VEHICLE MOMENT BASED STREET LIGHT CONTROLLED SYSTEM USING SOLAR PANEL.

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Abstract: The project is designed to detect vehicle movement on highways to switch ON only a block of street lights ahead of it (vehicle), and to switch OFF the trailing lights to save energy. During night all the lights on the highway remain ON for the vehicles, but lots of energy is wasted when there is no vehicle movement. This proposed system provides a solution for energy saving. This is achieved by sensing an approaching vehicle and then switches ON a block of street lights ahead of the vehicle. As the vehicle passes by, the trailing lights switch OFF automatically. Thus, we save a lot of energy. So when there are no vehicles on the highway, then all the lights remain OFF. However, there is another mode of operation where instead of switching OFF the lights completely, they remain ON with 10% of the maximum intensity of the light. As the vehicle approaches, the block of street lights switch to 100% intensity and then as the vehicle passes by, the trailing lights revert back to 10% intensity again. High intensity discharge lamp (HID) presently used for urban street light are based on principle of gas discharge, thus the intensity is not controllable by any voltage reduction. White Light Emitting Diode (LED) based lamps are soon replacing the HID lamps in street light. Intensity control is also possible by Pulse Width Modulation (PWM) generated by the microcontroller. Sensors used on either side of the road senses vehicle movement and sends logic commands to microcontroller to switch ON/OFF the LEDs. Thus this way of dynamically changing intensity ON/OFF helps in saving a lot of energy. The project uses an 8051 series microcontroller. Further the project can be enhanced by using appropriate sensors for detecting the failed street light and then sending an SMS to the control department via GSM modem for appropriate action.

KEYWORDS: *solar panel, ldr, temp, gsm.*

I. INTRODUCTION

Development of a good transportation network is important in order to fulfill people needs. This includes streets, roads and highways that have to be adequately illuminated so that a sufficient visibility is guaranteed in order to decrease the accident rate and increase the flow of the vehicles and safety. However, these streets and roads are illuminated constantly for more than 13 hours daily. This will lead to a huge amount of electrical power to light all the streets and roads. Hence the development of sensor nodes capable of sensing motion or moving objects is crucial. In this system, if there is an object moving past the sensor node, the street light will turn on. Otherwise, the street light will remain off. The type of sensor node needed should have criteria such

as low energy consumption. If the sensor node itself just use low energy consumption, it will also help to increase the lifetime of the battery. Industry of street lighting systems are growing rapidly and going to complex with rapid growth of industry and cities. Automation, Power consumption and Cost Effectiveness are the important considerations in the present field of electronics and electrical related technologies. 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 existing work is use the High intensity discharge lamp (HID). HID presently used for urban street light are based on principle of gas discharge, thus the intensity is not been controllable by any voltage reduction method as the discharge path is broken. The objective of this study is to develop a low cost sensor node for smart street lighting system and analyse the develop sensor node in term of its functionality and energy consumptions. The scope of this project focuses on the development of sensor node for LED type of street light only. The study also focuses on testing and analyses part that has been used in the development of low cost sensor circuitry.

II. HARDWARE SYSTEM

This proposed system provides a solution for energy saving. This is achieved by sensing an approaching vehicle and then switches ON a block of street lights ahead of the vehicle. As the vehicle passes by, the trailing lights switch OFF automatically. Thus, we save a lot of energy. So when there are no vehicles on the highway, then all the lights remain OFF. However, there is another mode of operation where instead of switching OFF the lights completely, they remain ON with 10% of the maximum intensity of the light. As the vehicle approaches, the block of street lights switch to 100% intensity and then as the vehicle passes by, the trailing lights revert back to 10% intensity again. High intensity discharge lamp (HID) presently used for urban street light are based on principle of gas discharge, thus the intensity is not controllable by any voltage reduction. White Light Emitting Diode (LED) based lamps are soon replacing the HID lamps in street light. Intensity control is also possible by Pulse Width Modulation (PWM) generated by the microcontroller. Sensors used on either side of the road senses vehicle movement and sends logic commands to microcontroller to switch ON/OFF the LEDs. Thus this way of dynamically changing intensity ON/OFF helps in saving a lot of energy.

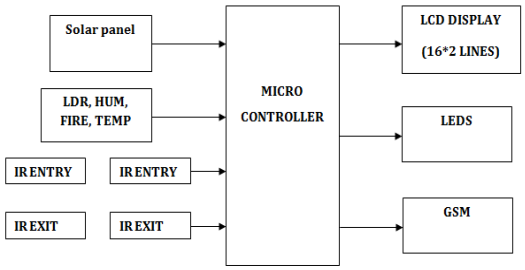

Fig 1: Block diagram

III. BOARD HARDWARE FEATURES

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (**LCD**) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

LDR:

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically. The animation opposite shows that when the torch is turned on, the resistance of the LDR falls, allowing current to pass through it. This is an example of a light sensor circuit: When the light level is low the resistance of the LDR is high.

Fig 2: LDR

This prevents current from flowing to the base of the transistors. Consequently the LED does not light. However, when light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. The LED lights on. The preset resistor can be turned up or down to increase or decrease resistance, in this way it can make the circuit more or less sensitive.

IR Tx and Rx:

Transmitter and receiver are incorporated in a single housing. The modulated infrared light of the transmitter strikes the object to be detected and is reflected in a diffuse way. Part of the reflected light strikes the receiver and starts the switching operation. The two states – i.e. reflection received or no reflection – are used to determine the presence or absence of an object in the sensing range.

This system safely detects all objects that have sufficient reflection. For objects with a very bad degree of reflection (matt black rough surfaces) the use of diffuse reflection sensors for short ranges or with background suppression is recommended.

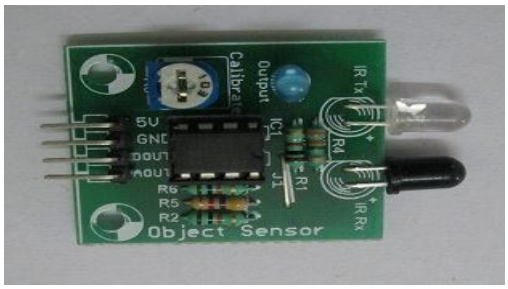

Fig 3: IR sensor

SOLAR PANELS:

Solar panels (arrays of photovoltaic cells) make use of renewable energy from the sun, and are a clean and environmentally sound means of collecting solar energy. Here at solar panel information, we've amassed a wealth of information relating to solar panels and the field of photovoltaic technology. Solar panels collect solar radiation from the sun and actively convert that energy to electricity. Solar

panels are comprised of several individual solar cells. These solar cells function similarly to large semiconductors and utilize a large-area p-n junction diode. When the solar cells are exposed to sunlight, the p-n junction diodes convert the energy from sunlight into usable electrical energy. The energy generated from photons striking the surface of the solar panel allows electrons to be knocked out of their orbits and released, and electric fields in the solar cells pull these free electrons in a directional current, from which metal contacts in the solar cell can generate electricity. The more solar cells in a solar panel and the higher the quality of the solar cells, the more total electrical output the solar panel can produce. The conversion of sunlight to usable electrical energy has been dubbed the Photovoltaic Effect. The photovoltaic effect arises from the properties of the p-n junction diode, as such there are no moving parts in a solar panel.

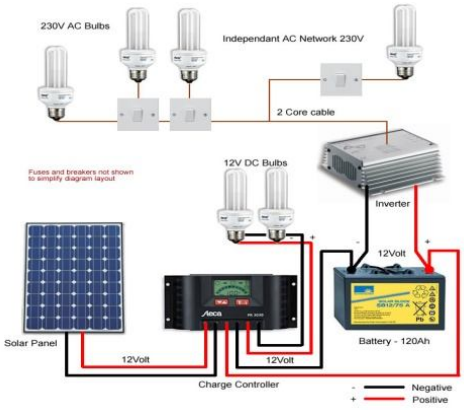

Fig 4: Solar panel working

GSM:

Global System for Mobile Communication (GSM) is a set of ETSI standards specifying the infrastructure for a digital cellular service.The network is structured into a number of discrete sections

Base Station Subsystem – the base stations and their controllers explained

Network and Switching Subsystem – the part of the network most similar to a fixed network, sometimes just called the "core network"

GPRS Core Network – the optional part which allows packet-based Internet connections

Operations support system (OSS) – network maintenance was intended to be a secure wireless system. It has considered the user authentication using a pre-shared key and challenge-response, and over-the-air encryption. However, GSM is vulnerable to different class of attacks, each of them aiming a different part of the network.

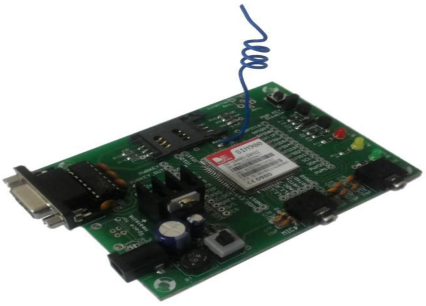

Fig:5: GSM Module

Temperature sensor:

A thermistor is a type of resistor whose resistance is dependent on temperature. Thermistors are widely used as inrush current limiter, temperature sensors (NTC type typically), self-resetting over current protectors, and self-regulating heating elements. The TMP103 is a digital output temperature sensor in a four-ball wafer chip-scale package (WCSP). The TMP103 is capable of reading temperatures to a resolution of 1°C.

Fig:6: Temperature sensor

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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