DESIGN: SMART STREET LIGHT SYSTEM

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ABSTRACT

Automation, power consumption, and cost effectiveness are the most important factors in today's field technology. With the use of intelligent technology, automation aims to reduce manpower. Because the supply of power is diminishing owing to a variety of factors, power conservation is always a priority. As we all know, energy usage is on the rise, therefore we're turning to IoT devices to help us deal with the implications. This project suggests a method i.e diagrams and the structure for the system that need to implement to switch from traditional street lamp system to IoT system to get most out of it and this will also going help in the process of conserving environment.

INTRODUCTION

One of a city's major energy bills is street lighting. Municipal street lighting costs can be reduced by 50% to 70% with an intelligent street lighting system. On sunny and wet days, the ON and OFF times differ noticeably, which is one of the major drawbacks of today's street lighting systems. Additionally, the lighting system's manual operation is no longer required. Due to population expansion and economic development, the world's energy consumption is expanding at the highest rates ever, while energy resources are severely limited. As a result, resource expansion and development in energy production have not kept up with rising demand, and the country continues to experience severe energy shortages. Streetlights are an essential component of any growing community. They can be found on all main highways as well as in the suburbs. Even when no one is there, streetlights are turned on at full power from sunset to sunrise every day. Millions of dollars are spent each day on these street lights to deliver the essential electrical energy on a global scale. The costs of maintaining and replacing traditional incandescent bulbs are enormous. They use a lot of electricity to operate, and their heat outputs are also extremely substantial. All of this contributes to increased electricity consumption and, as a result, increased carbon dioxide emissions from power plants. As a result, this behaviour hurts our ecosystem in addition to producing excessive light pollution. The main purpose of the project is to develop a "Internet of Things-based Automatic Street Lighting System" that overcomes all the drawbacks of the traditional street lamp system.

PROBLEM STATEMENTS

1: In the presence of sunlight, street lights are turned on.
2: It has adverse effect on environment.
3: High maintenance cost and need decent amount of manpower.

Disadvantages of Classical Street Light:

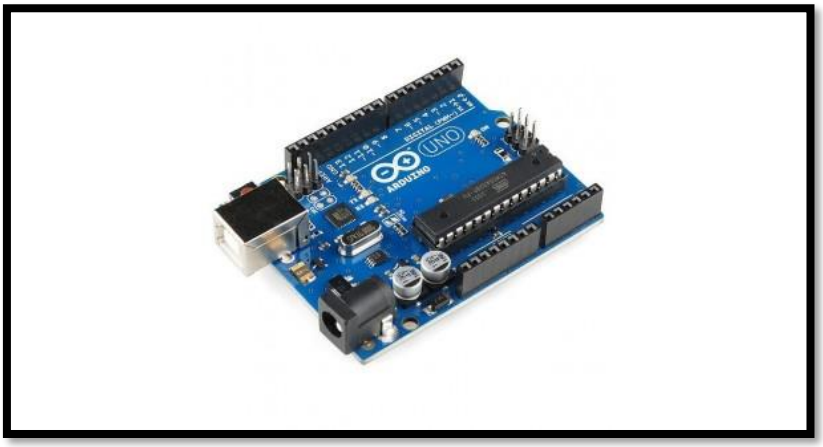
- Street lights even in the day time.
- Conventional street lamp system need manual switching hubs and operators.
- Need of man power that also adds in the list for increase in finance.
- Most of these are not LEDs and they have high power consumption that results in waste of energy.

Advantages of the Proposed System:

- No need of switching hubs.
- Definite fall in maintenance cost.
- Fall can be noticed in the light pollution. Energy conservation.
- Maintenance will be less as a result need less man power.

HARDWARE REQUIREMENTS

1] Arduino UNO



Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects.

2] IR Sensor

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment.

3] Light Dependent Resistor [LDR]

A photoresistor (also known as a Photocell, or light-dependent resistor, LDR, or photo-conductive cell) is a passive component that decreases resistance with respect to receiving luminosity (light) on the component's sensitive surface.

4] Light Emitting Diodes [LED]

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

PROPOSED DIAGRAMS

1] BLOCK DIAGRAM FOR SMART STREET LIGHT SYSTEM.

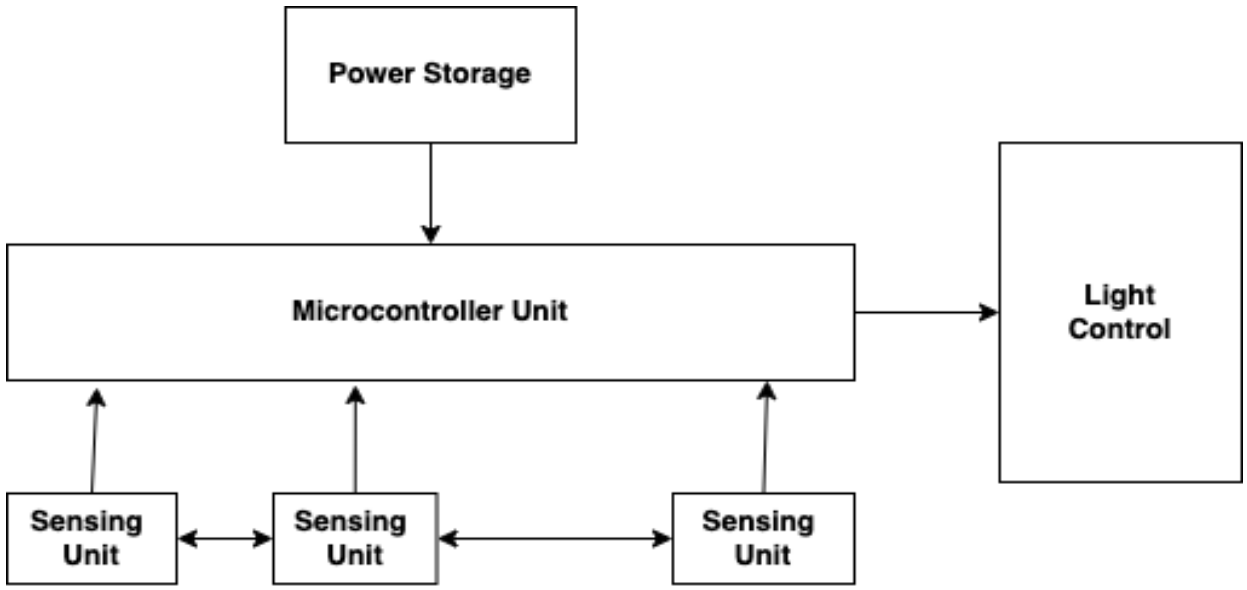
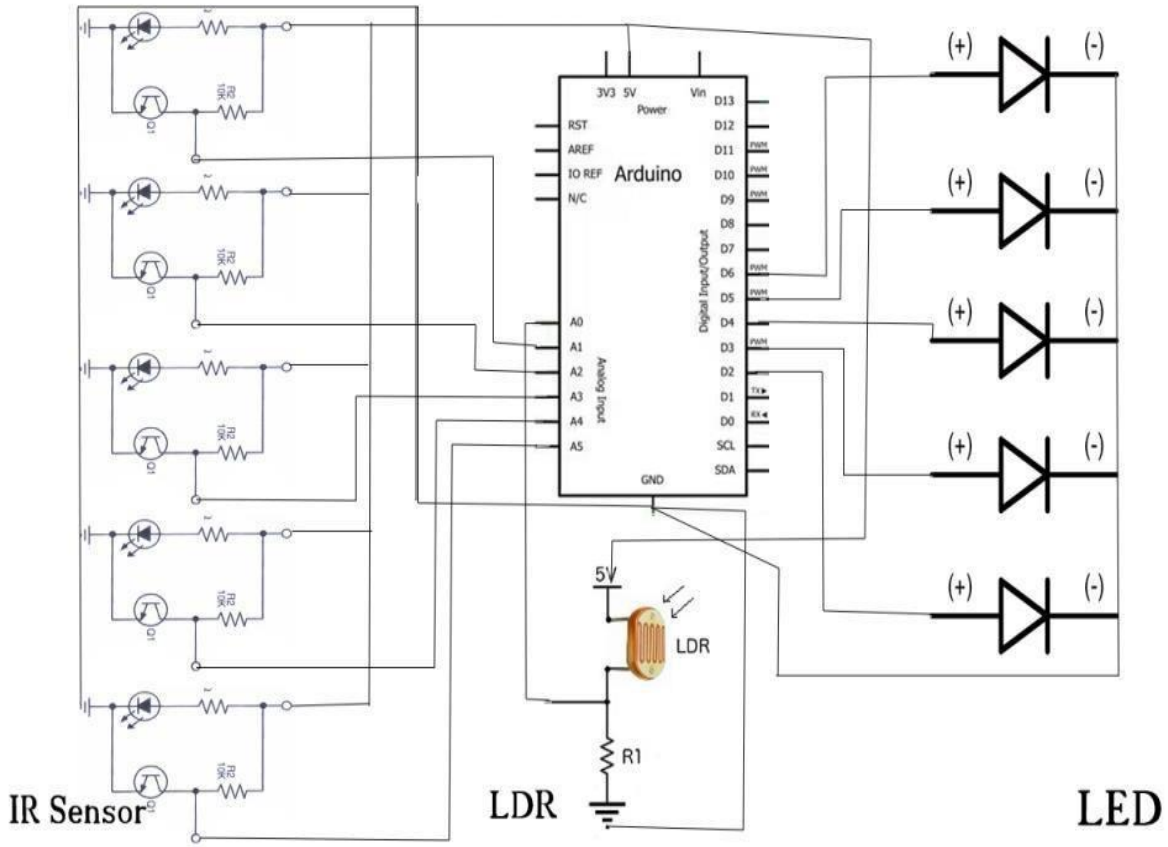


Fig.2 Basic Block Diagram of Dynamic Street Lighting System

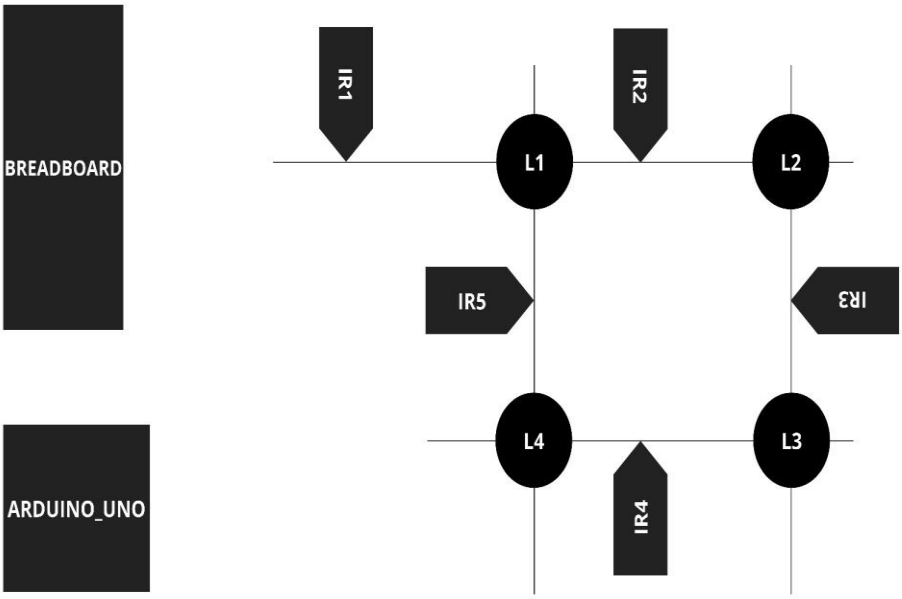
Above diagram shows the block diagram of the dynamic street lighting system. The block diagram consists of various subsystems like Sensing Unit, Microcontroller unit and the Lighting system. The Sensing unit consists of both IR to detect the density of the lane. Low power microcontroller is attached with a sensing unit to adjust the intensity level of lighting based on density. The microcontroller is connected to the lighting system. This whole unit gets powered from the batteries. The sensing unit will prescribe internal communication for the clearance of lights along the path.

2] Architecture of Smart Street Light



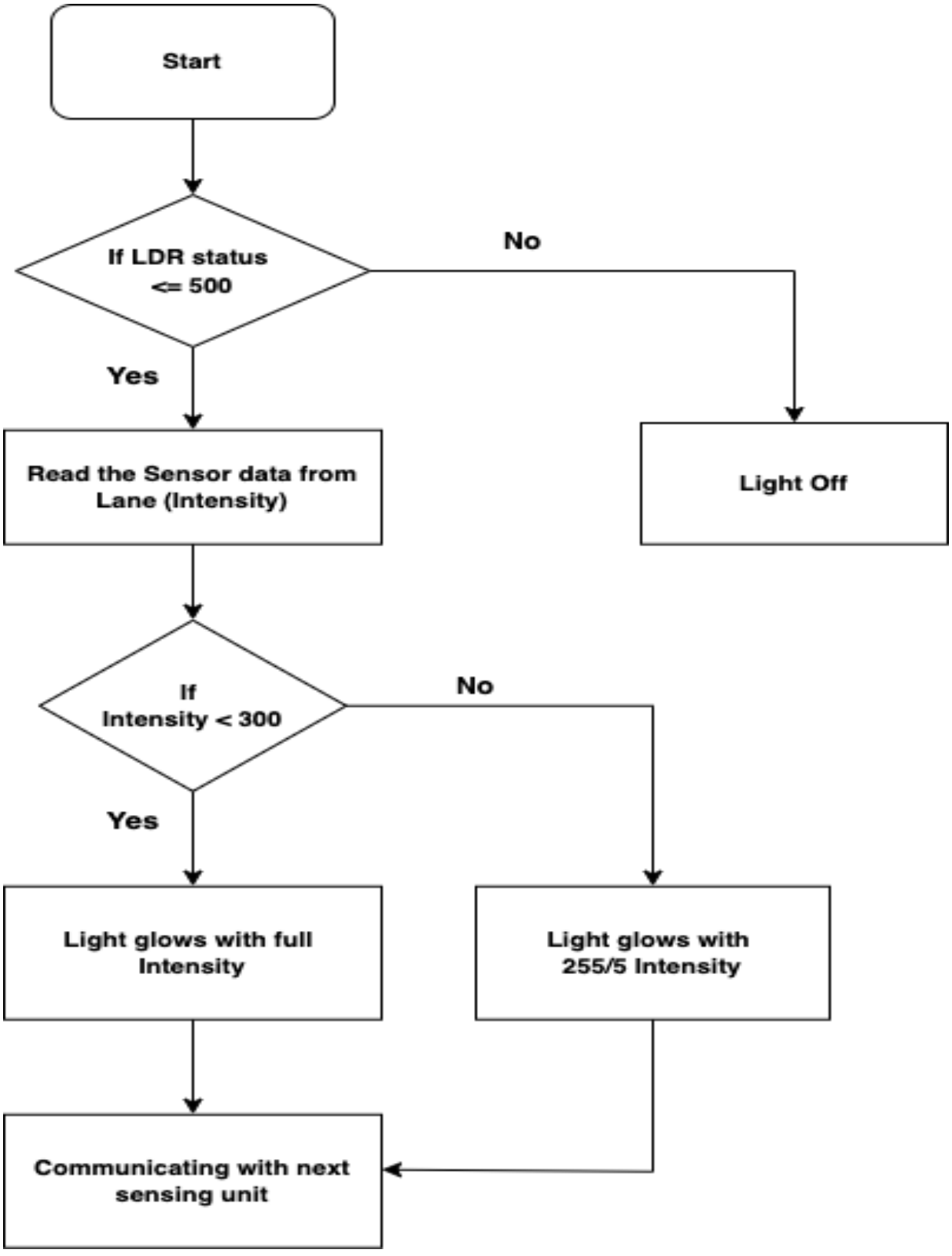
The architecture consists of several IR sensors placed at both the ends of the lane to detect the density of passers-by. These sensors are placed at a certain distance and it transfer the information among itself when is vehicle is detected. The sensors communicate with each other through wired connection. Here wired connection is used in order to reduce the cost. The implementation of Smart and Dynamic Street Lighting System provides an easy way to reduce the energy consumption and CO2 emission. This system has the capability of real time flow control. Each sensing part consists of both infrared and PIR sensors to detect the flow. In this two sensors are used to improve it accuracy of detection. These sensors are connected to the microcontroller in which data has been processed and adjust the lighting levels.

3] ACTUAL PLACEMENT OF THE SYSTEM COMPONENT.



Above diagram has the details about the actual placement of the sensors and the microcontroller unit as well as how lights are placed between the sensors and communicate with the Arduino uno.

4] FLOWCHART


Start
If LDR status <= 500
No
Yes
Read the Sensor data from Lane (Intensity)
Light Off
If Intensity < 300
No
Yes
Light glows with full Intensity
Light glows with 255/5 Intensity
Communicating with next sensing unit

CONCLUSION AND FUTURE SCOPE

Smart Street Light project is advantageous not just in rural areas, but also in urban ones. As we progress, we will require more power, thus the utilization of renewable resources will be useful and advantageous. We can even include smart vehicle parking to this project, which is useful for driverless automobiles. The cost of the project can be decreased with advances in technology and solid resource planning, and maintenance can be reduced in terms of periodic checks with the use of good equipment. LEDs have a long life span, produce cool light, contain no harmful materials, and can be used for quick switching. As a result, our project has significantly more advantages than disadvantages, which can outweigh the current restrictions. Considering the long-term benefits while keeping the initial expense in mind will never be an issue because the investment return period is relatively short. Other applications for the project include supplying lighting in factories, colleges, and parking lots of large retail malls. This technology is a cost-effective, practical, environmentally beneficial, and safe solution to save energy, and the light status information in this system can be accessed at any time and from any location. It effectively addresses the two problems that the world is facing today: energy conservation and incandescent light disposal.

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