TP - Domotique: Automated Curtain System

Realized by: Nadim Hafsi - Ahmed Chelbi - Oussama ben Dlala - Ons Arouri
Med Islam Ben Gammem - Kamel Hameda - Fahd Belhaj Mohamed

1. Introduction

The Automated Curtain System project aims to create a system capable of controlling the opening and closing of curtains automatically based on various conditions such as ambient light or manual commands. To achieve this, the system utilizes light sensors (LDR), a motion sensor (PIR), and a servo motor to actuate the curtains. Communication between the system and the user is facilitated through the MQTT protocol, enabling remote control and scheduling of actions.

2. Hardware Used

- ESP32: Microcontroller used for control and communication.
- Motion Sensor (PIR): Detects motion presence.
- Light Sensor (LDR): Measures ambient light.
- Servo Motor: Actuates the curtains.
- RTC (Real-Time Clock) Module: Manages time and schedules.
- LEDs: Indicate the status of the curtains (open or closed).

3. Key Features

- **Manual and Automatic Control:** Users can choose between manual and automatic modes to control the curtains.
- **Motion Detection:** Curtains automatically open when motion is detected (automatic mode).
- **Automatic Adjustment Based on Light:** Curtains open or close automatically based on ambient light.
- **Scheduling:** Users can schedule specific times for opening and closing the curtains.
- **MQTT Communication:** Utilizes MQTT protocol for communication between the system and the mobile application.

4. MQTT Communication

The system uses MQTT for communication with a mobile application. The MQTT topics used are as follows:

- **rideaux/rtc:** For scheduling curtain open/close times.
- **rideaux/mode:** To switch between manual and automatic operation modes.
- **rideaux/commande:** For sending manual open/close commands for the curtains.

5. Mobile Application

The mobile application serves as the primary interface for users to interact with the Automated Curtain System. It offers the following features:

- **User Authentication**: Users are required to create an account and log in to access the functionalities of the application. This ensures secure access to the system and personalized settings.
- **Manual Control:** Allows the user to manually open or close the curtains.
- **Automatic Control:** Activates automatic mode for automatic curtain control.
- **Planning**: Allows the user to set specific schedules for curtain opening and closing.
- **Sensors:** Provides real-time information on:
  - Light Percentage
  - PIR Sensor Status
  - LDR Sensor Status
  - Curtain Status (Open/Closed)

6. Initial Setup

Before using the system, users need to perform the following initial setup steps:

- **Account Creation:** Users need to create an account by providing necessary information such as username, email, and password.
- **Authentication:** After creating an account, users must log in using their credentials to authenticate themselves and gain access to the application's features.
- **Configuration:** Users are prompted to configure Wi-Fi parameters (SSID and password) for connecting the system to the internet. Additionally, users need to connect the system to an MQTT server (e.g., "broker.hivemq.com") and configure MQTT topics as needed.

8. Conclusion

The Automated Curtain System project offers a convenient and efficient solution for curtain control, providing users with customizable options for manual or automatic operation and scheduling. With the MQTT communication protocol and real-time sensor data monitoring, users can remotely control their curtains and monitor environmental conditions, enhancing comfort and energy efficiency in residential or commercial settings.