**TABLE OF CONTENTS**

**1. TITLE**

**2. ABSTRACT**

**3. INTRODUCTION**

**4. LITERATURE REVIEW**

4.1 CONCLUSION OF LITERATURE REVIEW

**5. METHODOLOGY**

5.1 DESIGN SPECIFICATIONS

5.2 MODULAR OVERVIEW

5.3 CIRCUIT DIAGRAM

5.4 COMPONENTS USED

**6. TIMELINE CHART**

**7. ADVANTAGES**

**8. CONCLUSION**

**9. REFERENCES**

**INTELLIGENT STREET LIGHTS**

**ABSTRACT:**

Currently, in the whole world, enormous electric energy is consumed by the street lights, which are automatically turn on when it becomes dark and automatically turn off when it becomes bright. This is the huge waste of energy and power in the whole world and should be changed.

The project aim is to reduce the consumption of electric energy and power which are used by the street lights. In this Project, street light intensity is controlled by dimming the light when not required and lighting with full intensity when in use.

The project “intelligent street light system” is based on microcontroller and it consists of a LED light, a brightness sensor and a motion sensor.

**INTRODUCTION:**

Intelligent street lightning refers to public street lightning that adapts to movement by pedestrians and vehicles. Intelligent street lightning means, light dims when no activity is detected. Intelligent street lights is a real time automatic control of the intensity of LED street lights by varying the voltage across the LED array.

The idea or the inspiration for this project was came from the shortage of power and electric energy in an ever increasing power demand scenario. Currently, in the whole world more amount of electric energy is consumed due to street lights and this is because street lights continuous operate during night time. Some attempts are made to reduce the wastage of electric energy and power.

The project, propose an autonomous-distributed-controlled light system, in which the lights turn on before pedestrians come and turn off or reduce power when there is no one by means of a distributed-installed sensor network.

In this project, intensity of the street light is controlled .During the day time street lights are off and during the night time when there is any movement of vehicles and pedestrians detected then street lights works with the full intensity. When there is no one on the road then street lights automatically works in that way with the low light. In the winter season during fog and in rainy weather, street lights is needed in morning time but not with the full intensity so if any movement is detected that time the street lights work in their own way at that time with the low power. In this project for detection of movement and controlling the intensity of street lights, a motion sensor and brightness sensor is used.

In this project, a PIR sensor is used to detect the motion and a LDR sensor for brightness. LDR is a device whose sensitivity depends upon the intensity of light falling on it. When the strength of the light falling on LDR increases the LDR resistance decreases, while if the strength of the light falls on LDR is decreased resistance increased. During the day time LDR resistance is low therefore voltage at the inverting input is higher than the voltage at the non-inverting input so, the transistor goes into cut-off state which means street light or LED will not glow. But in the night ,LDR resistance is high hence voltage at inverting input decreases than the non-inverting input, which makes transistor to conduct and LED or street light start to glow.

LITERATURE REVIEW:

|  |  |  |  |
| --- | --- | --- | --- |
| REFERENCE | AUTHOR | KEY FINDINGS | COMMENTS |
| [1] | Aishwarya.N. Patil et al | System automatically controls and monitors the light of the streets.  Light Dependent Resistor (LDR) to indicate a day/night time and the photoelectric sensors to detect the movement on the street. | This project makes the process of energy saving easier and efficient. It can also be used in many present day such as head lights, street light, park lights, industrial lights and many more. |
| [2] | Prof.B.A.Khivsara,Dhanashri Patil | IOT base street light is the concept used to reduce energy consumption and to give the automation to the street lights.  Smart Street Light Management system is used also different  Sensors used for the automation which is done through android application. | Different sensors are used for the automation which is done through  android application user can upload, requests,  Complaints which Admin can view and reply. This system is user-friendly and useful to the society. |
| [3] | Prof. K.Y.Rajput1, | A smart lighting system which targets the energy saving and autonomous operation on economical affordable for the streets.  An energy saving smart lighting system with integrated sensors and controllers.  Remote on/off, Dimming and on-site Status Check. System Fault Detection/Alarm. Anti-theft Detection/Alarm. | Along with energy saving it also tackles with the problem of power theft and is also capable of taking actions in case of unprecedented events of climatic changes. |
| [4] | Yusaku Fujii | An autonomous-distributed-controlled light  system, in which the lights turn on before pedestrians come  and turn off or reduce power when there is no one by  means of a distributed-installed sensor network | The system is autonomous-distributed  Controlled. No host computer is needed and firmware of each unit can be updated easily. |
| [5] | Samir A. Elsagheer Mohamed1 | Efficient autonomous street lighting control and monitoring system based on the innovative technology named as Vehicular Ad-Hoc Networks (VANET) is proposed. The system can be integrated with VANET. | Huge energy can be saved without affecting the visibility and the safety of the drivers. It can extend the lifetime of the lamps. The street lighting equipment can be automatically monitored. |

Conclusion of Literature Review:

From the above research papers, it is concluded that:

[1] Energy saving is easier and efficient.

[2] Automation is done through android application user can upload requests.

[3] Solves the problem of power theft.

[4] Lifetime of lamps can be extended.

[5] Street lighting equipment can be automatically monitored.

**METHODOLOGY:**

1. DESIGN SPECIFICATIONS

2. BLOCK DIAGRAM

3. CIRCUIT DIAGRAM

4. COMPONENS USED

1. DESIGN SPECIFICATIONS :-

The project aim is to reduce the power consumption and overall costs of street lighting by integrating dimmable light-emitting diodes (LEDs). The principle of operation is to efficiently control the intensity of the streetlights to respond to the needs of road users. The following is a list of requirements our system aims to fulfill such to solve the problems that the current lighting system presents:

1**. Motion Detection**: A motion detection sensor will ensure that the lights only brighten when motion is detected.

2. **LDR Module:** LDR is installed for checking the day/night condition.

3. **Microcontroller:** The microcontroller will act as the processing unit. It will have the following functions:

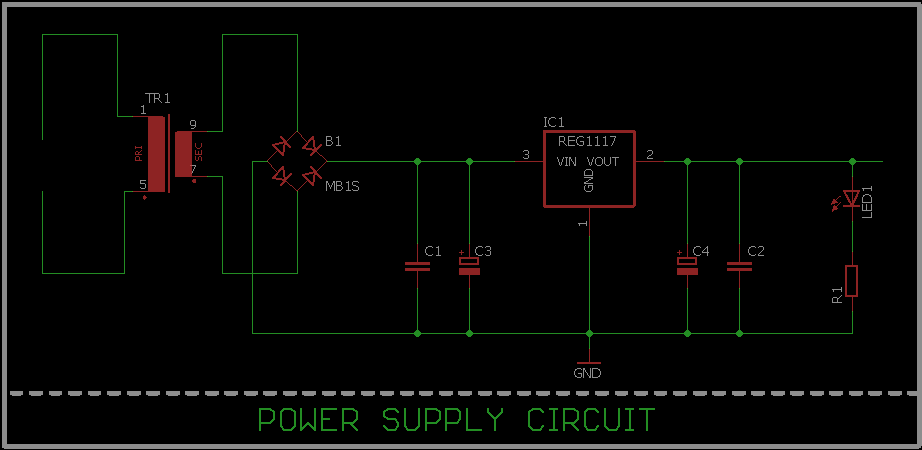
**a. Process Data**: It must process the data received from the sensor.

**b. Control Output**: This output controls the intensity of the light according to the results of data processing.

**c. Communication with wireless interface**: It must be able to receive and send control signals through the network.

5. **Control:** Intelligent algorithms will be used to smartly control the lights to quickly respond to the needs of road users.

1. CIRCUIT DIAGRAM:



POWER CONVERSION STAGE-

Firstly, the conversion from AC (mains) to DC is implemented using a full-wave rectifier, which can be implemented by four diodes in a bridge configuration. In general, the output voltage required for the LEDs is lower than 230V, and so a step down converter is needed. A more constant DC output at the rectifier can be achieved by adding a combination of a resistor capacitor (RC) low pass filter.

4. COMPONENTS USED:

LDRLight Dependent Resistor as the name suggests the resistance is dependent upon the light incident on it. The theoretical concept of the light sensor lies behind, which is used in this circuit as darkness detector. In light intensity the resistance offered by the sensor decreases and with decrease in light intensity the resistance offered by the sensor increases. Hence it acts as variable resistor with change in light intensity. These helps in finding the amount of light intensity at that instant of time and thus helping in regulating the lighting of our lighting system accordingly.

PIR SENSOR

Passive Infrared (PIR) sensors react to infrared energy emitted by objects. They are passive in the sense that they only detect infrared; they do not emit any. The sensor contains consists of two detectors configured as differential inputs. When a warm object enters the field of one detector, there is a positive differential change. As the object moves to the next field, there is a negative change. These change pulses are detected and interpreted as motion. In the PIR case, detection ability is reduced since the width of the ‘gap in coverage’ increases with radius.

DIGITALSENSOR

A digital sensor is an electronic or electrochemical sensor, where data transmission are done digitally.

MICROCONTROLLERMicrocontroller is a small computer on a single integrated circuit which contains one or more CPUs along with memory and programmable input/output peripherals. The CPU controls a range of peripherals, which may provide both digital and analog functions such as timers and analog-to-digital converters. Small devices usually include both volatile and nonvolatile memory on the chip but larger processors may need separate memory

LCD:

This is mostly widely used. This is most widely used display device for embedded systems. The LCD unit receives character codes (8 bits per character) from a microprocessor or microcomputer, latches the codes to its display data RAM (80-byte DD RAM for storing 80 characters), transforms each character code into a 5´ 7 dot-matrix character pattern, and displays the characters on its LCD screen.

LED DRIVER:

The LED driver takes constant DC voltage as input and outputs variable DC current depending on logic control. Different dimming methods can be applied, such as analogue dimming or PWM. For our purposes, PWM control seems the best option in this case, since a fixed switching frequency can then be selected which optimizes efficiency of the rest of the driver circuit (See appendix G for more details on how the driver works). LEDs are controlled by the logic commands sent from the microcontroller to the LED driver.

LED: A light-emitting diode (LED) is a p-n junction diode, which emits light when activated. When the voltage is apply across its leads, electrons are able to recombine with holes within the LED, releasing energy in the form of photons which gives the light. Hence, it is a two-lead semiconductor light source. Light emitting diodes represents our lighting system and the amount of light emitted by it is directly related to the amount of light in the environment that is when outside light is less than the light given by LEDS is more and vice-versa. LEDs produce more light per watt than incandescent bulbs; this is useful in battery powered or energy-saving devices. LEDs can emit light of an intended color without the use of color filters that traditional lighting methods require. This is more efficient and can lower initial costs. Incandescent and fluorescent sources often require an external reflector to collect light and direct it in a usable manner. When used in applications where dimming is required, LEDs do not change their color tint as the current passing through them is lowered, unlike incandescent lamps, which turn yellow. LEDs are ideal for use in applications that are subject to frequent on-off cycling, unlike fluorescent lamps that burn out more quickly when cycled frequently, or High Intensity Discharge (HID) lamps that require a long time before restarting.

**TIMELINE CHART:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TASK | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER |
| Synopsis submission and presentation |  |  |  |  |  |
| Simulation and component purchasing |  |  |  |  |  |
| Hardware development and testing |  |  |  |  |  |
| Testing and report submission |  |  |  |  |  |
| Final presentation |  |  |  |  |  |

**ADVANTAGES:**

Several advantages of implementing a New Modern Street Lighting System using LEDs are illustrated below:

1**. Improvements in road safety**

LEDs produce a more natural white light, which provides better facial recognition helping people feel safer at night. Therefore, use of white light sources has a positive impact on the crime rate, reducing the risk of night crimes. In addition, due to good colour rendering, white light sources such as LEDs have a significant role to play, particularly when introduced into residential areas.

**2. Reduction in energy consumption**

The system will use dimming levels of street lights between the hours of 11pm and 5.30am subsequently reducing the energy consumption.

**3. Energy Conservation**

Centrally managed systems shall be considered the preferred option for all existing and proposed street lighting systems. This will give the ability to have complete control over street lights and help reduce energy usage and therefore carbon emissions. In addition, the lights used should be capable of dimming and switching off, should have a high energy efficiency, should support the application of electronic ballasts (lower energy consumption, near unity power factor), should provide lower wattage white light.

**4. Reduction in light pollution**

LEDs can be directed more easily such that light is only shone where needed, e.g. pavement or road. This leads to significant reductions in light pollution in the sky.

**CONCLUSION:**

The fundamental aim of this project is to find a cost-effective and energy efficient replacement for the current street lighting systems. By identifying the causes of energy waste of lamps during night and investigating the requirements needed for the residential area chosen, a design is proposed that provides an efficient solution.

In order to reduce the energy spending, the project design integrates highly efficient and smartly controlled modules. In brief, the design utilizes dimmable LEDs and wireless technology in order to activate the street lighting in the required area only when motion is detected. In this project, components with desirable features such as low cost, low power consumption is used. Moreover, the low maintenance costs support the profitability of our design .Overall, the proposed system solves energy spending problems (lower power consumption of street lights) and environmental issues (lower carbon emissions).

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