**Project Title: IoT-Based Weather-Adaptive Street Lighting System**

**Project Documentation**

**Introduction:** The IoT-Based Weather-Adaptive Street Lighting System is a project aimed at designing and implementing an intelligent lighting system for streetlights that dynamically adjusts the brightness based on the prevailing weather conditions. The system utilizes IoT technology to gather real-time weather data and control the streetlights accordingly, ensuring energy efficiency and enhanced visibility.

**Components Used:**

1. Arduino Uno (or any compatible microcontroller)
2. Weather sensor (e.g., DHT11 or BME280)
3. Light sensor (e.g., LDR - Light Dependent Resistor)
4. Relay module
5. LED strip or streetlight module
6. Breadboard and jumper wires

**System Overview:** The system architecture consists of three main components: the Arduino Uno, the weather sensor, and the light sensor. The Arduino acts as the central processing unit that receives data from the sensors, makes decisions, and controls the streetlights through the relay module. The weather sensor provides temperature and humidity data, while the light sensor measures the ambient light level.

**Circuit Design:**

1. Connect the weather sensor (DHT11 or BME280) to the Arduino Uno using appropriate pins (refer to datasheets or pinout diagrams).
2. Connect the light sensor (LDR) to the Arduino Uno.
3. Connect the relay module to the Arduino Uno.
4. Connect the LED strip or streetlight module to the relay module.

**Code Implementation:**

1. Set up the necessary libraries for the weather sensor, light sensor, and relay module.
2. Initialize the sensor and relay module objects.
3. Create variables to store weather data (temperature and humidity) and light intensity.
4. Set up the Arduino pins for sensor input and relay output.
5. In the main loop, read the weather sensor data (temperature and humidity) and store it in variables.
6. Read the light sensor data and store it in a variable.
7. Implement the decision-making algorithm based on the weather and light data.
8. Control the relay module based on the decision (turn on/off the streetlights or adjust the brightness).

**Simulation in Tinkercad:** To create a simulation in Tinkercad, follow these steps:

1. Open Tinkercad and create a new circuit design.
2. Drag and drop the Arduino Uno, weather sensor, light sensor, relay module, LED strip, and other necessary components onto the workspace.
3. Connect the components according to the circuit design described earlier.
4. Write the code for the Arduino in the built-in Arduino code editor.
5. Upload the code to the Arduino Uno.
6. Run the simulation to observe the behavior of the IoT-based weather-adaptive street lighting system.

**Conclusion:** The IoT-Based Weather-Adaptive Street Lighting System offers an intelligent and energy-efficient solution for street lighting. By utilizing IoT technology and real-time weather data, the system can adjust the brightness of streetlights based on weather conditions and ambient light levels. This project documentation provides an overview of the system's components, circuit design, code implementation, and simulation in Tinkercad. Implementing such a system can contribute to reduced energy consumption, increased visibility, and improved overall safety on the streets.

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