



Smart Home IOT - A Study

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1 Topic Summary

The paper describes the design and implementation of a home automation framework that uses Internet of Things (IoT) technology to control various home appliances remotely through a smartphone application. The system allows for automation of tasks such as turning lights on and off, adjusting thermostat settings, and controlling home security. The Android app serves as the user interface for controlling the connected devices and receiving status updates.

The implementation and analysis of such an IoT-based home automation framework using open-source firmware Node MCU (Node Microcontroller Unit) through the MQTT (MQ Telemetry Transport) protocol were well described.

The system has a central controller (Raspberry Pi), that communicates with the home appliances through a wireless network. The appliances are controlled through a web application that is accessed through the smartphone. The architecture of the system is designed to enable communication between the connected devices, the IoT gateway, the Android app, and the cloud server. This approach allows for a cost-effective and efficient solution for home automation helping the user to monitor and control home appliances from remote places by using a mobile application over the internet.

2 Key contributions/ideas from the Authors

The authors have done an analysis of the performance of the system, including power consumption and response time. This is an important aspect of home automation as it helps to evaluate the efficiency and effectiveness of the system. They have also considered the security and reliability of the system and have found that this system is secure and reliable.

(1) Protocols:

Communication protocols enable communication between devices in the smart home: Some protocol systems that were considered by the author include:

- a. Zigbee: A wireless communication protocol designed for low-power and low-data rate communication between devices. It is often used in smart home systems to communicate between devices such as lights, thermostats, and sensors.
- b. Bluetooth: A wireless communication protocol that is commonly used for short-range communication between devices. It is often used in smart home systems to communicate between devices such as smartphones and smart speakers.

- c. MQTT: MQTT is a publish-subscribe based messaging protocol that is designed for low-power and low-data rate communication between devices. It is often used in IoT-based systems to communicate between devices and the central control system.

The authors felt that MQTT is the best for low-power wireless devices with unstable connections. This best satisfies their requirement and hence MQTT was chosen over the other protocols.

(2) System architecture:

The system uses an opensource firmware Node-MCU through MQTT protocol along with diverse sensors, such as temperature and humidity sensor - DHT11, PIR motion sensor - HC-SR 505, gas sensor - MQ2, rain sensor - YL-83 for measuring the temperature, humidity, smoke, gas leakage, and rain. Several actuators control the activities of electronic devices of the home. The lights and fans are controlled by the dashboard. A graphical user interface (GUI) helps to interact with users and the system and ensures the comfort and safety of the users.

(3) Algorithm:

DRK value of darkness
TMP value of temperature
HMDT value of humidity
GAS value of gas
MTN value of motion
RN value of rain

Sensors optimum values are set: DRK0, TMP0, HMDT0, GAS0, MTN0, RN0

Initialize by switch on.

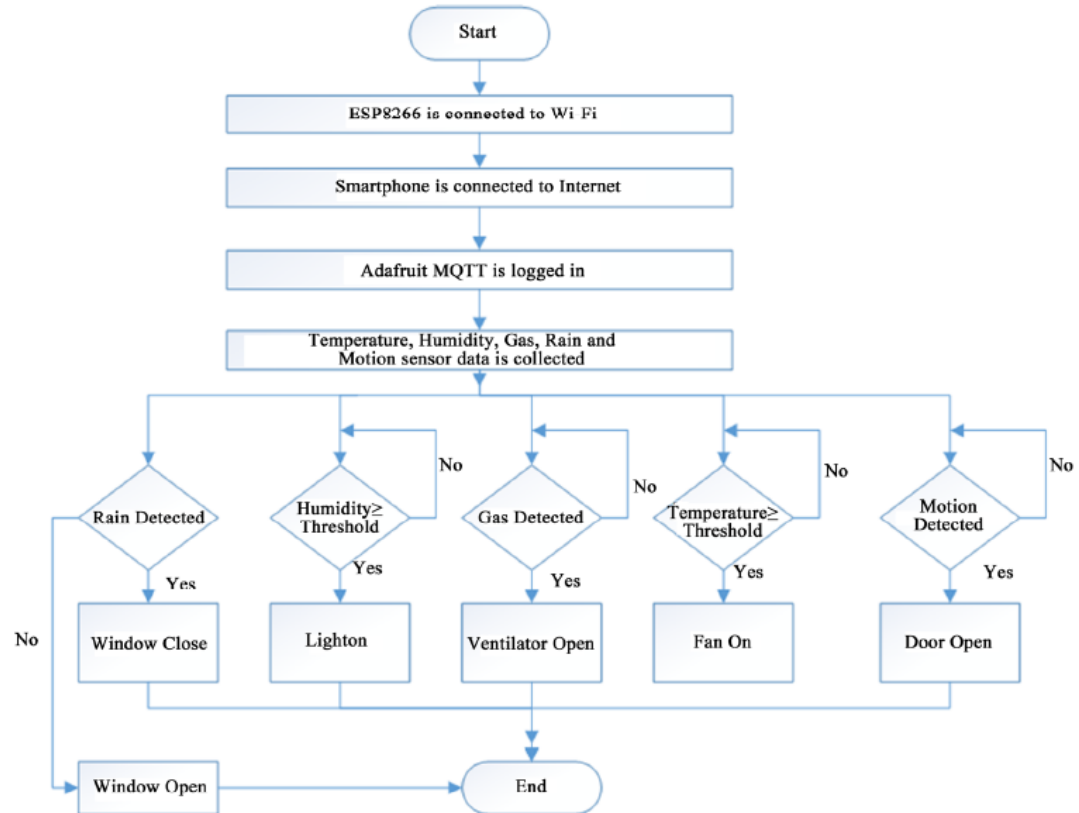
ESP8266 is connected.

The Internet access point is activated.

MQTT server is connected

ESP8266 get data from sensors

Node-MCU gets connected to the server along with the other devices. The LED is on/off by the push button on the app through a virtual switch on the dashboard. We can control the home appliances from anywhere using internet connectivity. The room temperature and humidity are displayed on the dashboard.



3 My Views on the topic Agreements, Pitfalls and Fallacies:

I feel that the authors didnt give us much of insights about the algorithms used for implementing this system framework. So I would like to map my existing knowledge of algorithms in different possible scenarios.

Machine learning algorithms could be used to control devices and make decisions based on the sensor data. For example, a smart thermostat sensor could use a machine learning algorithm to learn a user's preferred temperature settings and adjust the temperature accordingly.

Other algorithm that could be used is - Rule-based algorithm which uses a set of pre-defined rules to control the devices in the smart home based on sensor data. A rule-based algorithm might turn off the lights in a room when the room is unoccupied. The specific algorithm used in the framework presented in the paper were chosen based on the requirements and design of the system, and how well they work with the overall architecture and the protocols used in the system.

By getting a deeper understanding of whats happening the whole framework can be structured into different components as:

- a. The Hardware component that includes the devices and sensors that make up the smart home system, such as thermostats, lights, and security cameras.

- b. The Communication component that enables communication between the devices and the central control system. This can include both wired and wireless communication protocols
- c. Control and decision-making component responsible for controlling the devices in the smart home and making decisions based on sensor data
- d. User interface layer: The layer that provides a way for users to interact with and control the smart home system.
- e. Cloud component that provides remote access, data storage and support for advanced services.

Different protocols to be used since we use different IoT components and which protocol is best suited for each requires a deep analysis and prototyping. If the output of the analysed data has to be passed to a workflow, including it in later point in time will be difficult to handle. Not handled as of now as an MVP (Minimum Viable product) MVP design / prototyping is not specified in the use case. The business should have the feel of the product in a continuous manner so that correction and input from business community can be considered for enhancement of the product. Internet of Things (IoT) technology has the potential to revolutionize the field of home automation, by allowing for remote control of various home appliances through a smartphone application. The use of a low-cost and easy-to-install system, such as the one proposed in the paper, can make home automation more accessible and convenient for a wider range of people

(3)

4 FUTURE SCOPE:

Further this system can be developed by adding the topographies like controlling speed of fan and intensity of light through human brain or through blinking of eyes or the human meditation value and also some objects can be automated with the help of body or hand gestures.

References

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