

# IoT Based Smart Home and Plant Watering System

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## ABSTRACT

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The aim of this paper is to develop home automation system based on IOT using Wi-Fi based microcontroller. As scope of technology is widening every day, we are making our tech advance in mobile, robotics, Machine Learning, then why an exception for our home. Today houses are gradually transferring from ordinary/human's input-based appliances to smart/IOT enabled appliances to be controlled remotely. At Present, existing home automation systems use technology that is limited to only that device. So, in a nutshell, we are making our devices IOT enabled not our homes.

Keywords :— Android Smartphone, Firebase, IOT, Home Automation

## I. INTRODUCTION

This project proposed system the overall design of Home Automation System (HAS) with low cost and wireless system. It specifically focuses on the development of an IOT based home automation system that is able to control various components via internet or be automatically programmed to operate from ambient conditions. In this project, we design the development of a firmware for smart control which can successfully be automated minimizing human interaction to preserve the integrity within whole electrical devices in the home. We used Node MCU, a popular open source IOT platform, to execute the process of automation. Different components of the system will use different transmission mode that will be implemented to communicate the control of the devices by the user through Node MCU to the actual appliance. The main control system implements wireless technology to provide remote access from

smart phone. We are using a cloud server-based communication that would add to the practicality of the project by enabling unrestricted access of the appliances to the user irrespective of the distance factor.

Internet of Things (IOT) is a concept where each device is assign to an IP address and through that IP address anyone makes that device identifiable on internet. The mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically, it started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet of Things" (IoT). The recent developments in technology which permit the use of wireless controlling environments like, Bluetooth and

Wi-Fi that have enabled different devices to have capabilities of connecting with each other. Using a WIFI shield to act as a Micro web server for the Arduino which eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Arduino to communicate with the internet. With this in mind, an internet based home automation system for remote control and observing the status of home appliances is designed. Due to the advancement of wireless technology, there are several different type of connections are introduced such as GSM, WIFI, and BT. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in HAS project, WIFI is being chosen with its suitable capability. The capabilities of WIFI are more than enough to be implemented in the design. Also, most of the current laptop/notebook or Smartphone come with built-in WIFI adapter. It will indirectly reduce the cost of this system.

## II. LITERATURE SURVEY

“Smart Energy Efficient Home Automation System using IOT”, by Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, Arun Kumar Mishra. This paper presents a step-by-step procedure of a smart home automation controller. It uses IOT to convert home appliances to smart and intelligent devices, with the help of design control. An energy efficient system is designed that accesses the smart home remotely using IOT connectivity. The proposed system mainly requires, Node MCU as the microcontroller unit, IFTTT to interpret voice commands, Adafruit a library that supports MQTT acts as an MQTT broker and Arduino IDE to code the microcontroller. This multimodal system uses Google Assistant along with a web based application to control the smart home. The

smart home is implemented with main controller unit that is connected with the 24-hour available Wi-Fi network. To ensure, that the Wi-Fi connection do not turn off, the main controller is programmed to establish automatic connection with the available network and connected to the auto power backup.

“IOT Based Smart Security and Home Automation”, by Shardha Somani, Parikshit Solunke, Shaunak Oke, Parth Medhi, Prof. P. P. Laturkar. This paper focuses on a system that provides features of Home Automation relying on IOT to operate easily, in addition to that it includes a camera module and provides home security. The android application basically converts Smartphone into a remote for all home appliances. Security is achieved with motion sensors if movement is sensed at the entrance of the house; a notification is sent that contains a photo of house entrance in real time. This notification will be received by the owner of the house via internet such that app can trigger a notification. So owner can raise an alarm in case of any intrusion or he/she can toggle the appliances like opening the door if the person is a guest. The system uses Raspberry Pi, a small sized computer which acts as server for the system. The smart home consist two modules. Home automation that consists; fan light and door controller, and security module that consists; smoke sensor motion sensor and camera module.

“A Dynamic Distributed Energy Management Algorithm of Home Sensor Network for Home Automation System”, by Tui-Yi Yang, Chu-Sing Yang, Tien-Wen Sung. This paper proposes an optimization of home power consumption based on PLC (Power Line Communication) for an easy to access home energy consumption. This also proposes a Zigbee and PLC based renewable energy gateway to monitor the energy generation of renewable energies. ACS and DDEM algorithm are proposed for the design of an intelligent distribution of power management system to make sure ongoing power supply of home networks.

To provide efficient power management the power supply models of home sensor network are classified groups viz. main supply only, main supply and backup battery, rechargeable battery power and non-rechargeable battery power. Devices with particular features are assigned to these groups. It targets to establish real time processing scheme to address variable sensor network topologies.

“Enhance Smart Home Automation System based on Internet of Things”, by Tushar Churasia and Prashant Kumar Jain. This paper proposes a system that develops a model to reduce the computation overhead in existing smart home solutions that uses various encryption technologies like AES, ECHD, hybrid, etc. these solutions use intermediate gateway for connecting various sensor devices. The proposed model provides a method for automation with sensor based learning. The system uses temperature sensor for development but other sensors can also be used as per requirement. These smart home devices with sensors can configure themselves autonomously and can operate without human intervention. This work minimizes encryption decryption and focuses on authentication and automation of smart home devices with learning. The system bypasses local gateway mentioned in existing system to provide better security for smart home devices and sensor data and save computation overhead. The real time broker cloud is directly connected with smart home and manages all incoming and outgoing request between users and devices. The main purpose to use real time broker cloud is save time of cryptographic operations.

“Visual Machine Intelligence for Home Automation”, by Suraj, Ish Kool, Dharmendra Kumar, Shovan Barman. The paper proposed a vision-based machine intelligence system to sense on/off state of common home appliance. The proposed method of sensing the state of appliances results on a novel home automation system. The accessibility of the suite of devices in the home over a remote network is facilitated by the IP

Addressing methods in the IOT. This project uses two boards viz. Raspberry Pi and Intel Galileo Gen 2. The communication between the User devices, Raspberry Pi and the Intel Galileo boards happens over a wireless network. The UDP protocol is deployed to facilitate the wireless communication of the nodes present in the home automation network. A Pi Cam and a USB Logitech camera attached to the rotating shaft of two different servo motor capture snapshots that are passed as inputs to the Machine Learning based models trained using dlib-C++ to detect the state of the operation of the appliances. The proposed method uses visual modality to automate the appliances, as privacy concerns may emerge while using the images from some specific places, as a counter to this issue, an SPDT switch is added to the Raspberry Pi which when turned off ensures that even if the images are taken from the webcams, they are just passed as inputs to the machine learning models and are not displayed on the website when the users access the website on the server address obtained from Raspberry Pi.

“A Low Cost Home Automation System Using Wi-Fi based Wireless Sensor Network Incorporating internet of Things”, by Vikram.N, Harish.K.S, Nihaal.M.S, Raksha Umesh, Shetty Aashik Ashok Kumar.

This paper illustrates a methodology to provide a low cost Home Automation System (HAS) using Wireless Fidelity (Wi-Fi). This crystallizes the concept of internetworking of smart devices. A Wi-Fi based Wireless Sensor Network (WSN) is designed for the purpose of monitoring and controlling environmental, safety and electrical parameters of a smart interconnected home. The different sections of the HAS are; temperature and humidity sensor, gas leakage warning system, fire alarm system, burglar alarm system, rain sensing, switching and regulation of load & voltage and current sensing. The primary requirement of HAS to monitor and control of devices is accomplished using a Smartphone application. The application is developed using Android Studio based on

JAVA platform and User Interface of those are exemplified. The primary focus of the paper is to develop a solution cost effective flexible in control of devices and implementing a wide range of sensors to capture various parameters.

“Voice Controlled Home Automation System using Natural Language Processing and Internet of Things”, by Mrs. Paul Jasmin Rani, Jason Bakthakumar, Praveen Kumar.B, Praveen Kumar.U, Santhosh Kumar.

The paper focuses on the construction of a fully functional voice based Home automation system that uses Internet of Things, Artificial Intelligence and Natural Language Processing (NLP) to provide a cost-effective, efficient way to work together with home appliances using various technologies such as GSM, NFC, etc. it implements a seamless integration of all the appliances to a central console, i.e. the mobile device. The prototype uses Arduino MK1000, known as Genuino MK1000. The NLP in this project gives the user the freedom to interact with the home appliances with his/her own voice and normal language rather than complicated computer commands. The appliances are connected to the mobile device through an Arduino Board that establishes the concept of Internet of Things. The Arduino Boards are interfaced with the appliances and programmed in such a way that they respond to mobile inputs.

### III. METHODOLOGY

- Hardware Embedding
- Sensor Value Extraction
- Android Application
- IOT
- Database Connectivity
- Control Application

### Working Microcontroller

A microcontroller is a computer present in a single integrated circuit which is dedicated to perform one task and execute one specific application. It contains memory, programmable input/output peripherals as well a processor.

Microcontrollers are mostly designed for embedded applications and are heavily used in automatically controlled electronic devices such as cellphones, cameras, microwave ovens, washing machines, etc.

### NODEMCU

Nodemcu is an open source IoT platform .It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "Nodemcu" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project , and built on the Espress if Non- OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS.

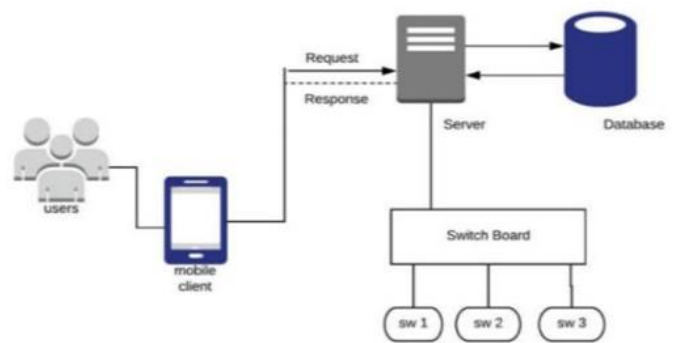


Fig. 1. Block Diagram

- The prototype establishes a wireless remote switching system of home appliances.
- The prototype uses Wi-Fi to establish wireless control, which gives an indoor range to about 150 feet.
- The command to switch on and off an appliance can be given from radio buttons on the application from one’s smartphone.

- There is also a provision developed to use voice commands on smartphone to remotely switch home appliances
- Any device capable of Wi-Fi connectivity can be used to control the prototype.
- The control over home appliances is obtained over secure connections, by SSL over TCP, SSH.
- Simple design easy to integrate into a verity of appliances and extend on further range.
- Displays the status of each appliances on the application in smartphone
- Cost effective.

#### IV. CONCLUSION

We proposed a fully automated IoT-based hierarchical framework for smart homes that takes advantage of edge-computing devices for data processing and storage. Related systems are proposed in the literature, but many of them cannot fully use the IoT-based platform.

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