

DEVELOPMENT OF IoT BASED SOLUTION FOR MONITORING AND CONTROLLING OF LOADS

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Abstract— In this paper, Internet of Things (IoT) conceptualizes the idea of remotely connecting and monitoring real world objects (things) through the Internet. When it comes to our house, this concept can be aptly incorporated to make it smarter, safer and automated. Our objective is to design with a low cost and flexible IoT (Internet of Things) Framework for monitoring and controlling of loads. These devices can be controlled through a mobile application called Blynk. And through VOICE COMMANDS also.

Keywords — Internet of Things, Automation, Voice Commands, Blynk App.

I. INTRODUCTION

Everyday modern people expect a new device and new technology to simplify their day-to-day life. The developers and researchers are always trying to find new things to provide comfort to the people. Now a days, Internet Connectivity became a part for many applications to provide access to information. However, these devices require more human interaction and monitoring through apps and interface. The Internet of Things is a new era of intelligence computing and it's providing a privilege to communicate around the world.

The foremost aim of technology is to increase efficiency and decrease effort. The most important thing that has been taking extreme importance is to simplify human interfacing with technology. With the advent of Internet of Things, it became easier. Automation is one such area that aims that increasing efficiency. Voice controlled automation system aims to further increase the cause of automation so as to achieve the goal of simplicity.

The primitive man realized that an effective way to communicate with one another is through voice. With minimum effort, ideas could be narrated with relative ease. However, with tremendous breakthroughs in the field, we are at the precipice of truly using voice to interface with devices.

Using this effective yet ingrained form of communication we would humanize technology to a great extent. Voice controlled Automation System deploys the use of voice to control devices.

One more important thing that comes under automation is security. It may be the crucial factor for automation. Home securities made a drastic change in the past few decades and continue to advance much more in the coming years.

Previously home security systems meant having an alarm that would go off when somebody would break in, but a smart secure home can do much more than that.

Wireless security and automation are the dual aspects of this project. In this project, we are introducing an IoT agent which is the brain of this architecture, and it controls the devices through the internet. At a very short period of time, the IoT agent receives the user data in the form of commands, which will be sent to control the systems through Google commands. The command will be received by Google assistant and control the devices.

II. INTERNET OF THINGS

The Internet of Things (IoT) in layman's terms. The Internet of Things (IoT) is a system of physical things embedded with sensors, software, electronics and connectivity to allow it to perform better by exchanging information with other connected devices, the operator or the manufacturer. The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that 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.

The Internet of things (IoT) is also known as internet of all connected devices or Web of things. The internet of things is a network just like the internet. It comes as significant change in how human interact with surroundings. To put it simply, this may be the idea of basically connecting any device to the on and off switch to the net. This incorporates from cell phone, coffeemaker, washing machines, headphones, lamps, wearable devices it.

Internet of things is a sensor-based network where any device connecting to the internet and any other connected device to exchange data over internet. Even the IoT is really just a huge network of connected things and people — all of which collect and share data regarding how they have been used and about the environment.

IoT is short for Internet of Things. The Internet of Things refers to the ever-growing network of physical objects that feature an IP address for internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems.

The IoT concept was coined by a member of the Radio Frequency Identification (RFID) development community in 1999, and it has recently become more relevant to the practical world largely because of the growth of mobile devices, embedded and ubiquitous communication, cloud computing and data analytics. Imagine a world where billions of objects can sense, communicate and share information, all interconnected over public or private Internet Protocol (IP) networks. These interconnected objects have data regularly collected, analyzed and used to initiate action, providing a wealth of intelligence for planning, management and decision making. This is the world of the Internet of Things (IoT). Internet of things common definition is defining as: Internet of things (IoT) is a network of physical objects. The internet is not only a network of computers, but it has evolved into a network of device of all type and sizes , vehicles, smart phones, home appliances, toys, cameras, medical instruments and industrial systems, animals, people, buildings, all connected ,all communicating & sharing information based on stipulated protocols in order to achieve smart reorganizations, positioning, tracing, safe & control & even personal real time online monitoring , online upgrade, process control & administration. We define IoT into three categories as below: Internet of things is an internet of three things: (1). People to people, (2) People to machine /things, (3) Things machine to things machine, Interacting through internet. Internet of Things Vision: Internet of Things (IoT) is a concept and a paradigm that considers pervasive presence in the environment of a variety of things/objects that through wireless and wired connections and unique addressing schemes can interact with each other and cooperate with other things/objects to create new applications/services and reach common goals. In this context the research and development challenges to create a smart world are enormous. A world where the real, digital and the virtual are converging to create smart environments that make energy, transport, cities and many other areas more intelligent.

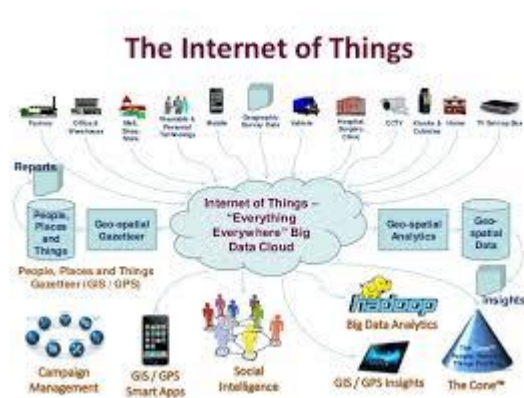


Fig. 1 Diagram of Internet of Things

III. Proposed method of IOT based solution for monitoring and controlling loads using IOT

Automatic switches operation(home and industrial appliances) Using IoT, control wherever we are without distance limitations. Using NODEMCU ESP8266 we can handle all Electrical appliances and Providing VOICE COMMANDS

IoT devices can be used to monitor and control the mechanical, electrical and electronic systems used in various types of buildings (e.g., public and private, industrial, institutions or residential), home automation and building automation systems. In this context, three main areas are

being covered in literature: The integration of the Internet with building energy management systems in order to create energy efficient and IOT-driven "smart buildings".

The possible -means of real-time monitoring for reducing energy consumption and monitoring occupant behaviors. The integration of smart devices in the built environment and how they might to know how to be used in future applications.

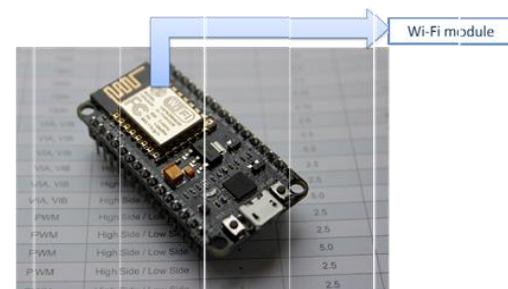
NODEMCU ESP8266

NodeMCU is an open-source platform-based firmware developed for ESP8266 Wi-Fi chip. By exploring functionality with ESP8266 chip, NodeMCU firmware comes with ESP8266 Development board/kit i.e. NodeMCU Development board. Since NodeMCU is open-source platform, their hardware design is open for edit/modify/build.

NodeMCU Dev Kit/board consists of ESP8266 Wi-Fi enabled chip. The **ESP8266** is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer ESP8266 Wi-Fi module.. For more information about NodeMCU Boards available in market refer NodeMCU Development Boards.

NodeMCU Dev Kit has **Arduino like** Analog (i.e. A0) and Digital (D0-D8) pins on its board. It supports serial communication protocols i.e. UART, SPI, I2C etc. Using such serial protocol. we can connect it with serial devices like I2C enabled LCD display, Mag6.netometer HMC5883, MPU-6050 Gyro meter + Accelerometer, RTC chips, GPS modules, touch screen displays, SD cards etc.

Node MCU is the Wi-Fi equivalent of Ethernet module. It combines the features of Wi-Fi access point and station microcontroller. These features make the Node MCU extremely powerful tool for Wi-Fi networking. It can be used as access point and/or station, host a web server or connect to internet to fetch or upload data.



The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.

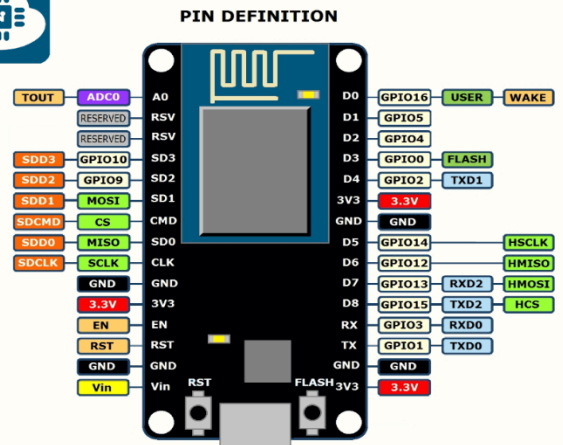
3.2.2 Features

- Arduino-like (software defined) hardware IO.
- Can be programmed with the simple and powerful Lua programming language or Arduino IDE.
- USB-TTL included, plug & play.
- 10 GPIOs D0-D10, PWM functionality, IIC and SPI communication, 1-Wire and ADC A0 etc. all in one board.

- Wi-Fi networking (can be used as access point and/or station, host a web server), connect to internet to fetch or upload data.
- Event-driven API for network applications.
- PCB antenna.



NodeMCU ESP-12 development kit V1.0



Arduining.com

Pin configuration of NodeMCU development board

I/O index	ESP8266 pin
0	GPIO16
1	GPIO5
2	GPIO4
3	GPIO0
4	GPIO2
5	GPIO14
6	GPIO12
7	GPIO13
8	GPIO15
9	GPIO3
10	GPIO1
11	GPIO9

This module provides access to the GPIO (General Purpose Input/ Output) subsystem. All-access is based on the I/O index number on the Node MCU dev kits, not the internal GPIO pin. For example, the D0 pin on the dev kit is mapped to the internal GPIO pin 16; the D1 pin on the dev kit is mapped to the internal GPIO pin 5 the D2 pin on the dev kit is mapped to the internal GPIO pin 4, the D3 pin on the kit is mapped to the internal GPIO pin 0.

NodeMCU pin configuration
 Node MCU provides access to the GPIO (General Purpose Input /Output) and pin mapping table is part of the API documentation.

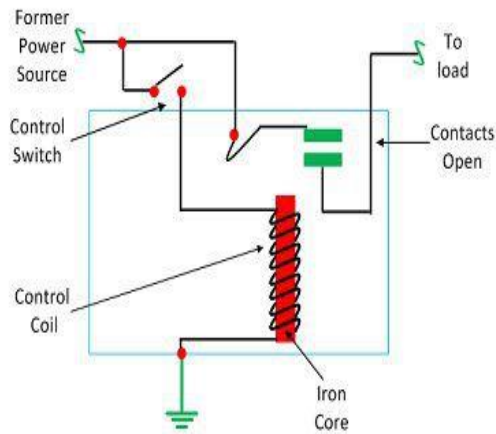
GPIO Pins of the NodeMCU

The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer Espressif Systems. The successor to these microcontroller chips is the ESP32, released in 2016.

Principle of Relay

There are two fixed contacts, a normally closed and a normally open. When the coil is not energized, the normally open contact is the one that is off, while the normally closed one is the other that is on. Add a certain voltage to the coil and some currents will pass through the coil thus generating the electromagnetic effect. So the armature overcomes the tension of the spring and is attracted to the core, thus closing the moving contact of the armature and the normally open contact (or you may say releasing the former and the normally closed contact). After the coil is de-energized, the electromagnetic force disappears and the armature moves back to the original position, releasing the moving contact and normally closed contact.

Working Principle of Relay, it works on the principle of an electromagnetic attraction. This magnetic field moves the relay armature for opening or closing the connections. The small power relay has only one contact, and the high power relay has two contacts for opening the switch. Add a certain voltage to the coil and some currents will pass through the coil thus generating the electromagnetic effect. So the armature overcomes the tension of the spring and is attracted to the core.



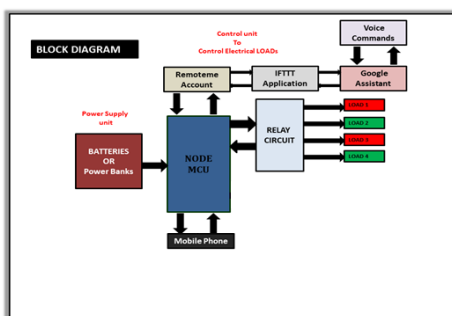
Working Principle of Relay

IV. WORKING AND RESULTS

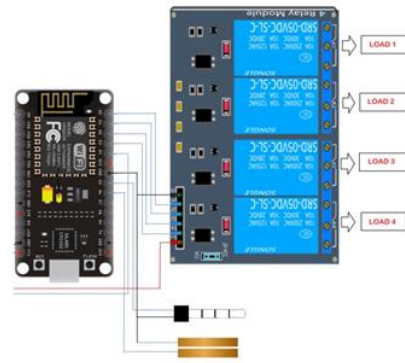
The work is divided into two parts

1. Monitoring and Controlling loads or Electric appliances by using voice commands with Google Assistant Application.
2. Security system for home, automatic photo capturing and uploading into Google drive with a notification on the Mobile phone.
3. The loads are switched on when the given voice commands to the Google Assistant are matched with the Code present in the NODEMCU then the signal gets triggered from the IFTTT and Remote Me Cloud and it drives the particular load relay. Similarly, the loads are switched off only when the NODEMCU gets the OFF signal from Remote Me Cloud i.e. from the user.
4. In Home Security System we are using a Headset audio jack pin which is connected to the smartphone, when the mic slot and ground slot of the audio jack pin is shorted the photo is captured in the mobile phone.
5. During day times in order save energy we are using LDR sensor i.e. During day time LDR sensor is acts as a photo resistor that is stops signal(turns OFF) to the light during day times and turns ON the light during night times nothing but acts like a Automatic Street Light.

BLOCK DIAGRAM

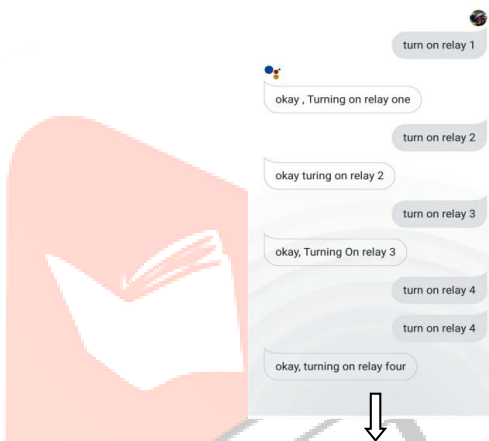


CIRCUIT DIAGRAM



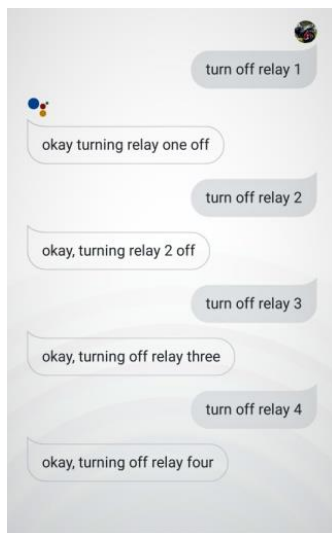
RESULT

The experimental model was made according to the circuit diagram and the results were as expected.



Switching ON the loads using Google Assistant

The loads are switched on when the NODE MCU gets the signal correctly from IFTTT to RemoteMe Server and it drives the particular load relay correctly. The loads are switched on only when the NODEMCU gets the on signal from IFTTT to RemoteMe i.e. from the user



V. CONCLUSION

Here we have used NodeMCU which has inbuilt Wi-Fi module to control relays locally as well as globally. It is one of the easiest and most pocket friendly home automation and security control system based on IoT. The project proposes an efficient implementation of IoT (Internet of Things) used for monitoring and controlling the home appliances via World Wide Web. Home control system uses the portable devices as a user interface. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like Wi-Fi etc. The user here will move directly with Mobile through a Android, Google Assistant Application over the web, whereas home appliances like lights, fans etc are remotely controlled through easy Google Assistant app. The server will be interfaced with relay hardware circuits that control the appliances running at home. The server communicates with the corresponding relays and also automatically loads are switched on/off based on Sunlight. In the of Home security system mobile phone is connected with headset jack pin and configured with automatically backup option in the Google drive, depending on the contact strips opening and closing on the door the image will be captured and sends to Google drive. By this we provide a climbable and price effective control System.

VI. REFERENCES

- [1] Riyale M.Tazil, "Bluetooth Based Home Automation System Using Cell Phone", 2011 IEEE 15th International Symposium on Consumer Electronics, 978-1-61284-842-6/11©2011 IEEE
- [2] Sushma P,Roopa M J , "Wi-Fi Based Home Automation Using Android & Arduino Platform", IJRASET, Volume 5 Issue VI, June 2017, ISSN: 2321-9653
- [3] Y Laxmana Rao,P Hari Babu,V Prasad,T Srinivasa Rao, "Home Automation using Radio Frequency",IJEETE, Vol-03,Issue-04,2016,259-263
- [4] Aayush Agarwal, Anshul Sharma , Asim Saket Samad , S Babeetha, "Home Automation using Google Assistant" , IJARIE-ISSN(O)-2395-4396,Vol-4 ,Issue-2, 2018
- [5] Manish Prakash Gupta, "Google Assistant Controlled Home Automation", IRJET,Vol-05,Issue-05,May-2018, e-ISSN: 2395-0056, p-ISSN: 2395-0072
- [6] A.O.Otuoze, N.T.Surajudeen-Bakinde, A.T.Abdulrahman and O.H. Isiwepeni, "Implementation of a Cloud-Based Home Automation



Switching OFF the loads using Google Assistant

The loads are switched off when the NODE MCU gets the signal correctly from IFTTT to Remote Me Server and it drives the particular load relay correctly. The loads are switched on only when the NODEMCU gets the on signal from IFTTT to Remote Me i.e. from the user.



System”, Centrepoint Journal Volume 22. No. 1 (2016),50-69

- [7] Govinda K and Sai Krishna Prasad K and Sai ram susheel 2014 Intrusion detection system for smart home using laser rays International Journal for Scientific Research &Development (IJSRD) 2 176-78
- [8] Sowjanya G and Nagaraju S 2016 Design and Implementation Of Door Access Control And Security System Based On Iot Inventive Computation Technologies (ICICT),International Conference on Inventive
- [9] Lee C T, Shen T C, Lee W D and Weng K W 2016 A novel electronic lock using optical Morse code based on the Internet of Things Proceedings of the IEEE International Conference on Advanced Materials for Science and Engineering eds. Meen, Prior & Lam
- [10] Pooja P, Mitesh P, Vishwa P and Vinit N 2016 Home Automation Using Internet of Things Imperial Journal of Interdisciplinary Research (IJIR) 2 648-51
- [11] Anitha A, Paul G and Kumari S 2016 A Cyber defence using Artificial Intelligence International Journal of Pharmacy and Technology 8 25352-57
- [12] .Anitha A, Kalra S and Shrivastav 2016 A Cyber defence using artificial home automation system using IoT International Journal of Pharmacy and Technology 8 25358-64

