

Centralized Wireless Home Appliances Control System

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Abstract - Home Automation System is the expansion of current activities performed in home and this system can be developed easily, because of powerful devices and wireless network, to provide user friendly and cost-efficient home automation system. In home automation system, different technologies like ZigBee, Bluetooth and Wi-Fi are used to communicate between the devices like mobile, laptop and tablet used for controlling various home electronics devices. The implementation is done with help of smartphone. Now a days Home Automation System is become very useful for handicapped people because of modern technology. It is very useful to the user for control and handle all the devices that are connected to the system. Handling the appliances comfortably and easily is the motive of this system. Home appliances can be monitored and controlled, and the user can interact with the system through a user-friendly interface.

Key Words: Wireless network, NodeMcu, Wi-Fi, Appliances.

1. INTRODUCTION

Automation can be termed as the process of controlling various equipment's, machineries, factory operations, etc. automatically using some controlling devices or systems. Automation is an efficient method that can be used in various such as to reduce manpower, energy usage and to improve the quality and efficiency of any system. There are various automation applications

and some of them can be listed as automated mining system, home automation system, industrial automation system, automated waste management system etc.

Home automation system makes the operations of various home appliances more convenient, easy to handle and also saves energy by switching of the electronics devices when not in use. Nowadays, by using the energy saving concept, building automation makes life very simpler and efficient. Through wireless communication the automatic controlling of all electrical or electronic devices in houses can be done remotely. Centralized control of lighting equipment's, air conditioning and heating, audio or video systems, security systems, kitchen appliances and various other equipment's used in home systems is possible with this system.

The system is mostly implemented by actuators, sensors, controlling devices and. The sensors detect light, motion, temperature and various other sensing elements, and then sends the received data to the main controlling devices. These sensors that can be thermocouples or thermistors, photo detectors, level sensors, pressure sensors, current transformers, IR

sensors, etc. These sensors need an additional signal which results the equipment to communicate with the main controller.

2. RELATED WORK

There exists system neither at cheaper rates nor easy to handle. Various systems are hard to install, difficult to use and maintain. Current systems are generally proprietary, closed and not very user friendly. All the existing systems are energy savings, convenient and secure but also hard to install and implement which increases the complexity. Also, not all the systems are compatible with one another and their cost is higher to afford [4]. Most advanced home automation systems in existence today require a big and expensive change of infrastructure. This means that it often is not feasible to install a home automation system in an existing building [2]. The Home automation is a wireless home automation system that is supposed to be implemented in existing home environments, without any changes in the existing infrastructure. Home automation lets the user to control the home from computer. In the computer program the user can create actions what should happen with electrical devices in the network depending on the sensors sensing surrounding environment [7].

3. PROPOSED SYSTEM

The system includes an android application that is used to send signal to NodeMcu with built in Wi-Fi module. Its main function is to gives this signal to NodeMcu for controlling devices using relay. The mcu will process the input and will take appropriate action.

3.1 SYSTEM ARCHITECTURE

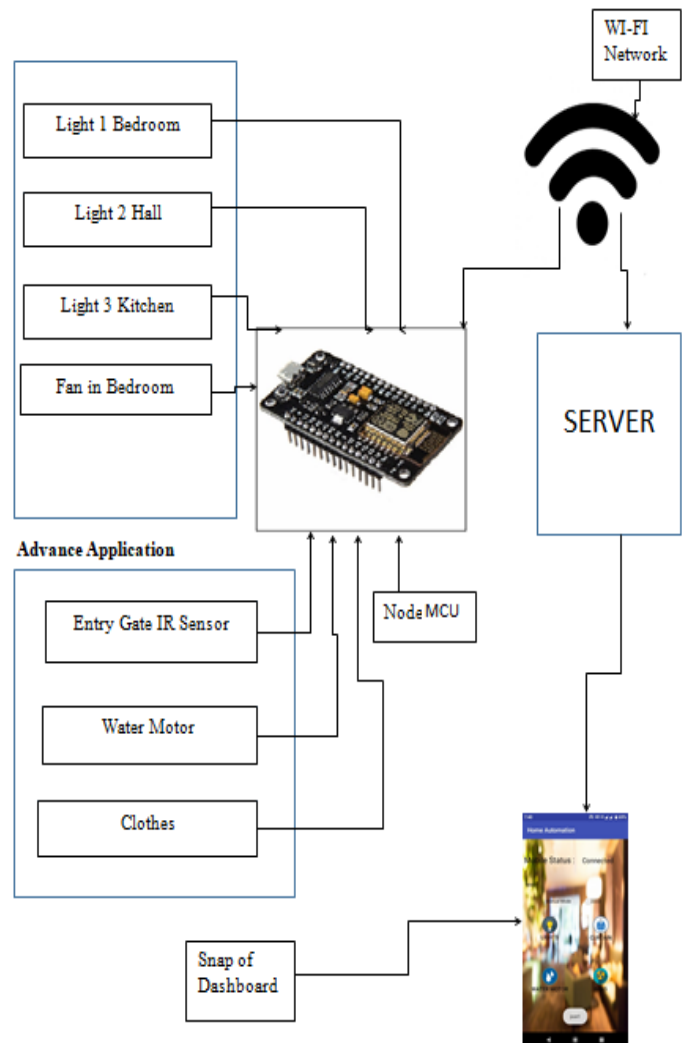


Fig -1: System Design of Home Appliances

- Android app sends the signal to the Wi-Fi module that is connected to same or different network. Android app has different the Graphics User Interface (GUI) buttons for each appliance.
- Relay board use as electrical switches to perform on/off operation
- NodeMcu board is used as microcontroller to control all the electronic devices. Relay is

connected to it. Every command is processed by NodeMcu board and is used for controlling the relay board for switching on/off the appliances

- Wi-Fi module function is to receive the signal from the mobile and sends this signal to the NodeMcu board for further process to take appropriate actions.
- Also, NodeMcu can send required information collected by various sensors to the user handling the smartphone.

3.2 SOFTWARE IMPLEMENTATION

The android application is built by using the open-source Arduino Software (IDE) which makes it easy to write code and upload it to the board. User can use it on Windows, Mac OS X, and Linux. The environment of IDE is written in Java and based on Processing and other open-source software. This software can be used with any NodeMcu board. To build an android application to control appliances Java and XML languages are used. PHP is used for web server and MySQL database used to keep logs. For each device one button is used for turning ON or OFF the home appliance, which will automatically get toggle after clicking on the button. Commands are sent through the web server to the Wi-Fi module. Web server passes this command to the address given by developer using Wi-Fi Network.

3.3 HARDWARE IMPLEMENTATION

- NodeMcu: NodeMcu is an open source development board and firmware based in the widely used ESP8266 -12E Wi-Fi module. It has functionality to program the ESP8266 Wi-Fi module with the simple programming language or Arduino IDE. With just a few lines of code one can establish a Wi-Fi connection and define input/output pins according to needs exactly like Arduino, turning the ESP8266 into a web server and a lot more. It is the Wi-Fi equivalent of Ethernet module ^[1].
- Servo Motor: A servo motor is an electric device which is used for precise control of angular rotation. It is a rotary actuator or linear actuator which precisely controls the angular or linear position, velocity and acceleration. It also requires a controller, often a dedicated module designed specifically for use with servomotors.
- Relay Module: A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch. Relays are used to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. ^[5]
- DC Motor: A DC motor is used to convert current electrical energy into mechanical energy.
- Moisture Sensor: The moisture sensor is used to measure the volumetric water contents present on it. This makes it ideal for performing experiments in courses such as soil science, environmental science, etc. ^[6].

- Ultrasonic Sensor: The ultrasonic sensors measure distance by using ultrasonic waves. The sensor's top emits an ultrasonic wave and receives the wave reflected from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception [2].
- Infrared sensor: An infrared sensor is an electronic instrument used to sense certain characteristics of its surroundings. It does this by emitting infrared radiation. The basic concept IR Sensor is used as obstacle detector [4].

4. CONCLUSIONS

Home automation is a dynamic resource which can make a home environment automated. People can control their electrical devices via these home automation devices and set up controlling actions through mobile.

This system is useful in the domestic as well as in the industrial appliances. It can enhance several devices by adding more appropriate circuits. Even the vibration, glass break, fire or smoke detector can be configured to report the user. The cost involved is moderate and the status can be sent to user(s) for the decision. Here system assuming that which can control devices through wireless based network or cloud-based approach. In the project, IoT based home automation system is implemented whose goal is to develop a home automation system that gives the user control over all remotely controllable aspects of user's home. The automation system will have ability to be controlled by the internet, and also remotely accessed

via a packet PC with a windows mobile based application.

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