EGERTON UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

A REPORT FOR SECURITY LIGHT CONTROL SYSTEM

UNIT CODE:

COMP 413

MICROPROCESSOR BASED SYSTEMS

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DATE OF SUBMISSION:

15th NOV 2023

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Abstract

The security light control system project aims to enhance the security of residential and commercial spaces by automating the activation and deactivation of lighting systems based on motion and ambient light levels. The system utilizes a motion sensor, light sensor, Arduino microcontroller, LED lights, and resistors to create an intelligent and energy-efficient solution. The motion sensor detects any movement within its range, triggering the Arduino to activate the LED lights. Simultaneously, the light sensor measures the ambient light levels in the surroundings.

If the ambient light is below a predefined threshold, indicating low light conditions, the LED lights are turned on. Conversely, if the ambient light is above the threshold, the LED lights remain off, conserving energy. To achieve this, the Arduino acts as the central control unit, processing the inputs from the motion sensor and light sensor. It then sends appropriate commands to the LED lights, controlling their on/off states. The resistors are used to ensure proper voltage regulation and current limiting for the LED lights, preventing any damage. This security light control system offers several advantages.

Firstly, it enhances security by automatically illuminating the area when motion is detected, deterring potential intruders. Secondly, it saves energy by only activating the lights when necessary, based on ambient light conditions. Additionally, the system is cost-effective and easily scalable, making it suitable for various applications and environments. In conclusion, the security light control system project provides an intelligent and energy-efficient solution to enhance security while conserving energy. By utilizing motion and light sensors, Arduino microcontroller, LED lights, and resistors, this system offers a reliable and scalable solution for residential and commercial spaces.

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Introduction

Welcome to the world of security lighting control plans! Our aim in this project is to c hange he way we protect our homes and workplaces by producing smart and energy-saving solutions. By combining the power of motion and light with various Arduino microco ntrollers, LED lights and resistors, we created a system that saves energy while increasing saf ety. Traditional security systems use manual or timed controls, resulting in wasted energy and the potential for breaches. Our project will turn the light on and off with a different approach using advanced technology.

By doing this, we not only increase security, but also contribute to a safer and more secure en vironment. The heart of our body is in the Arduino microcontroller, which acts as the brain an d processes feedback from motion and light sensors. The motion sensor causes the Arduino to turn on its LED light when it detects movement within range. Light sensors also measure am bient light, providing important information to determine whether to turn the light on or off. One of the main characteristics of our body is its ability to adapt to the environment. By analy zing the surrounding lights, we ensure that the lights are turned on only when necessary.

This not only saves energy, but also prevents unnecessary light from being created dur ing the day. We include resistors in the system to ensure the efficiency of LED lights.

Resistors help regulate the voltage and limit the current flowing through the LEDs, th us protecting the LEDs from damage and extending their life. In summary, our lighting safety management plan provides comprehensive and innovative solutions to improve safety and sa ve energy. By combining motion and lighting, Arduino microcontrollers, LED lights and resi stors, we created a system that is not only efficient but also efficient and useful.

Join us on this exciting journey as we redefine the way we protect space while mainta ining sustainability.

Objectives

The objective of this proposal is to present a detailed plan for the development and deployment of a Smart Security Light Control System. This system will leverage light sensors, motion detectors, and adjustable lighting levels to enhance security measures and optimize energy usage in specific areas

Requirements

System Requirements

1. Arduino Microcontroller

- Model: Arduino Uno.

- Input/Output (I/O) Ports: Sufficient for connecting motion sensors, light sensors, and LED lights.

Encompasses wiring and Connectors

Specify high-quality electrical wiring for reliable connections.

2. Motion Sensor

- Type: Passive Infrared (PIR) motion sensor.

- Range: Adjustable range for detecting motion within a specified distance.

- Sensitivity: Configurable sensitivity settings for different environmental conditions.

Implement infrared motion sensors for precise detection.

Strategically install detectors for maximum coverage.

Integrate interface circuitry for seamless connectivity.

3. Light Sensor

- Type: Photocell or LDR (Light Dependent Resistor).

- Sensitivity Range: Adjustable sensitivity to detect ambient light levels.

- Threshold: Configurable threshold for activating the system based on ambient light conditions.

Utilize high-precision photocells or photodiodes.

Optimize sensor placement for comprehensive coverage.

Interface with Arduino board for real-time data processing

4. LED Lights

- Type: High-efficiency, low-power consumption LEDs.

- Brightness: Adjustable brightness levels based on security and energy conservation requirements.

5. Resistors

- Type: Suitable resistors for limiting current and voltage across LEDs.

- Values: Calculated based on LED specifications and power supply characteristics.

6. Power Supply

- Voltage: Compatible with Arduino and LED requirements.

- Capacity: Adequate to power the Arduino, sensors, and LEDs simultaneously.

- Energy Efficiency: Preferably a low-power consumption power supply for sustainability.

7. Programming Environment

- Integrated Development Environment (IDE): Arduino IDE for programming the Arduino microcontroller.

- Programming Language: C for Arduino programming.

8. Enclosures and Mounting Hardware

Design protective enclosures for sensors and electronic components.

Specify durable mounting hardware for secure installations.

Use of Breadboard as the mounting board.

Implementation Plan

Phase 1 – System Design .

Define sensor locations and coverage areas.

Develop the algorithm for adjusting lighting based on sensor inputs.

Phase 2 – Hardware Integration

Install light sensors and motion detectors in designated areas.

Integrate the control system with existing lighting infrastructure.

Phase 3 – Software Development

Develop a code to process the system.

Implement adjustable lighting level algorithms.

Phase 4 – Testing and Optimization

Conduct thorough testing to ensure accurate sensor readings and system responsiveness.

Optimize algorithms for maximum efficiency and security.

Phase 5 – Deployment

Deploy the Security Light Control System in the specified locations.

Observations and Results

1. Motion Detection Accuracy

- The motion sensor consistently detected movement within the specified range.

- Rapid response time observed, ensuring timely activation of the LED lights.

2. Light Sensor Performance

- Light sensor effectively identified low-light conditions for triggering the system.

- Configurable threshold settings allowed for precise control over activation based on ambient light levels.

3. LED Illumination

- LEDs provided sufficient brightness for enhanced security without causing discomfort.

- Adjustable brightness levels allowed for customization based on specific security requirements.

4. Arduino Microcontroller Operation

- Arduino facilitated seamless integration and coordination of all components.

- Programming logic successfully controlled the activation and deactivation of the system.

Discussion

1. Energy Efficiency

- The system demonstrated energy-efficient behavior by activating only in low-light conditions and when motion was detected.

- The use of resistors contributed to optimal power management, extending the lifespan of the LED lights.

2. Customization and Flexibility

- The Arduino microcontroller’s programmability provided a platform for customization.

- Future enhancements could include additional features like remote monitoring or integration with smart home systems.

3. Weather Resistance

- The chosen enclosure effectively protected the components from outdoor elements, ensuring durability.

Recommendations

1. Sensor Calibration

- Fine-tune motion and light sensor settings for specific environmental conditions to enhance accuracy.

2. Power Consumption Optimization

- Explore advanced power-saving techniques for further minimizing energy consumption.

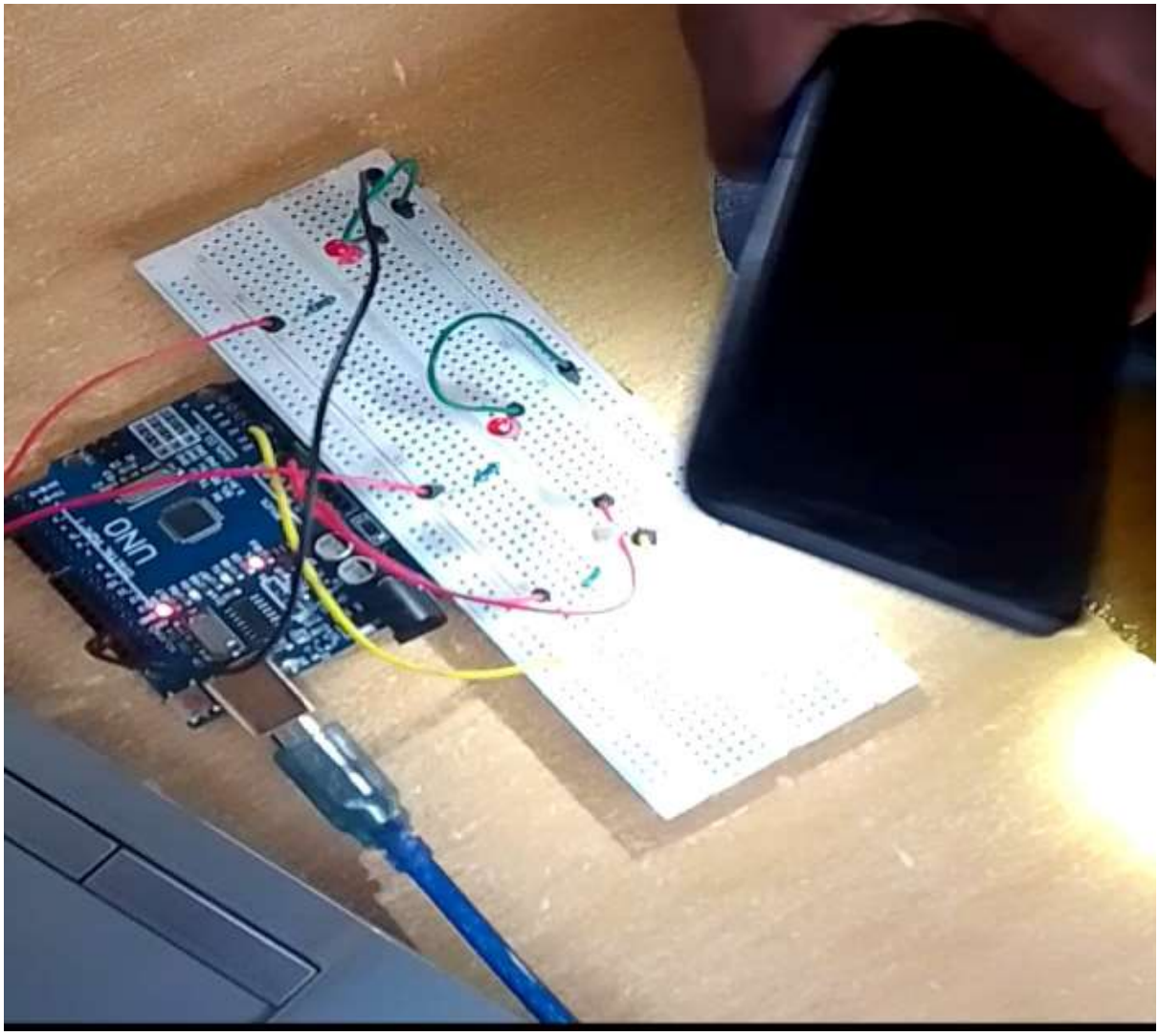
3. Integration with Other Security Systems

- Explore integration possibilities with existing security systems for a comprehensive solution.

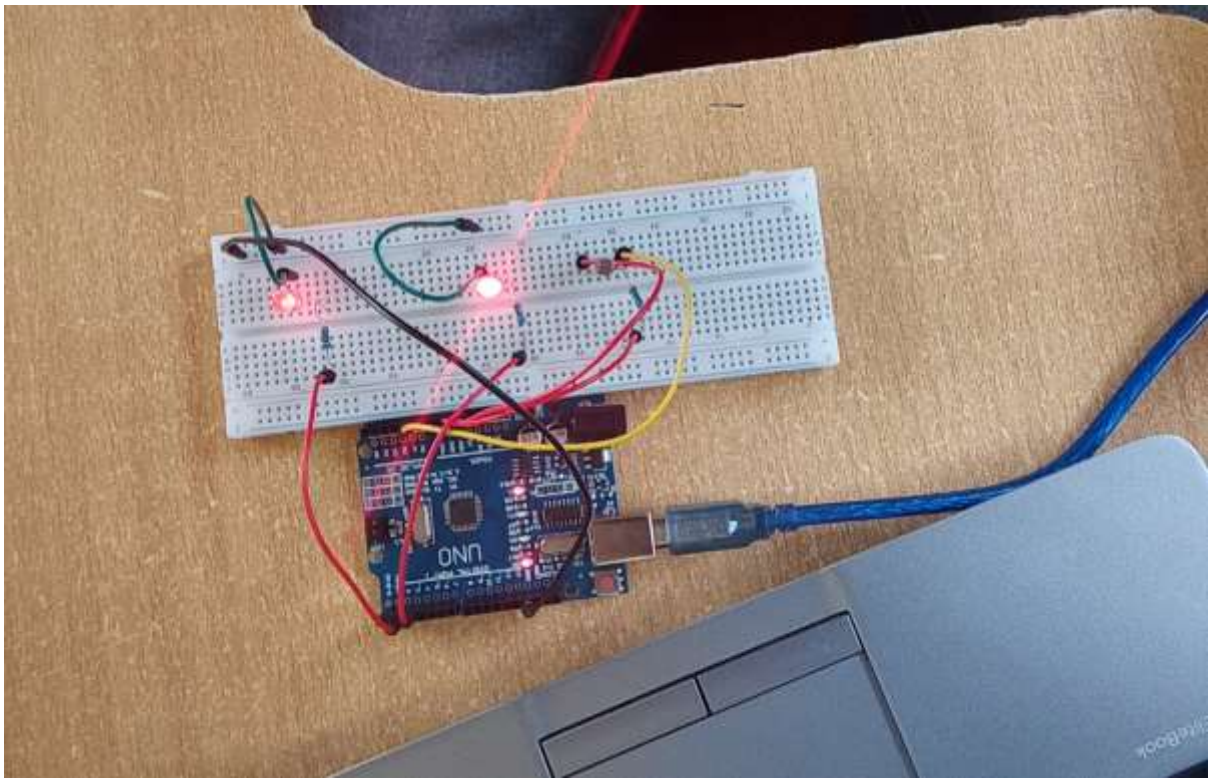
Conclusions

The implemented smart security lighting system successfully combines resistors, Arduino, LED lights, motion sensors, and light sensors to create an efficient and responsive outdoor lighting solution. The system effectively addresses security concerns while minimizing unnecessary energy usage. Ongoing refinement and potential integrations can further enhance its capabilities, providing a scalable and adaptable solution for various

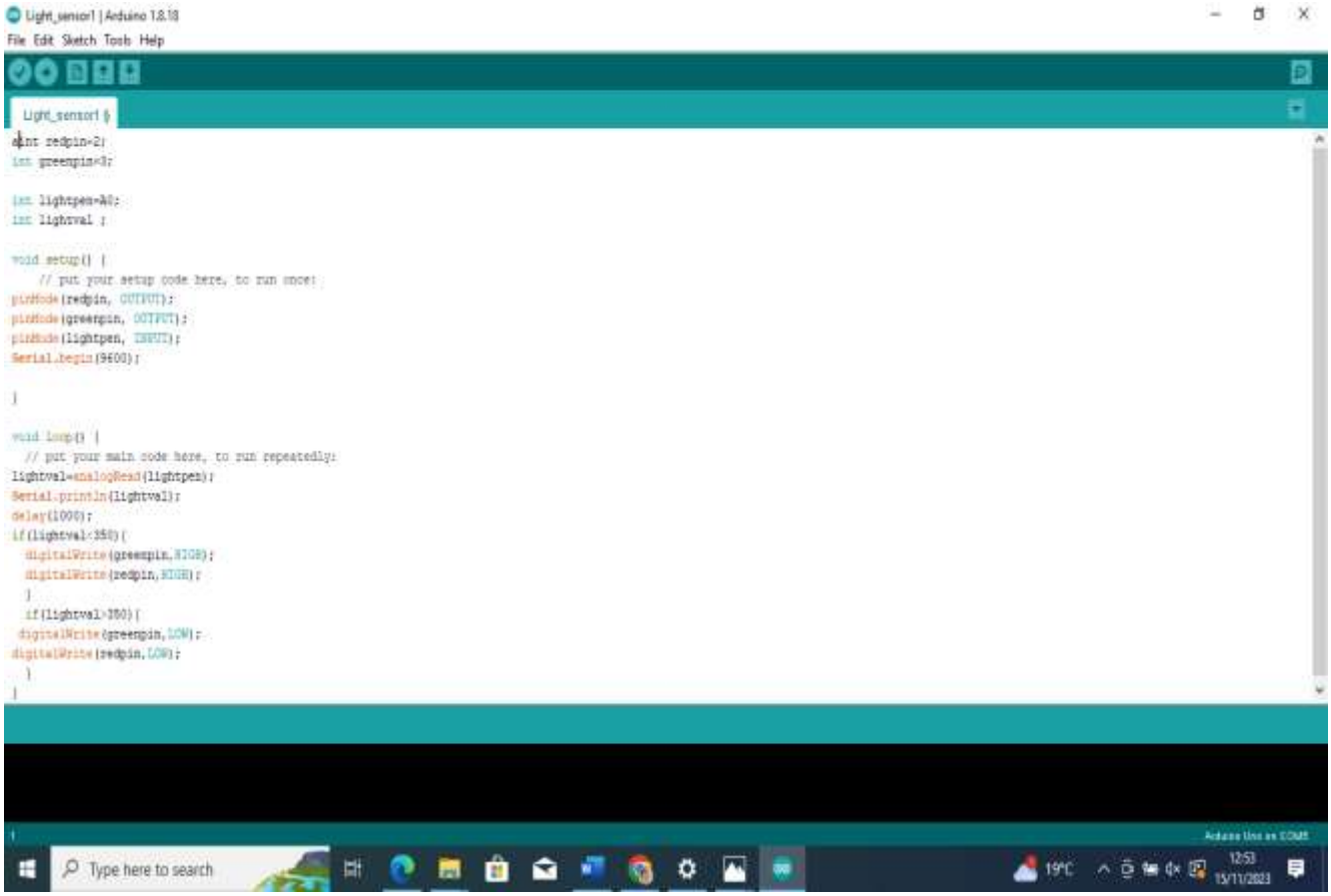
Demonstration once light intensity is high



Demonstration once light intensity is low



C program code on Arduino IDE



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