PROPOSED SYSTEM

In this process specification the use cases of the IoT system are formally described based on and derived from the purpose and requirement specifica-tions.fig1 shows the process diagram of the street light automation system. The process diagram shows the two modes of the system auto and manual.

In this process diagram, the circle denotes the start of the process, diamond denotes a decision box and rectangle denotes a state or an attribute. When the auto mode is chosen then the system denotes the motion, if the motion is detected then it manages the light level. The light level is high then light is "off" state. If the light level is low then light state is "on". When the manual mode is chosen, the light state set by the user.
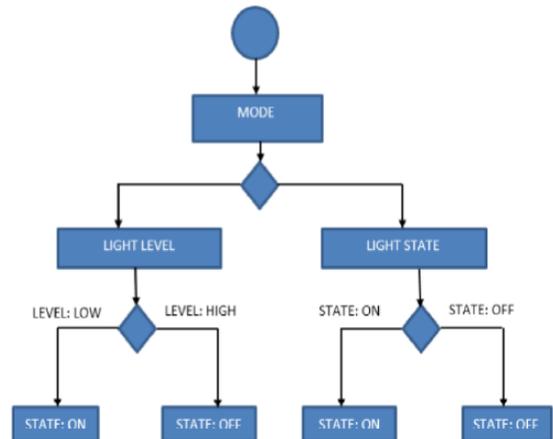

Fig. 5 process specification for street-light automation IoT system.

VI. EXPERIMENTAL RESULTS

The testing of this system is conducted in four cases
Case 1: Light level is high and object motion is not detected.
In this case LDR sensor is not sensing, because light level is high consider it has day time and object motion is also not detected. In this scenario the street light is in "off" state.

Case 2: Light level is high and object motion is detected.
In this case object motion is detected but LDR sensor is not sensing because it's the day time. In this scenario the street light is in "off" state.

Case 3: Light level is low and object motion is not detected.
In this case the LDR sensor is sensing because the light level is low so, consider it's as night time. But the object motion is not detected. In this scenario the street light is in "off" state.

Case 4: If light level is low and object motion is detected.
In this case the LDR sensor is sensing because the light level is low, and also object motion is detected by the IR sensor. So, in this scenario the street light is in "on" state.

VII. CONCLUSION

Street-lights are a large consumer of energy for cities using up to 50 percent of a city's energy budget. If every city installs the proposed system then a lot of power can be saved .Proposed system is power saving mechanism for street lights by using LED lamps as replacement of normal lamps and using special power savings mechanism for microcontroller rand ZigBee modules. It turns out most reliable and time efficient way to switch ON/OFF street-lights. It provides an effective measure to save energy by preventing unnecessary wastage of electricity, caused due to manual switching or lighting of street-lights when it is not required. It adopts a dynamic control methodology for traffic flow. The proposed system is especially appropriate for street lighting in remote urban and rural areas where the traffic is low at times. The system is versatile, extendable and totally adjustable to user needs.

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