Related Work Research

Popa Ioan-Ciprian

My Idea

What I want to accomplish is a system that can help the user motorise his entire house and have control over multiple aspects:
- Room Temperature
- Plant Irigation
- Garage door Access(working on how to do it)
- Automatic Ambient light
- More...

This can be done via a Raspberry PI board connected to multiple sensors and relays connected to the desired electronics. Everything can be monitored on a web interface remotely and on a mobile app. All the functionalities are modular such that there will be no limitations in terms of the user's plans.

Related Work - 1

The authors describe a Smart Plant Watering System that uses sensors to monitor environmental conditions like soil moisture, temperature, pH, and humidity to make decisions about when to irrigate plants. This system also includes some features such flame detection and email alerts to notify users about the health of the plant or potential dangers like fire.

Hardware: The system is built using an Arduino UNO microcontroller, various sensors (soil moisture, pH, DHT for temperature and humidity, and flame sensors), a Wi-Fi module (ESP8266), and a motor driver IC.

Software: Sensor data is processed using Arduino code, and results are published to the Adafruit IO platform using the MQTT protocol. The FindS algorithm is used to generate hypotheses about plant health based on the sensor data.

I would use a similar technology for the automatic irrigation part.

Related Work - 2

In this research paper the authors proposed and implemented a comprehensive model for remotely controlling smart houses. The model integrates both software and hardware simulators, enabling the testing and analysis of smart house systems without needing a physical setup. The key innovation lies in the model's ability to support multiple remote access methods, including web and mobile platforms. This allows users to control and monitor smart house devices from anywhere, using a variety of devices. The system also allows for scenario testing and manual simulation speed control, which helps analysts assess the impact of different automation schemes and optimize smart home designs, reducing costs and time spent on physical prototyping.

To achieve this, the authors used a combination of technologies and platforms. The Processing and Control Center (PCC), which is the core of the system, was implemented in C and is responsible for managing all communications between sensors, actuators, and user interfaces. The web-based interface was developed using ASP.Net, while the mobile applications were built on J2ME and Windows Mobile platforms. For simulating the smart house and individual hardware devices, the authors created software that can connect to the PCC, providing detailed diagnostics and control over the simulated environment. The use of GSM modems and UDP protocols facilitated communication between the various components, ensuring seamless integration and reliable remote control capabilities.

I would also have this kind of system in order to control the devices, the GSM way of communicating between the devices is good for reliability but I would use an Internet connection given by a provider for connecting the devices on a wireless way.

Related Work - 3

The research paper describes the development of a Vehicle Management System implemented at Christ University to improve campus security and efficiency in managing vehicle movements. The system integrates advanced technologies like YOLOv8 for vehicle detection and Tesseract OCR for license plate recognition, ensuring high accuracy in identifying and tracking vehicles in real-time. This solution is cost-effective, using a Raspberry Pi 4 with 8GB RAM and a 5MP Raspberry Pi Camera to handle video analysis and process the data locally. The system enhances campus security by preventing unauthorized vehicle access and improving traffic flow and parking management.

I would use some of the methods used in this paper for the garage door access, but it must be even more secure such that not anyone could enter the house without either a human verification by the owner or another security measure.

Related Work - 4

The proposed system in the research paper involves using a Raspberry Pi to interpret voice commands received through an Android app. The system communicates wirelessly via Wi-Fi, allowing users to control home appliances remotely. The setup simplifies home automation, particularly for individuals with disabilities, by providing a user-friendly interface and the ability to control multiple devices simultaneously.

This functionality would also be a good feature to centralise all the controls in voice commands manner.

Related Work - 5

The article describes a solar tracker system using Raspberry Pi 4B and digital image processing (DIP) to enhance solar energy capture, even in cloudy conditions. Unlike traditional trackers that struggle with weather changes, this system uses a webcam and image processing algorithms to pinpoint the Sun's position, adjusting solar panels via servo motors for optimal alignment, reducing tracking error to 0.040 degrees.

I would like to also introduce this is some manner such that if the main source of electricity is down, some current will be able to maintain the system up.

Related Work - 6

This project demonstrates a practical application of Raspberry Pi for agricultural monitoring.
It would help me for the automatic irrigation system.

Further Research

I want to implement as much as possible machine learning in the functionalities of the system.
My research doesn't stop here, I will try to find even more useful features.

Required components so far

Raspberry Pi 5 if possible
-5V 3A Power Supply or something similar
-DFRobot Gravity Analog Anti-corrosion Waterproof Capacitive Soil Moisture – moisture sensor
-DS18B20 - Temperature Sensor
-MCP3008 Analog-to-Digital Converter - converts the analog signal from the soil moisture sensor to digital
-5V multiple channel relay module
-4.7k Resistor - required for the DS18B20 temperature sensor
-Wi-Fi Module (optional if not built-in)
-Real-Time Clock (RTC) module (optional)
-TSL2561 Digital Luminosity Sensor
-BH1750 Ambient Light Sensor - connects via I2C(onboard pins)
-LDR (Light Dependent Resistor) together with another MCP3008
-TCS34725 RGB color sensor
-PIR Motion Sensor - connects via GPIO pins(onboard pins)
-DHT22 (AM2302) digital temperature and humidity sensor
-BME280 Digital Temperature, Humidity, and Pressure Sensor, Another MCP3008