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Project Name: Home Automation System

Overview

The Home Automation system is a project designed to enable users to remotely control various household devices, such as lights and irrigation systems, using their mobile phone. The system consists of an Arduino microcontroller, an ESP32 module, and various input and output devices, including a motion sensor, water level sensor, thermostat, LCD displays, and LEDs.

Functionalities

The following functionalities have been implemented in the Home Automation system:

Light Control: Users can remotely turn on or off the lights in their home using their mobile phone. This is achieved by sending commands from the phone to the Arduino, which in turn controls the LED lights.

Intrusion Detection: An motion sensor is used to detect the presence of an intruder. If an unauthorized person is detected, the system sends a warning message to the user's phone displaying a yes message on the screen.

Automatic Irrigation System: A moisture sensor is used to monitor the moisture level of the soil in the plant. If the moisture level is too low, the system automatically turns on the water pump to irrigate the plant. The system also tracks the level of water to make sure the user is aware of the tank needing a refill.

Temperature Control: A thermostat is used to monitor the temperature of the room. A timer interrupt is applied to the temperature reading being displayed on the LCD to delay it every 3 seconds.

Architecture

The Home Automation system consists of the following components:

Arduino Microcontroller: The Arduino microcontroller is the main control unit of the system. It receives commands from the ESP32 module and controls the various input and output devices.

ESP32 Module: The ESP32 module is used to provide a wireless interface between the Arduino and the user's mobile phone. It communicates with the Arduino via the Serial Peripheral Interface (SPI) protocol and uses a Wi-Fi connection to send data to the phone.

Input Devices: The system uses various input devices, including motion sensor, water level sensors, moisture sensor, and thermostat, to monitor the environment and user commands. These devices send input signals to the Arduino, which then processes them and sends output signals to the output devices.

Output Devices: The system uses various output devices, including a mobile phone, LED lights, and LCD display to control the environment and send feedback to the user. These devices receive output signals from the Arduino and respond accordingly.

Software

The Home Automation system is programmed in C++ using the Arduino Integrated Development Environment (IDE). The code is organized into modules, each responsible for a specific functionality, such as light control or temperature monitoring. The code is well-structured and easy to modify and maintain.

The esp.ino provided in the submission is used for the UI along with the esp32 communication with the Arduino microcontroller. The esp32 sends information to Arduino using Serial Peripheral Interface (SPI) protocol.



The UI is made with keeping the ease of use for the users who can use it. The three buttons of turning on and off light only need to be touched for the lights control. The RGB light control changes the color of RGB using the interface. The water and moisture sensor shows the level using the reading. Motion detection shows if any motion is being detected or not.

The lcd.ino file will have the temperature displayed on the LCD using a thermostat to measure temperature. Also, the applied timer interrupt is in the same file which displays the temperature every 3 seconds on the LCD.

Conclusion

The Home Automation system is a successful project that enables users to remotely control various household devices using their mobile phones. The system is reliable, user-friendly, and well-structured. With further development, it has the potential to become a popular home automation solution.