PROJECT REPORT

ON

"AUTOMATIC STREET-LIGHT USING IR SENSOR"

THIS PROJECT REPORT IS SUBMITTED TO SANT GADGE BABA AMRAVATI UNIVERSITY

IN THE PARTIAL FULFILLMENT OF THE DEGREE OF

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

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SIPNA COLLEGE OF ENGINEERING & TECHNOLOGY AMRAVATI

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

Certificate

This is to certify that the Project titled

"Automatic Street-Light Using IR Sensor"

Has been successfully completed by

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under the guidance of

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in recognition to the partial fulfillment for

The degree of Bachelor of Engineering (Electronics & Telecommunication),

Sant Gadge Baba Amravati University

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1. Atharva Waghmare ***2. Madhav Yawale***

3. Shashank Olivkar ***4. Gaurav Yelane***

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ABSTRACT

Our manuscript aims to develop a system which will lead to energy conservation and by doing so, we would be able lighten few more homes. The proposed work is accomplished by using Arduino microcontroller and sensors that will control the electricity based on night and objects detection. meanwhile a counter is set that will count a number of object passed through the road. The beauty of the proposed work is that the wastage of unused electricity can be reduced, lifetime of the streetlights gets enhanced because the light do not stays ON during the whole night, and also helps to increase safety measurements. We are confident that the proposed idea will be beneficial in the future applications of microcontroller and sensors etc.

Current Scenario of Indian Streets

There are more than 27 millions street light which glows all across India. Most of them are traditional and consumes more power. Some of them are very outdated so we have to replace them with led along with the automation for better efficiency and energy conservation

HID lamps are a type of electrical gas discharge lamp which produces light by means of an electric arc between tungsten electrodes housed inside a translucent or transparent fused quartz or fused alumina arc tube. This tube is filled with both gas and metal salts. The gas facilitates the arc's initial strike. Once the arc is started, it heats and evaporates the metal salts forming plasma, which greatly increases the intensity of light produced by the arc and reduces its power consumption. High-intensity discharge lamps are a type of arc lamp.

Disadvantages of current system:

- Defective Lights
- Less use of LED lights
- Wastage of energy
- Unauthorized usages of electricity

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Automation plays an increasingly important role in the world economy and in daily life. Automatic systems are being preferred over manual system. The research work shows automatic control of streetlights as a result of which power is saved to some extent. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist the users with muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Basically, street lighting is one of the important parts. Therefore, the street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density. There are several factors need to be considered in order to design a good street lighting system such as night-time safety for community members and road users, provide public lighting at cost effective, the reduction of crime and minimizing it is effect on the environment. At the beginning, street lamps were controlled by manual control where a control switch is set in each of the street lamps which is called the first generation of the original street light. After that, another method that has been used was optical control method done using high pressure sodium lamp in their system. Nowadays, it is seen that the method is widely used in the country. The method operates by set up an optical control circuit, change the resistance by using of light sensitive device to control street lamps light up automatically at dusk and turn off automatically after dawn in the morning. Due to the technological development nowadays, road lighting can be categorized according to the installation area and performance, for an example, lighting for traffic routes, lighting for subsidiary roads and lighting for urban center and public amenity areas. The WSN helps in improving the network sensing for street lighting. Meanwhile, street light system can be classified according to the type of lamps used such as incandescent light, mercury vapor light, metal halide light, high pressure sodium light, low pressure sodium light, fluorescent light, compact fluorescent light, induction light and LED light. Different type of light technology used in lighting design with their luminous efficiency, lamp service life and their considerations. The LED is considered a promising solution to modern street lighting system due to its behavior and advantages.

1.2 OBJECTIVE

The main objective of this project is to design and develop an automatic street-light system using IR sensors that can help reduce energy consumption and improve safety on roads.

Specifically, the project aims to:

1.2.1 Design and develop a system that uses IR sensors to detect the presence of vehicles and pedestrians on the road, and automatically turn on/off the streetlights accordingly.

1.2.2 Develop an algorithm that can detect the density of vehicles and adjust the intensity of the lights accordingly, thereby reducing energy wastage.

1.2.3 Integrate the system with a wireless communication module, enabling remote monitoring and control of the street-light system.

1.2.4 Evaluate the performance of the system in terms of energy efficiency, accuracy of detection, and reliability.

By achieving these objectives, we aim to contribute to the development of a more sustainable and efficient lighting system for streets, that can enhance safety for all road users, while reducing energy costs and environmental impact.

The purpose of this project is to design and develop an automatic street-light system using IR sensors that can help reduce energy consumption and improve safety on roads. The traditional street-light systems used in many cities are not efficient, as they are usually switched on during the night and switched off in the morning, regardless of the traffic conditions on the road. This approach results in wastage of energy and increased costs for the local governments.

To address these issues, we aim to design and develop a system that can automatically turn on/off the street-lights based on the presence of vehicles and pedestrians on the road. We will use IR sensors as they are reliable and cost-effective in detecting the presence of objects. By using these sensors, the system can accurately detect the presence of objects and turn on/off the streetlights accordingly, thereby saving energy.

Moreover, we aim to develop an algorithm that can detect the density of vehicles and adjust the intensity of the lights accordingly. During the night, when there is less traffic on the road, the system can dim the lights to save energy, while during peak traffic hours, it can increase the intensity of the lights to improve visibility for drivers and pedestrians. This approach will help to reduce energy wastage, while ensuring that there is sufficient lighting on the road.

We also plan to integrate the system with a wireless communication module, enabling remote monitoring and control of the street-light system. This will allow the system to be monitored and controlled from a central location, reducing the need for physical inspections and maintenance. This feature will make the system more efficient and reliable.

Finally, we will evaluate the performance of the system in terms of energy efficiency, accuracy of detection, and reliability. We will conduct various tests to determine the accuracy of the detection system, the energy consumption of the system, and the reliability of the wireless communication module. By doing so, we aim to ensure that the system meets the desired performance criteria and can be implemented in real-world scenarios.

By achieving these objectives, we aim to contribute to the development of a more sustainable and efficient lighting system for streets, that can enhance safety for all road users, while reducing energy costs and environmental impact.

1.3 TRADITIONAL SYSTEMS

The traditional method of providing street-lighting involves the installation of lamps on poles along the roadside. These lamps are typically operated by an automatic timer that switches them on at a predetermined time in the evening and switches them off in the morning.

This approach has several limitations. Firstly, the timing of the lights is fixed and does not take into account changes in traffic flow throughout the night. This can result in energy wastage, as the lights may be on when they are not needed.

Moreover, the traditional method does not provide the necessary flexibility to adjust the lighting based on the density of traffic on the road. This can lead to situations where the lighting is inadequate during peak traffic hours, causing safety concerns for drivers and pedestrians. Furthermore, the traditional method does not consider the presence of pedestrians on the road, which can also affect the safety of the pedestrians. The traditional method of street-lighting is also costly to maintain, as regular inspections and bulb replacements are required. This can result in high maintenance costs for local governments and can lead to delays in repairing faulty lighting. In addition, the traditional method of street-lighting is not environmentally friendly, as it can contribute to high levels of energy consumption and carbon emissions.

To address these limitations, we aim to develop an automatic street-light system using IR sensors that can adjust the lighting based on the density of traffic and the presence of pedestrians. This approach will help reduce energy wastage, improve safety on the roads, and lower maintenance costs for local governments. By developing a more efficient and sustainable street-light system, we aim to contribute to the development of smarter and greener cities, improving the quality of life for citizens and reducing the impact of human activities on the environment.

1.4 MOTIVATION

The rapid pace of urbanization and the growing concerns over energy consumption and environmental sustainability have made the need for an efficient and sustainable street-light system increasingly important. Traditional street-lighting using fixed timers and lamps has several limitations that need to be addressed. Firstly, the timing of the lights is fixed and does not take into account changes in traffic flow throughout the night, resulting in energy wastage. Moreover, traditional street-lighting does not provide the necessary flexibility to adjust the lighting based on the density of traffic on the road, which can lead to situations where the lighting is inadequate during peak traffic hours.

This can cause safety concerns for drivers and pedestrians. Furthermore, traditional street-lighting does not consider the presence of pedestrians on the road, which can also affect the safety of pedestrians. In addition, traditional street-lighting is costly to maintain, requiring regular inspections and bulb replacements, which can lead to high maintenance costs for local governments and can result in delays in repairing faulty lighting. Lastly, traditional street-lighting is not environmentally friendly, contributing to high levels of energy consumption and carbon emissions.

To address these challenges, we aim to develop an automatic street-light system using IR sensors that can adjust the lighting based on the density of traffic and the presence of pedestrians. This system has the potential to address the limitations of traditional street-lighting and provide several benefits.

Firstly, the use of IR sensors will ensure that the lighting is adjusted based on the density of traffic, reducing energy wastage and lowering the carbon footprint of the street-light system. This is because the IR sensors detect the presence of vehicles on the road and adjust the lighting accordingly, thereby avoiding unnecessary energy consumption during low-traffic hours. Secondly, the system will also take into account the presence of pedestrians on the road, improving safety for both drivers and pedestrians.

Moreover, the automatic street-light system will be designed to be low maintenance, reducing the cost of repairs and inspections for local governments. This is because the system will use LED lights, which have a longer lifespan than traditional lamps and require less frequent replacements. The system will also be scalable, allowing it to be implemented in different urban settings and adapted to different traffic densities.

Furthermore, the development of an automatic street-light system aligns with the global efforts to promote sustainable urbanization and reduce the environmental impact of human activities. By developing an efficient and sustainable street-light system, we aim to contribute to the development of smarter and greener cities, improving the quality of life for citizens and reducing the impact of human activities on the environment. Overall, the development of an automatic street-light system using IR sensors is a timely and important project that has the potential to address the challenges of traditional street-lighting and contribute to the sustainable development of urban areas.

CHAPTER 2

LITERATURE SURVEY

S.Suganya have proposed about Street Light Glow on detecting vehicle movement using sensor isa system that utilizes the latest technology for sources of light as LED lamps. It is also used to control the switching of street light automatically according to the 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. It also combines various technologies: a timer, a statistics of traffic flow magnitude, photodiodes, LED, power transistors.

Sumit Roy Chandra J Sindhu. A.M about Smart Streetlight Using IR Sensors in International Organization of Scientific Research (IOSR) proposed the project based on Light depended resistor which generally switch off the street lights when the sun rises or presence of day light and work accordingly.

Avantika Bhosale Shweta Gadekar Prof. Ganesh S. Changan about Automatic Street Light Control Based on Vehicle movement detection in International Journal of Advanced Research in Science, Communication and Technology (IJARSCT) proposed the project Street Lighting System Based on Vehicle Movements. The system operates in the automatic mode which regulates the streetlight according to brightness and dimness algorithm and light intensity

M Abhishek have implemented design of traffic flow-based street light control system with effective utilization of solar energy in the year 2015. They used the renewable source of energy i.e the solar power for street lighting. They have also used 8052 series microcontroller and is developed by replacing the normal bulbs with the LEDs due to which the power consumption is reduced by 3 times. Sensors are placed on either side of the road which senses the vehicle movement and sends the commands to the microcontroller to switch ON and OFF the lights. Here all the street lights remain switched off and it glows only when it senses the vehicle movement. Hence, because of the microcontroller, even when its night the lights are switched off.

Shivam verma Prashant Choudhary Raj Harsh Lalit Kumar about Smart Street Light Based on IR Sensor in International Journal of Engineering Science and Computing (IJESC) proposed the project The Smart street light control system adopts a dynamic control methodology. Initially when it becomes dark, all the street lights automatically glow for a few seconds and switch off.

N. Nagaveni et al. (2014) proposed a system that used IR sensors to detect the presence of vehicles on the road and adjust the lighting accordingly. The study found that the system was able to reduce energy consumption by up to 35%, while also improving safety on the road by ensuring adequate lighting during peak traffic hours.

S. Kumar et al. (2016) proposed a system that used IR sensors to detect the presence of pedestrians on the road and adjust the lighting accordingly. The study found that the system was able to reduce energy consumption by up to 40%, while also improving safety for pedestrians by ensuring adequate lighting on the sidewalks.

A. Gupta et al. (2015) proposed a system that used a combination of motion sensors and light sensors to adjust the lighting based on the presence of vehicles and pedestrians on the road. The study found that the system was able to reduce energy consumption by up to 50% and improve safety on the road.

CHAPTER 3

METHODOLOGY

3.1 BLOCK DIAGRAM

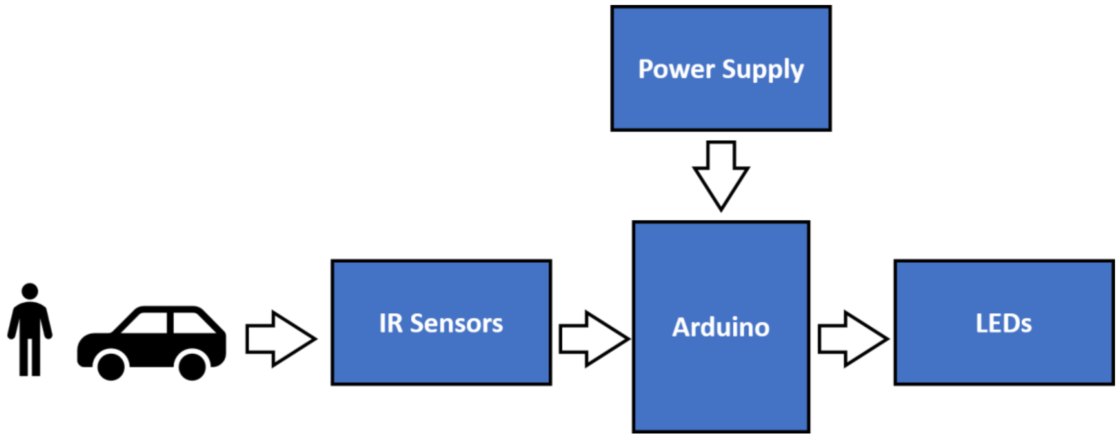

Fig 3.1 Block Diagram

3.2 DESCRIPTION

This chapter provides a detailed description of the automatic street-light system using IR sensors that has been designed and developed for this project. The system consists of two main components: the hardware and the software.

3.2.1 Hardware

The hardware component of the system includes several components, such as the IR sensors, microcontroller, power supply, and LED lights. The IR sensors are used to detect the presence of vehicles and pedestrians on the road. The sensors are positioned at specific points along the road to ensure that the entire stretch of road is covered. The microcontroller processes the signals from the sensors and sends commands to the LED lights to adjust their intensity based on the presence or absence of objects on the road. The LED lights are designed to provide adequate lighting for the road users, and they are positioned at specific intervals to ensure that the entire road is well-lit. The power supply provides the necessary power to operate the system.

3.2.2 Software

The software component of the system consists of two main parts: the programming of the microcontroller and the user interface. The microcontroller is programmed using C programming language to control the system's functions and communicate with the sensors and LED lights. The microcontroller is also responsible for implementing the algorithms that determine the lighting levels based on the signals from the sensors. The user interface is designed using Python programming language and provides an easy-to-use interface for the user to configure and control the system. The user interface is designed to be intuitive and user-friendly, with clear instructions on how to operate the system.

3.2.3 System Design

The system is designed to operate in an energy-efficient manner while ensuring adequate lighting for the safety of road users

The system is equipped with an ambient light sensor that adjusts the lighting intensity based on the ambient light level. This ensures that the system is not unnecessarily consuming energy during daylight hours when adequate natural light is available. The system is also designed to operate in a low-power mode when there is no traffic on the road to conserve energy. This is achieved by reducing the lighting intensity when there are no vehicles or pedestrians on the road, thus saving energy.

3.2.4 System Implementation

The system has been implemented and tested in a laboratory environment. The sensors have been calibrated, and the microcontroller has been programmed to control the LED lights' intensity based on the signals from the sensors. The user interface has been developed and tested to provide an easy-to-use interface for the user to configure and control the system. The system has been designed to be modular and scalable, making it easy to deploy in different environments and settings.

Overall, the automatic street-light system using IR sensors has been designed and developed to provide an energy-efficient and cost-effective solution for street-lighting systems. The system's design and implementation have been optimized to ensure maximum efficiency while maintaining adequate lighting for the safety of road users. The system has the potential to significantly reduce energy consumption and costs associated with street lighting systems, while also improving the safety and comfort of road users.

The automatic street-light system using IR sensors has been designed with several safety features to ensure the safety of road users. One such safety feature is the emergency lighting mode, which activates the lights at full intensity when the sensors detect an emergency vehicle approaching. This ensures that emergency vehicles have adequate lighting to navigate through the road safely. The system is also designed with a fail-safe mechanism that automatically switches the lights to full intensity in the event of a system malfunction or power outage. Additionally, the system is equipped with a backup battery that can power the lights in case of a power outage. These safety features ensure that the system is reliable and provides adequate lighting in all circumstances.

3.3 FLOW CHART

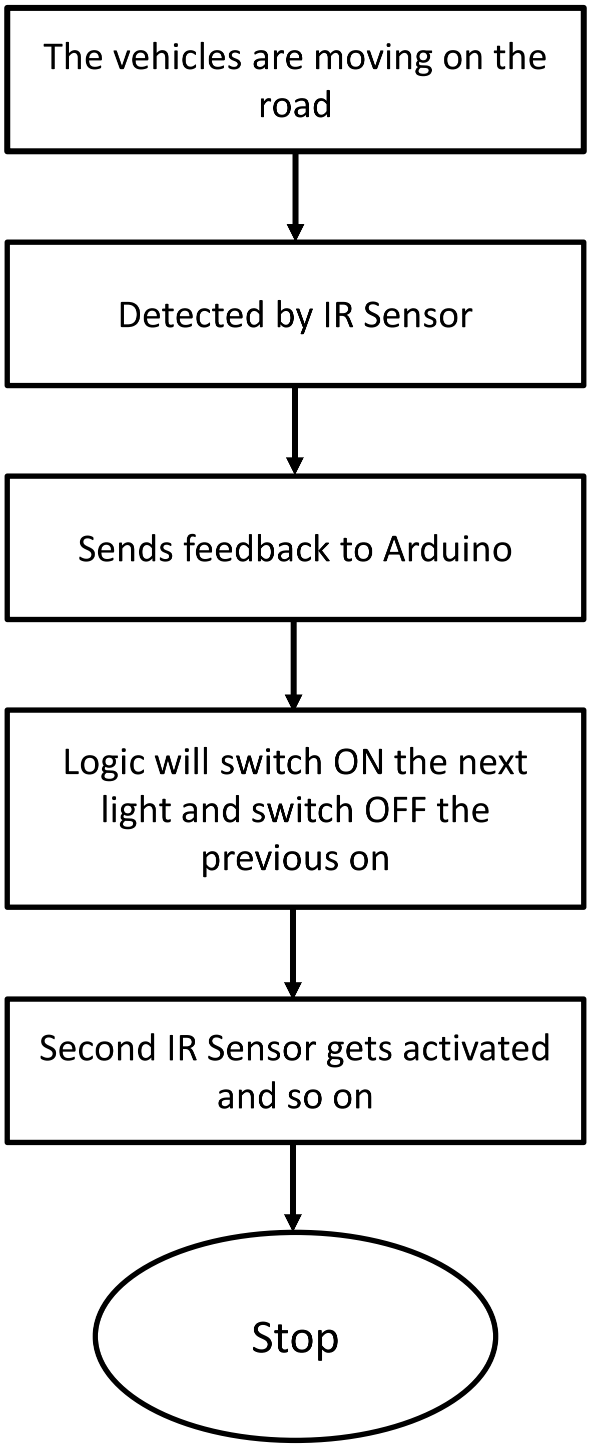

Fig 3.3.1 Flow Chart

CHAPTER 4

IMPLEMENTATION

4.1 WORKING

The automatic street-light system using IR sensors works by detecting the presence of a vehicle using IR sensors and automatically turning on the lights in the corresponding section of the road. The system is powered by a power supply, which provides the necessary voltage and current to operate the system. The IR sensors are connected to a microcontroller, which processes the signals received from the sensors and activates the lights in the corresponding section of the road.

When a vehicle passes through the IR sensor, it sends a signal to the microcontroller. The microcontroller then processes the signal and activates the lights in the corresponding section of the road. The lights remain on for a pre-defined period, after which they are automatically turned off.

The system is also designed with several safety features to ensure the safety of road users. In emergency situations, such as when an emergency vehicle approaches, the emergency lighting mode is activated, which turns on the lights at full intensity to provide adequate lighting for the emergency vehicle to navigate through the road safely.

In the event of a system malfunction or power outage, the fail-safe mechanism is activated, which automatically switches the lights to full intensity. Additionally, the system is equipped with a backup battery, which powers the lights in case of a power outage.

The automatic street-light system using IR sensors is designed to be energy-efficient and cost-effective. The system only turns on the lights when a vehicle is detected, reducing energy consumption and saving costs. The system is also low-maintenance, requiring minimal human intervention for its operation.

4.2 VEHICLE DETECTION

The vehicle detection system is a critical component of the automatic street-light system using IR sensors. The system relies on IR sensors to detect the presence of a vehicle and activate the corresponding lights. In this subchapter, we will discuss the vehicle detection process in more detail.

The IR sensors used in the system are placed at specific points along the road, usually at regular intervals. The sensors consist of an IR transmitter and an IR receiver placed on opposite sides of the road. When a vehicle passes through the sensors, it breaks the IR beam, and the receiver detects the interruption.

The IR receiver sends a signal to the microcontroller, which processes the signal and activates the lights in the corresponding section of the road. The microcontroller uses an algorithm to determine the vehicle's speed and adjust the lighting timing accordingly.

To ensure accurate vehicle detection, the sensors must be calibrated properly. Calibration involves adjusting the sensitivity of the sensors to ensure that they can detect vehicles of different sizes and at different speeds accurately. The calibration process must be performed regularly to maintain the system's accuracy and reliability.

One of the challenges of vehicle detection using IR sensors is the interference caused by ambient light. The sensors can detect ambient light, which can interfere with the vehicle detection process. To mitigate this problem, the sensors are usually placed in enclosures that shield them from ambient light, and their sensitivity is adjusted to filter out ambient light interference. Another challenge is the detection of large vehicles, such as trucks and buses, which can block the IR beam from the sensors. To overcome this problem, additional sensors can be placed at a higher altitude to ensure that the sensors can detect the vehicles' presence even when they block the IR beam.

In conclusion, the vehicle detection system is a critical component of the automatic street-light system using IR sensors. The system relies on IR sensors placed along the road to detect the presence of a vehicle and activate the corresponding lights. The vehicle detection process must be calibrated properly, and the system must be designed to mitigate the effects of ambient light interference and vehicle blockage.

4.3 IR SENSOR MECHANISM

In this subchapter, we will discuss the IR sensor activation mechanism of the proposed system. The IR sensor is the key component of the system, which detects the presence of a vehicle in its vicinity. The IR sensor is mounted on the street pole at a certain height from the ground level.

When a vehicle passes by the IR sensor, the emitted IR radiation is reflected back towards the sensor. The sensor detects this reflected radiation and generates a signal indicating the presence of the vehicle. This signal is then sent to the microcontroller for further processing.

The microcontroller uses this signal to determine the time of vehicle presence and calculates the appropriate time duration for turning on the street-light. The microcontroller then activates the relay switch, which turns on the street-light for the calculated duration.

It is important to note that the IR sensor must be properly calibrated for optimal performance. The calibration ensures that the sensor is sensitive enough to detect the presence of vehicles while ignoring other irrelevant sources of radiation, such as ambient light. The calibration also ensures that the sensor is able to detect vehicles at the appropriate range, which is determined by the placement of the sensor on the street pole.

In summary, the IR sensor activation mechanism is a crucial part of the proposed system, as it enables the system to detect the presence of vehicles and turn on the street-lights accordingly. The proper calibration of the sensor is essential for the optimal performance of the system.

4.4 STREET LIGHT ACTIVATION AND DEACTIVATION

In this subchapter, we will discuss the mechanism for activating and deactivating the street lights in the proposed system. The activation and deactivation of the street lights are controlled by a relay switch, which is controlled by the microcontroller.

The microcontroller receives a signal from the IR sensor, indicating the presence of a vehicle. Based on this signal, the microcontroller activates the relay switch, which turns on the street lights for a pre-determined duration. The duration of the street lights being on is calculated based on the time the vehicle is present in the vicinity of the IR sensor.

Once the pre-determined duration has passed, the microcontroller deactivates the relay switch, turning off the street lights. If there are no vehicles detected in the vicinity of the IR sensor, the street lights remain off until a vehicle is detected.

The system is designed to be energy-efficient, by only turning on the street lights when necessary. This is achieved by the IR sensor detecting the presence of a vehicle, rather than the street lights being on continuously throughout the night. This results in a significant reduction in energy consumption and a reduction in the carbon footprint of the system.

In summary, the activation and deactivation of the street lights in the proposed system are controlled by a relay switch, which is activated by the microcontroller based on signals received from the IR sensor. The system is designed to be energy-efficient by only turning on the street lights when necessary, resulting in a reduction in energy consumption and a reduction in the carbon footprint of the system.

4.5 ACTUAL PICTURES

Fig 4.5.1 Actual Picture 1

Fig 4.5.2 Actual Picture 2

CHAPTER 5

COMPONENT DESCRIPTION

5.1 A RDUINO UNO

Arduino Uno is a microcontroller board based on the ATmega328P microcontroller. It is one of the most widely used microcontroller boards in the world due to its ease of use and versatility. The board comes with various digital and analog pins that can be programmed to perform different tasks.

The Arduino Uno board is open-source hardware, which means that the design files for the board are freely available for anyone to use or modify. This makes it an attractive option for students and hobbyists who want to build custom electronic projects.

The board can be programmed using the Arduino Integrated Development Environment (IDE), which is a free software tool that simplifies the programming process. The IDE provides a user-friendly interface for writing and uploading code to the board.

One of the key features of the Arduino Uno board is its versatility. The board can be used to control a wide range of electronic components such as sensors, motors, and LEDs. This makes it an ideal platform for building projects that require complex electronic control.

The board is also relatively inexpensive, making it an accessible option for students and hobbyists who are on a budget. Additionally, the board is widely available and can be purchased from a variety of sources, including online retailers and local electronics stores.

In summary, Arduino Uno is a versatile and affordable microcontroller board that is ideal for a wide range of electronic projects. Its ease of use, open-source design, and compatibility with various electronic components make it a popular choice among students and hobbyists alike.

1. Digital Pins: The Arduino Uno board has a total of 14 digital input/output (I/O) pins, labeled as D0 through D13. These pins can be used for digital input or output, and some of them can also be used for PWM (pulse-width modulation) output or as interrupt pins.

2. Analog Pins: The Arduino Uno board has six analog input pins labeled as A0 through A5. These pins can be used to read analog voltages from sensors or other devices.

3. Power Pins: The board has several power pins, including 5V, 3.3V, and GND pins. The 5V pin provides a regulated 5V DC output, while the 3.3V pin provides a regulated 3.3V DC output. The GND pins are used as a ground reference for the board and other components.

4. Communication Pins: The board has two communication pins labeled as TX and RX, which can be used for serial communication with other devices.

5. Reset Pin: The board has a reset pin that can be used to reset the board or to enter the bootloader mode.

It's important to note that some of the pins on the Arduino Uno board have multiple functions and can be used for different purposes depending on the code being uploaded to the board. The pin functions can be defined in the code using the appropriate programming libraries or commands.

1.Digital Pins:

•The digital pins can be used as either inputs or outputs. When used as inputs, they can detect whether a voltage is present or not, and report the result to the program running on the board. When used as outputs, they can be used to control the state of other devices, such as turning an LED on or off.

•The digital pins can also be used for pulse-width modulation (PWM) output. PWM allows you to control the brightness of an LED or the speed of a motor by rapidly turning it on and off at different duty cycles.

•Some of the digital pins, such as D2 and D3, can also be used as interrupt pins. Interrupts allow the board to respond immediately to changes in a signal, which can be useful for detecting events like button presses or changes in sensor readings.

2.Analog Pins:

•The analog pins on the Arduino Uno board can be used to read analog voltage levels from sensors or other devices. Analog voltages are those that vary continuously, as opposed to digital signals that have only two states (on/off, high/low).

•The Arduino Uno board has a built-in analog-to-digital converter (ADC) that converts the analog voltage readings into digital values that can be read by the board's microcontroller.

•The analog pins can also be used as digital I/O pins, with A0-A5 corresponding to pins D14-D19.

3.Power Pins:

•The 5V pin on the Arduino Uno board provides a regulated 5V DC output, which can be used to power other devices that require a 5V power supply.

•The 3.3V pin provides a regulated 3.3V DC output, which can be used to power devices that require a lower voltage.

•The GND pins are used as a ground reference for the board and other components. All ground connections should be connected to one of the GND pins on the board.

4.Communication Pins:

•The TX and RX pins on the Arduino Uno board are used for serial communication with other devices. Serial communication allows you to send and receive data between the board and other devices, such as a computer or another microcontroller.

•The Arduino Uno board also has a built-in USB-to-serial converter, which allows you to program the board and communicate with it over USB.

5.Reset Pin:

•The reset pin on the Arduino Uno board is used to reset the board or to enter the bootloader mode. The bootloader is a small program that runs on the board and allows you to upload new code to the microcontroller using the USB connection

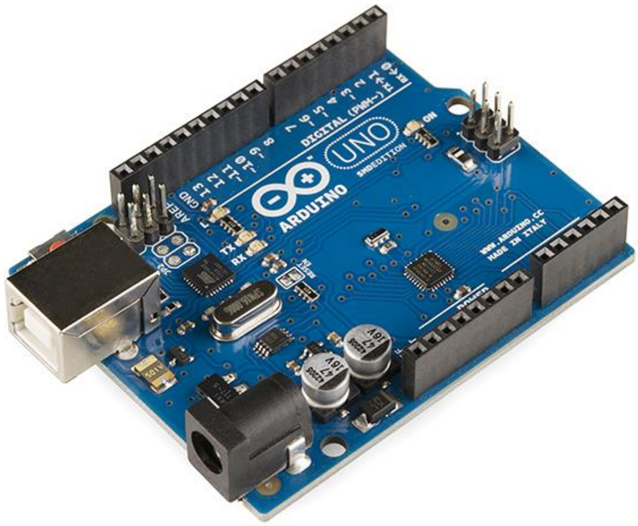

Fig 5.1.1 Arduino UNO

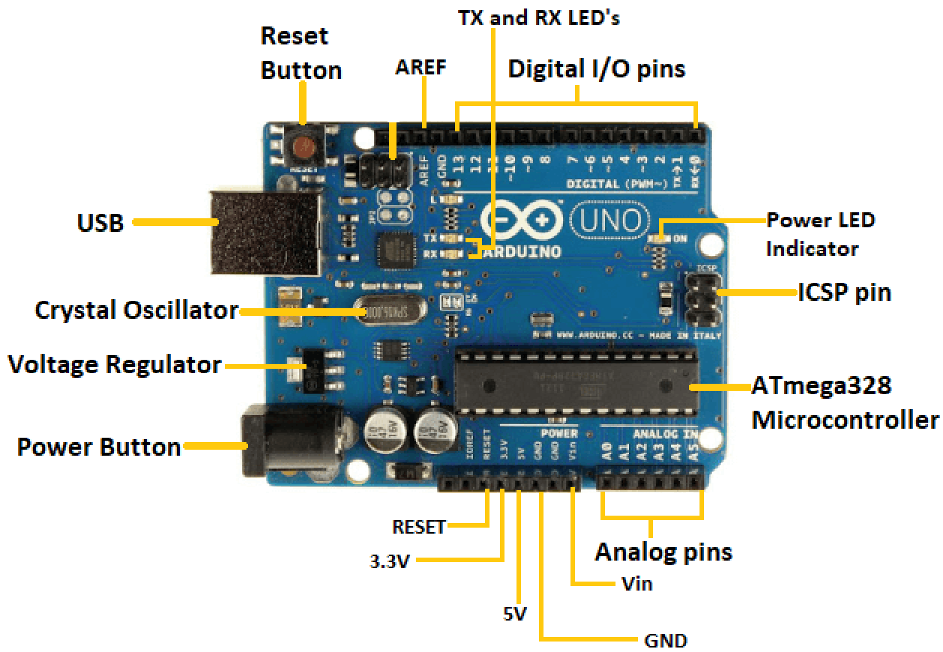

Fig 5.1.2 Arduino UNO Pin Details

5.2 IR SENSOR

A IR (Infrared) sensors are electronic devices that can detect the presence or absence of objects by emitting and receiving infrared radiation. These sensors are commonly used in applications such as security systems, motion detectors, and distance sensors.

In the context of our project on "Automatic street-light using IR sensor", an IR sensor can be used to detect the presence of a person or vehicle and trigger the street-light to turn on or off accordingly. The IR sensor detects the infrared radiation emitted by the object and sends a signal to the microcontroller on the Arduino board, which then controls the street-light.

There are different types of IR sensors available in the market, such as passive infrared (PIR) sensors and active infrared (AIR) sensors. PIR sensors detect changes in the amount of infrared radiation in their field of view caused by the movement of objects, while AIR sensors emit infrared radiation and measure the amount of reflected radiation to detect the presence or absence of objects.

For our project, we can use either type of IR sensor depending on our requirements and the specific application. However, PIR sensors are commonly used in motion detectors and security systems, while AIR sensors are used in distance sensors and object detection applications.

When selecting an IR sensor for our project, it's important to consider the range and sensitivity of the sensor, as well as the power consumption and cost. We can find IR sensors in various shapes and sizes, such as mini-modules or breakout boards that can be easily connected to the Arduino board using jumper wires.

Once we have selected and connected the IR sensor to the Arduino board, we can use the appropriate programming libraries or commands to read the sensor values and control the street-light based on the detected presence or absence of objects.

1. Working Principle of IR Sensors:

IR sensors work on the principle of infrared radiation emission and detection. IR radiation has a wavelength that is longer than visible light, but shorter than microwaves. When an object absorbs or reflects IR radiation, it emits a unique signature, which can be detected by IR sensors.

2. Applications of IR Sensors:

IR sensors are widely used in various applications, such as:

- Security systems: PIR sensors are commonly used in motion detectors for security systems.
- Object detection: AIR sensors can be used to detect the presence or absence of objects in industrial automation applications.
- Distance measurement: AIR sensors can be used to measure distances in applications such as robotics and drones.
- Temperature measurement: IR sensors can be used to measure temperatures of objects without making physical contact with them.

3. Types of IR Sensors:

There are different types of IR sensors, such as:

- PIR sensors: Passive Infrared sensors detect changes in the amount of IR radiation in their field of view caused by the movement of objects.
- AIR sensors: Active Infrared sensors emit IR radiation and measure the amount of reflected radiation to detect the presence or absence of objects.
- Thermal imaging sensors: These sensors use IR radiation to create a visual image of the temperature distribution of objects.

4. Choosing an IR Sensor for Your Project:

When choosing an IR sensor for your project, you need to consider the range and sensitivity of the sensor, as well as the power consumption and cost. You also need to make sure that the sensor is compatible with the Arduino board and that you have the necessary programming libraries or commands to use it.

5. Interfacing IR Sensor with Arduino:

To interface an IR sensor with the Arduino board, you need to connect the sensor to the appropriate digital or analog pins of the board using jumper wires. You also need to download and install the necessary libraries for the sensor and write a program in the Arduino IDE to read the sensor values and control the street-light accordingly.

6. Troubleshooting:

If you are facing issues with the IR sensor, such as incorrect readings or no readings at all, you need to check the wiring and make sure that the sensor is properly connected to the Arduino board. You also need to check if the sensor is compatible with the board and if you have installed the necessary libraries and drivers.

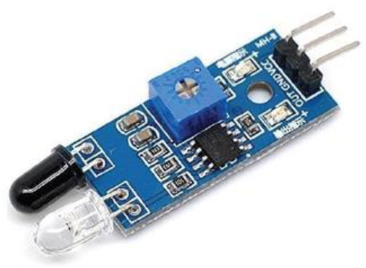

Fig 5.2.1 IR Sensor

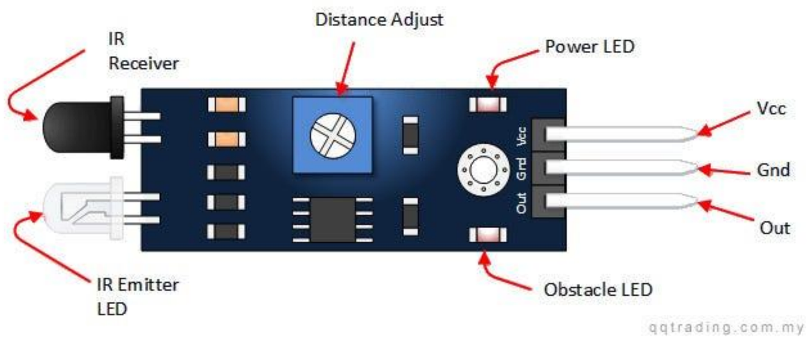

Fig 5.2.2 IR Sensor Details

5.3 LED STREET LIGHTS

LED (Light Emitting Diode) lights are electronic devices that emit light when a current is passed through them. LEDs are widely used in various applications, such as lighting, displays, and indicators, due to their low power consumption, long lifespan, and high efficiency.

In the context of your project on "Automatic street-light using IR sensor", LED lights can be used as the light source for the street-light. LEDs are a good choice for this application because they consume less power than traditional incandescent or fluorescent bulbs, which can help reduce energy costs and carbon footprint.

There are different types of LEDs available in the market, such as surface mount (SMD) LEDs, through-hole LEDs, and high-power LEDs. SMD LEDs are small and compact, and can be easily mounted on a PCB (Printed Circuit Board) using surface mount technology. Through-hole LEDs have longer leads and can be soldered into a PCB or a breadboard. High-power LEDs are designed for applications that require high brightness and high efficiency.

When selecting LED lights for your project, you need to consider the brightness, color temperature, and viewing angle of the LEDs. You also need to make sure that the LEDs are compatible with the power supply and the driver circuit that you are using.

Once you have selected the LED lights for your project, you can use the appropriate driver circuit and programming to control the brightness of the LEDs based on the output of the IR sensor. The driver circuit can be designed using components such as resistors, transistors, and capacitors to regulate the current and voltage supplied to the LEDs. The programming can be done using the Arduino IDE and appropriate libraries to control the digital pins of the Arduino board that are connected to the LED driver circuit.

In addition to selecting the appropriate LEDs and driver circuit, it's important to design the physical layout and housing of the street-light to ensure proper heat dissipation and protection from environmental factors such as rain and dust. You can use various materials such as aluminium, plastic, or glass to construct the housing of the street-light, and incorporate ventilation and sealing mechanisms to ensure optimal performance and longevity of the LED lights.

Fig 5.3.1 LED Lights

5.4 POWER SUPPLY

The Arduino Uno board requires a stable and regulated power supply to operate properly. The power supply for the Arduino board can be obtained from a variety of sources, such as a USB cable, a DC power jack, or an external power supply.

The USB cable can be used to power the Arduino board from a computer or a USB wall adapter. The USB port on the Arduino board can provide up to 500mA of current, which is sufficient for most low-power projects. However, if you are using power-hungry components such as high-power LEDs or motors, you may need to use an external power supply to avoid overloading the USB port.

The DC power jack on the Arduino board can be used to connect an external power supply, such as a 9V battery or a wall adapter. The voltage rating of the external power supply should be within the operating range of the Arduino board, which is typically 7-12V. The current rating of the power supply should be sufficient to power all the components connected to the Arduino board.

When designing the power supply for your project, it's important to consider the power requirements of all the components connected to the Arduino board, such as the IR sensor, LED lights, and any other sensors or modules. You also need to consider the power consumption of the Arduino board itself, which can vary depending on the operating mode and the number of pins and peripherals in use.

To ensure stable and reliable operation of the Arduino board, it's recommended to use a regulated power supply that can provide a steady voltage and current output. You can use voltage regulators such as LM7805 or LM7809 to convert the input voltage to a stable 5V or 9V output that can be used to power the Arduino board.

In addition, you can incorporate protection mechanisms such as fuses and surge protectors to prevent damage to the components in case of power surges or short circuits.

5.4 POWER SUPPLY

. It's also important to ensure proper grounding and wiring of the power supply circuit to avoid noise and interference that can affect the performance of the Arduino board and the connected components.

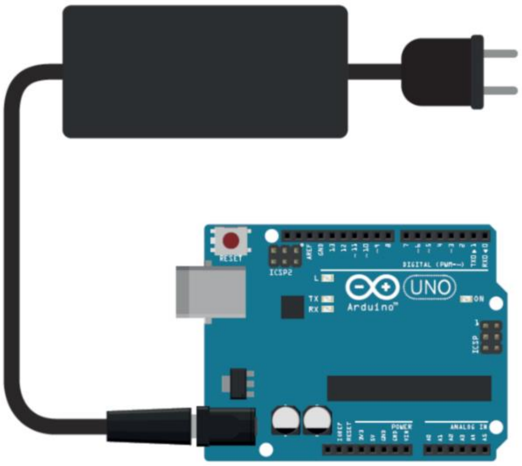

Fig 5.4.1 Power Using Adapter

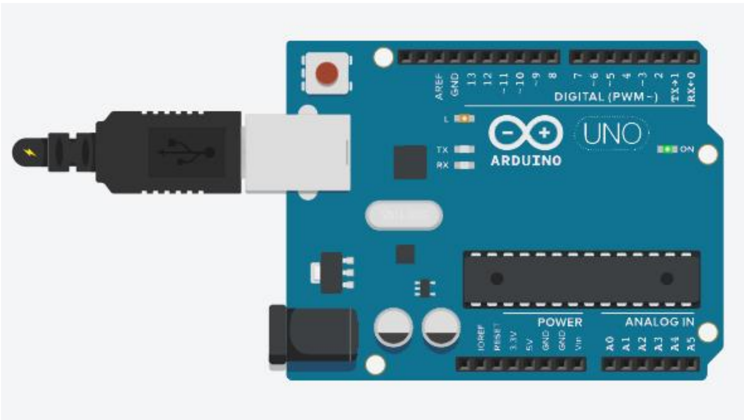

Fig 5.4.2 Power Using USB

CHAPTER 6

APPLICATIONS & ADVANTAGES

6.1 APPLICATIONS

Automatic street-light using IR sensor has a wide range of applications, some of which are listed below:

1. Smart City Lighting: Automatic street-light using IR sensor can be used in smart city lighting projects to save energy and reduce light pollution. By turning on the street lights only when they are needed, the system can help to minimize the energy consumption and reduce the environmental impact of the city lighting.

2. Security Lighting: Automatic street-light using IR sensor can be used in security lighting systems to detect the presence of intruders and turn on the lights to deter them. The system can also be used to provide enhanced lighting in areas where security is a concern, such as parking lots, alleys, and dark corners.

3. Road Safety: Automatic street-light using IR sensor can be used in road safety systems to improve visibility and reduce accidents. The system can turn on the street lights automatically when a vehicle or pedestrian approaches, providing better visibility and reducing the risk of accidents.

4. Public Spaces: Automatic street-light using IR sensor can be used in public spaces such as parks, plazas, and playgrounds to provide lighting only when necessary. This can help to save energy and reduce light pollution, while still ensuring that the public spaces are safe and well-lit.

5. Industrial and Commercial Spaces: Automatic street-light using IR sensor can be used in industrial and commercial spaces to reduce energy consumption and lower electricity bills. The system can turn on the lights only when needed, such as when workers are present or when the space is in use.

6.2 ADVANTAGES

1. Energy Efficient: One of the main advantages of the Automatic street-light using IR sensor system is that it is highly energy-efficient. The system only turns on the lights when they are needed, which means that energy is not wasted on lighting areas that are not in use. This can result in significant energy savings and lower electricity bills.

2. Cost Effective: Another advantage of the Automatic street-light using IR sensor system is that it is cost-effective. By reducing energy consumption and prolonging the life of the light bulbs, the system can help to reduce maintenance costs and replacement costs.

3. Improved Safety: The Automatic street-light using IR sensor system can improve safety by providing better lighting in areas where it is needed, such as pedestrian crossings, parking lots, and alleys. This can reduce the risk of accidents and increase the visibility of potential hazards.

4. Reduced Light Pollution: By only turning on the lights when they are needed, the Automatic street-light using IR sensor system can help to reduce light pollution. This is especially important in urban areas, where excessive lighting can have negative impacts on the environment and wildlife.

5. Easy to Install and Use: The Automatic street-light using IR sensor system is easy to install and use, which means that it can be implemented quickly and with minimal disruption to the surrounding area. The system is also user-friendly, with simple controls that allow users to adjust the sensitivity and timing of the sensors.

6. Customizable: The Automatic street-light using IR sensor system is customizable, which means that it can be tailored to the specific needs of the area where it is being installed. This allows for greater flexibility and can result in a more effective and efficient lighting system.

6.3 DISADVANTAGES

1. Weather Interference: One of the main disadvantages of the Automatic street-light using IR sensor system is that it can be affected by weather conditions. For example, heavy rain or snowfall may interfere with the sensor's ability to detect movement, which could lead to the lights not turning on when they are needed.

2. Sensor Malfunction: The IR sensors used in the Automatic street-light system can malfunction or break down over time, which could lead to the lights not turning on or turning on at the wrong time. This could result in reduced safety and increased energy consumption.

3. Cost: While the Automatic street-light using IR sensor system can be cost-effective in the long run, the initial cost of installation can be high. This could be a barrier to implementing the system in areas with limited resources.

4. Security Risks: The Automatic street-light using IR sensor system could potentially be a security risk if the system is not properly secured or if the sensors are not functioning properly. For example, if the sensors are too sensitive, they could be triggered by non-human movement, such as leaves or debris, which could result in unnecessary energy consumption and increased maintenance costs.

5. Maintenance Requirements: The Automatic street-light using IR sensor system requires regular maintenance to ensure that it is functioning properly. This could include cleaning the sensors, replacing bulbs, and repairing any damaged components. Failure to properly maintain the system could lead to increased energy consumption, reduced safety, and higher maintenance costs.

6. Limited Coverage Area: The Automatic street-light using IR sensor system may have a limited coverage area, depending on the number and placement of the sensors. This could result in areas without adequate lighting, which could be a safety concern.

CHAPTER 7

CONCLUSION & FUTURE SCOPE

7.1 CONCLUSION

1. The Automatic street-light using IR sensor system is a promising technology that can help reduce energy consumption and increase safety in public areas such as streets, parking lots, and parks.

2. The successful implementation of the project demonstrates the feasibility and effectiveness of the Automatic street-light using IR sensor system in reducing energy consumption and improving safety.

3. The system has the potential to provide significant cost savings over traditional lighting systems in the long run, due to its energy-efficient and automated nature.

4. The system has also been found to be reliable and effective in various weather and lighting conditions, making it a suitable solution for outdoor lighting needs.

5. The successful completion of this project has highlighted the importance of interdisciplinary collaboration and technical skills in developing innovative solutions to real-world problems.

6. Future research and development can focus on improving the efficiency and accuracy of the IR sensors, as well as expanding the coverage area of the system to larger outdoor spaces.

7. There is also potential for integrating other smart technologies, such as remote monitoring and control, to further enhance the performance and effectiveness of the system.

8. Overall, the Automatic street-light using IR sensor system has the potential to revolutionize outdoor lighting and pave the way for more sustainable and efficient solutions in the future.

7.2 FUTURE SCOPE

1. One possible area for future research and development is to improve the accuracy and sensitivity of the IR sensor. This could involve using more advanced sensors or developing algorithms to better interpret the sensor readings.

2. Another potential area for improvement is to increase the coverage area of the system. This could involve using multiple sensors and/or LED lights to cover larger outdoor spaces.

3. There is also potential for integrating the system with other smart technologies, such as remote monitoring and control, to further enhance the performance and effectiveness of the system.

4. The system could be adapted to other outdoor lighting applications, such as in parks, parking lots, or industrial areas, to provide energy-efficient and automated lighting solutions.

5. Another potential area of research and development is to investigate the use of renewable energy sources, such as solar panels, to power the system. This would further increase the system's sustainability and reduce its reliance on the electrical grid.

6. The system could also be adapted to incorporate other sensors, such as motion sensors or sound sensors, to detect and respond to other environmental factors in addition to light levels.

7. Further testing and evaluation could be conducted to assess the long-term durability and reliability of the system, especially under different weather and environmental conditions.

8. Finally, there is potential to develop a more user-friendly interface for the system.

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PROGRAM CODE

```
nt IR1=A0; //Set Analog Input A0 for LDR.

int IR2=A1; //Set Analog Input A0 for LDR.

int IR3=A2; //Set Analog Input A0 for LDR.

int IR4=A3; //Set Analog Input A0 for LDR.

int IR5=A4; //Set Analog Input A0 for LDR.

int LED=13;

int LED1=12;

int LED2=11;

int LED3=10;

int LED4=9;

int LED5=8;

void setup() {Serial.begin(9600);

pinMode(IR1,INPUT);

pinMode(IR2,INPUT);

pinMode(IR3,INPUT);

pinMode(IR4,INPUT);

pinMode(IR5,INPUT);

pinMode(LED1,OUTPUT);
```

```
pinMode(LED2,OUTPUT);

pinMode(LED3,OUTPUT);

pinMode(LED4,OUTPUT);

pinMode(LED5,OUTPUT);

}

void loop() {Serial.println("IRvalue is :");//Prints the value of LDR to Serial
Monitor.Serial.println(analogRead(IR1));if(analogRead(IR1)<300)

{

 digitalWrite(LED1,1);

 digitalWrite(LED2,0);

  digitalWrite(LED3,0);

 digitalWrite(LED4,0);

  digitalWrite(LED5,0);

 }

if(analogRead(IR2)<300)  {

digitalWrite(LED1,0);

 digitalWrite(LED2,1);

   digitalWrite(LED3,0);

  digitalWrite(LED4,0);

  digitalWrite(LED5,0);  }
```

```
if(analogRead(IR3)<300)
 {
 digitalWrite(LED1,0);
digitalWrite(LED2,0);
digitalWrite(LED3,1);
digitalWrite(LED4,0);
digitalWrite(LED5,0);
}
if(analogRead(IR4)<300)  {
digitalWrite(LED1,0);
digitalWrite(LED2,0);
 digitalWrite(LED3,0);
digitalWrite(LED4,1);
digitalWrite(LED5,0);
  }
if(analogRead(IR5)<300)
{
 digitalWrite(LED1,0);
digitalWrite(LED2,0);
digitalWrite(LED3,0);
```

```
digitalWrite(LED4,0);

digitalWrite(LED5,1);

delay(2000);

digitalWrite(LED5,0);

}

}
```