



Smart Quality Check for Home Appliances Using IoT

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Abstract *In the past few years, technology has grown in a high speed. Now a day's humans are constantly using electronic devices and appliances. In today's world advancement of technology in the fields of automation is getting simpler and better in all aspects. The internet users were increased rapidly over the past few years. Smartphones have played a very important role in helping users with much better internet service and much better internet service and different online applications. The smart quality checker is used to determine the quality of home appliances using raspberry pi and IOT. An RTC is used to determine the run time of the program and update this information to cloud using IOT. This information can be viewed through the mobile app. By determining the runtime, it becomes of great use to the second-hand buyers and the manufacturers. Password protection is used to allow only authorized users to use the system. The system works on online with the help of smartphone.*

Keyword: *Internet of things (IoT), Raspberry pi (model zero W), RTC, Cloud.*

1. INTRODUCTION

In the development of technology, the technology has become the integrated part of people's lives. It has Social interaction and ease of transportation. The computer has caused many people to rely on technology to communicate with their friends, store information such as pictures, documents etc., Internet helps

and continues to influence many aspects of daily life and has allowed better us to bring in with immediate solution for many problems and able to connect from any of remote places which contributes to overall cost reduction and energy consumption [1].

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IOT refers to networked connection of everyday objects, which are often equipped with more intelligence. IOT will increase the use of internet by integrating every device for interaction via embedded systems, which leads to distributed network of devices communicating with objects as well as other devices.

IOT is opening lot of opportunities for large number of applications that promise to improve the quality of our lives. Internet of things allows the sense of control across different objects with the help of a network infrastructure. Statistics show that IOT will consist of more than 50 billion objects by 2020. Integration of internet to various objects will have unique IP addresses through which they will be connected. Embedded objects will have low cost, low hardware and limited resources. IOT systems are responsible for only sensing things but also for reacting to any command or performing actions. IOT systems are less complex with better space complexities and easy architecture. It plays an important role in providing secure and flexible environment and it also maintains the living standard [2].

The quality of the home appliance is determined by its run time. Now, this run time is monitored using IoT (Internet of Things). Raspberry Pi is the master controller. Android application is developed in order to interface the real time data from the device to that with the server where the run time of the data is stored. In order to create the application, UBIDOTS website is used which allows the user to customize the application depending upon their needs. It allows to include several parameters such as graphs, charts, maps, Tables etc., The devices whose runtime is to be calculated are interfaced with the Raspberry pi zero w. Whenever the device is on, the runtime of the device is automatically calculated which will be displayed in the application on smart phone.

The section 2 surveys about the existing system and its applications which describes about the Home Automation using IoT. The section 3 describes about our proposed word. The section 4 deals with the materials and methods used in the article. The section 5 explains about the simulation and result. The section 6 concludes our article.

2. EXISTING SYSTEM

2.1 IOT Based Home Automation Using Raspberry PI

This paper provides the IOT design which uses raspberry pi. The aim of the paper is to develop the home automation with mobile devices for the controlling of home appliances with the help of raspberry pi. Raspberry pi has a various communication media such as Ethernet port, HDMI port USB port, Bluetooth etc., the local server is created on the raspberry pi. Through the different mobile devices like smart phones, laptops, Tablets the home appliances can be controlled with the help of UI which is created on the web page [3].

The major elements used in this paper are raspberry pi and the relay module with their driving circuitry. The entire block diagram is divided into 2 sections. The first one was server side and it is installed on the

raspberry pi and another one was client side. With the help of LAPM (Linux, apache, PHP, MySQL). Here two PHP files are created on the server of the raspberry pi which consists of 40 GIPO pins. The home appliances are controlled with the help of these pins.

User side is nothing but a client side. With the help of internet, the mobile devices and the raspberry pi were accessed by the user. The IP address of the raspberry pi is put into the browser of the mobile devices and hence the user connects the mobile devices with the network means the user was able to saw the web page that contains UI to control home appliances in each room. The UI shows the numbers of home appliances and the rooms. Buttons are also present there for toggle the status of home appliances of each room [4]. The block diagram is shown in Figure 1.

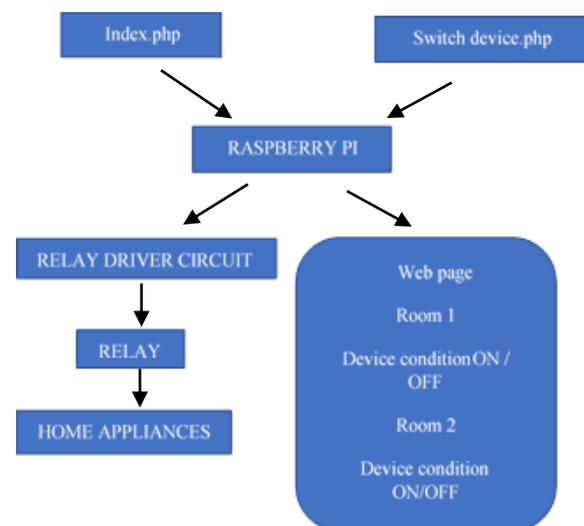


Figure: 1 Block Diagram of IOT based home automation system

2.2 IOT Based Smart Security and Home Automation System

This paper mainly focused on the development of the smart wireless home security system that sends the alerts to the owner with the help of internet in case of any trespasses and optionally it raised the alarm. The micro controller used in this paper was TI-CC3200 Launched board with an embedded micro controller and an on board WIFI shield which makes use of all the home appliances inside the home and that can be controlled and managed [5].

The aspects of this paper are wireless home security and home automation. This system sends an alert to the owner by means of voice calls that uses internet when any movement of humans are noticed near the entrance of his house [6] At the same time, the person entered his house was not a stranger means the user instead of triggering the alarm he can decide like

opening the door and switching on various appliances that are all connected and controlled to the micro controller in the system. It also ensures that the user itself entered the room means he can virtually make the decision by using the system for controlling the home appliances at his doorstep [7]. The status and alerts of the system can be viewed and accessed by the user from anywhere even when the internet connectivity is poor.

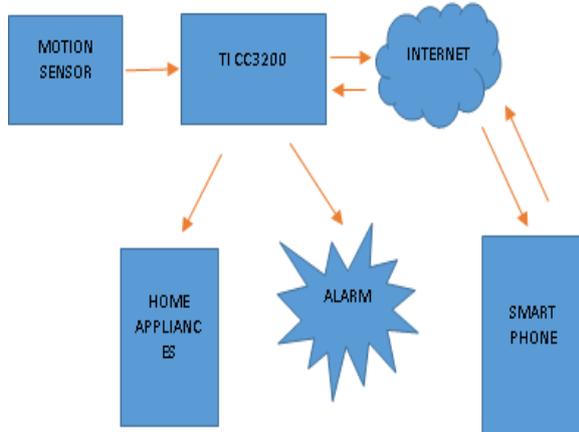


Figure: 2 Block Diagram

2.3 Implementation of Smart Home Automation System through E-Mail Using Raspberry Pi and Sensors

The main objective of the paper is to automate devices i.e., home appliances via E-mail that uses raspberry pi and it has system security by using sensors like PIR, LPG, temperature sensors. With the help of this system the problems can be avoided. [8]With the help of python language, the algorithm was developed which is the default programming language of python. The system sends the E-mail to the newly generated E-mail Id about the current status of the devices and sensors.

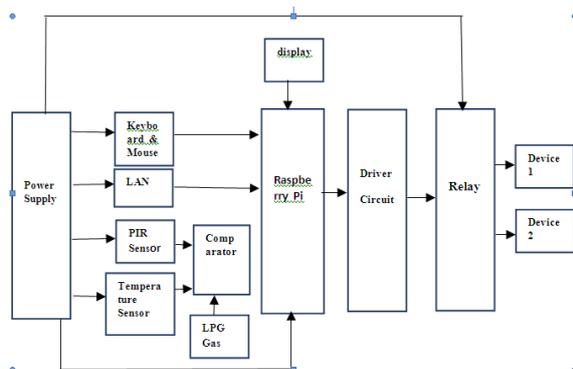


Figure: 3 Block Diagram

Email is intimated with the output. Switching action of the device and sensors are indicated by LEDs. Raspberry pi, sensors like LPG gas, PIR, temperature and HDMI display are included in the system. The above diagram shows the block diagram of smart home automation system through Email using raspberry pi and sensors [7].

2.4 Internet of Things (IOT) Based Smart Home Automation

The main objective of this paper deals with design, concept and implementation of IoT (Internet of things) depends on smart home automation with remotely connecting and monitoring through internet [9]. The paper mainly focused on controlling and handling the wireless home security system for better authentication and energy efficiency of the system. System uses the web as well as smart phone for controlling purpose.[10] It uses an Arduino board with different types of sensors to make system effective because it is easy and flexible to use. only authorized users can use the system due to password protection [11]. By using the smartphones systems works in online as well as in offline with the help of web. Using various sensors make smart home efficient and secure and it controls large number of appliances or devices at a time. The block diagram is shown in Figure 4.

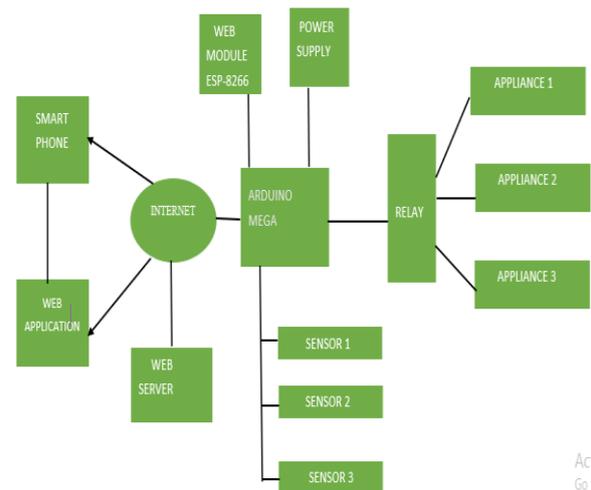


Figure: 4 IOT based home automation

2.5 Android Based Home Automation System Using Bluetooth and Voice Command

This paper explains about home automation system by using smartphone to operate all the home appliances [12]. The system consists of three components such as an Arduino microcontroller for the appliances to connect with Bluetooth module for signal transformation, and a smartphone is used for the android ap-

plication. The system also supports for naïve users by providing the voice command by command sensor. It decodes the user’s voice command and extracts the meaning of his command [13]. The paper mainly focused on the design of proposed system and its features. Home appliances are connected to the standalone Arduino BT board using relays and with the help of the Bluetooth Arduino interacts with smartphone. The main aim of this system development is low cost and scalable depends on the requirements and used for password authentication for security purpose. The block diagram is shown in Figure 5.

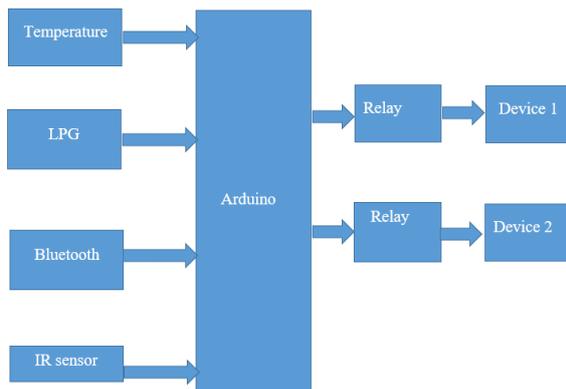


Figure: 5 Block Diagram

3. PROPOSED SYSTEM

Android application is developed in order to interface the real time data from the device to that with the server where the run time of the data is stored. Raspberry Pi is the master controller. The devices are turned on and with the help of RTC (Real Time Clock) the run time data is uploaded to the server. User and manufacture log in are the important aspect of IoT that is it can be made secure by setting password. In this proposed system, the run time of the product is determined with built-in RTC in the Raspberry pi zero. This calculated runtime is updated to the cloud with the help of IOT. Both the second-hand buyers and the manufactures can have access to the updated information. This system becomes of great use to the second-hand buyers as well as the manufacturers in determining the quality and standard of any product.

The working of this proposed system is illustrated as follows: The products whose runtime is to be calculated are interfaced with raspberry pi zero w. The raspberry pi is programmed in such a way that whenever the product is ON it immediately starts calculating the runtime of the device until the product is OFF. This calculated runtime can be viewed with the help of a mobile app “UBIDOTS”. In order to view the runtime information, initially we will have to modify our app in the UBIDOTS website.

UBIDOTS allows us to add charts, graphs, Tables etc., In our paper we have decided to use Table. There are two different Tables in UBIDOTS namely historical and last value Table. The historical Table describes each detail from the initial state but whereas the last value Table, as the name itself indicates it displays only the last value.

The client and the manufacturers should install UBIDOTS in their smartphones. It consists of a login and the password which is unique for each product. The manufacturers should share the login id and password with their clients so that the clients can later use it for reselling the product. With this login id, the user can view the details of the product whenever and wherever they login. The block diagram of the proposed system is shown in Figure 6.

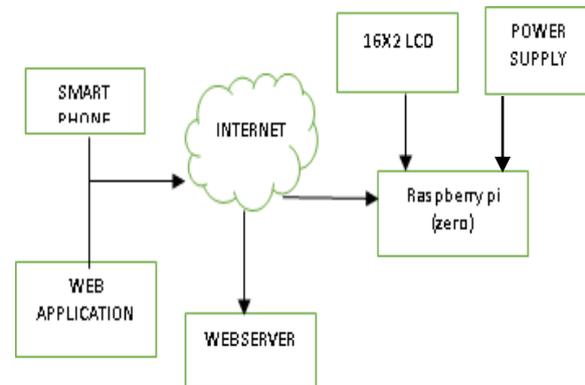


Figure: 6 Block Diagram of Proposed System

4. MATERIALS and METHODS

4.1 Smart Phones

Smart phones are defined to be enhanced mobile phones that perform functionalities other than typical phone. These advanced or elaborated features can be anything from email and internet to a full key board. It offers more advanced connectivity and facility than a normal phone. In general, a smart phone will be based on operating system that allows it to run applications. It includes cameras to take pictures. Lollipop, marsh mellow, nougat and Oreo are the various versions of smart phone.



Figure: 7 Smart phones

4.2 Power Supply

An electrical load is supplied with electric power by an electrical device is known as power supply. Power supply is used to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, Power supplies are often referred as electric power converters. All power supplies have a power input connection, which receives energy in the form of electric current from a power source, and one or more power output connections that deliver current to the load. The input and output are usually hardwired circuit connections, in spite of some power supplies employ wireless energy transfer to power their loads without wired connections. Some power supplies have other different types of inputs and outputs as well, for functions such as external monitoring and control.



Figure: 8 Power supplies

4.3 Raspberry Pi Zero

Raspberry pi is a card sized minicomputer it includes several features such as Bluetooth, WIFI, camera, RTC etc., Raspberry Pi and their models are used as desktop computer, which is the heart of a media center and other applications. Raspberry Pi's are used for enormous number of purposes which includes Internet of Things (IoT) devices.

The cost of raspberry pi module is comparatively low so most of IoT automated home appliances using raspberry pi module.

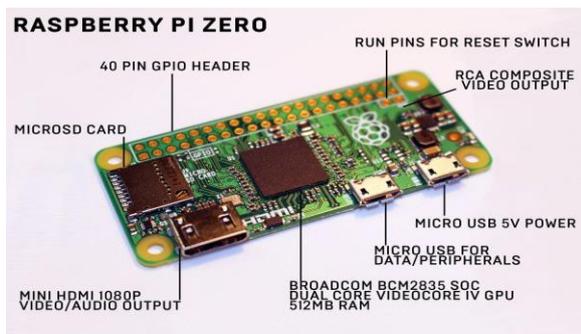


Figure: 9 Raspberry pi zero Module

4.4 Relay Module

A switch which could be operated electrically is known as relay, which could be done with the help of

an electromagnet to mechanically operate a switch which could also done by other operating principles such as solid-state relays. An electric device is an automatic device which senses an abnormal condition of electric circuits and its contacts.

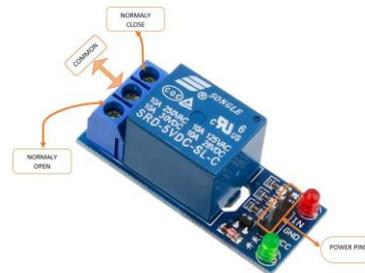


Figure: 10 Relay module

Relays are used to control a circuit by a separate low-power signal, or where circuits must be controlled by one signal. The electrical relays could be used to allow low power electronic or computer type circuits to switch respectively high currents or voltages both ON or OFF, some form of relay switch circuit is required to control it.

4.5 LCD

The technology used for displays in notebooks and other similar smaller computers is known as LCD (liquid Crystal display). Similar to light-emitting diode (LED) and gas-plasma technologies, it allows displays to be thinner than cathode ray tube (CRT) technology. It consumes less power and economical than LED and gas-display displays, because LCD works on the principle of emitting light rather than emitting it. Either a passive matrix or an active matrix display grid is used to make an LCD. It is used in screens for mobile devices, like laptops, Tablets, and smartphones.



Figure: 11 LCD module

5. SIMULATION OUTPUT

UBIDOT is the well-known platform for developing applications for Android smartphones. UBIDOTS provides a platform for the users or the developers for providing the useful information that is easily captured by the sensor data. By using the UBIDOTS we

can send data to the cloud from anywhere i.e., Internet-enabled device. It is mainly used to configure the actions and alerts based on the real-time data and unlock the value of data via visual tools. It offers a REST API that allows to read and write data to the available resources such as: data sources, variables, values, events and insights. API supports both HTTP and HTTPS for that an API Key is required. UBIDOTS helps to create applications that capture real-world data and change it into meaningful actions. The below Figure shows the UBIDOT application.

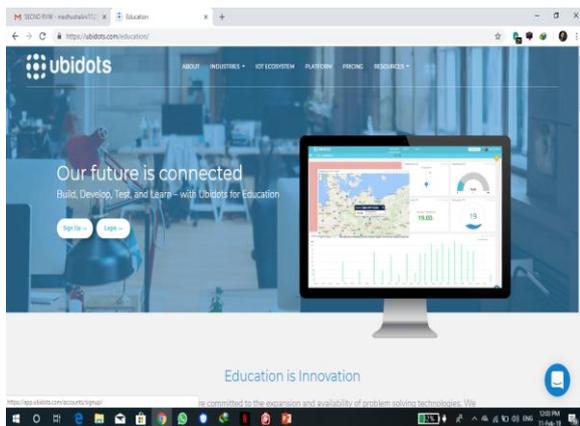


Figure: 12 UBIDOTS

Python is a programming language used to create or develop software and application all around the world. The login type is shown in Figure 13.

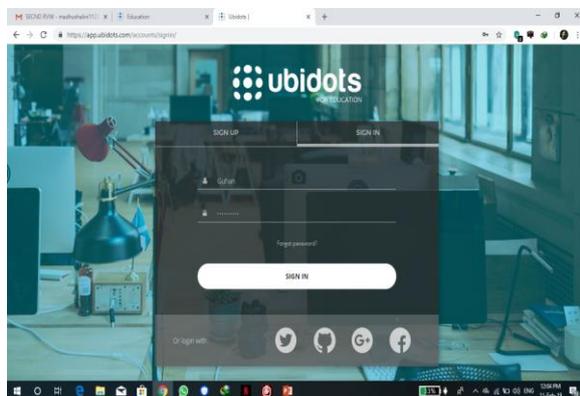


Figure: 13 First Page (Login)

First page is for the admin login or as well as the manufacturer login to view the run time of the appliances. When the device is turned on means the run time of the appliances is calculated by the RTC which is inbuilt in the raspberry pi. The ON and OFF time of the appliances will be updated to the cloud. With the help of the relay module the load can be switched based on the requirements of the user.

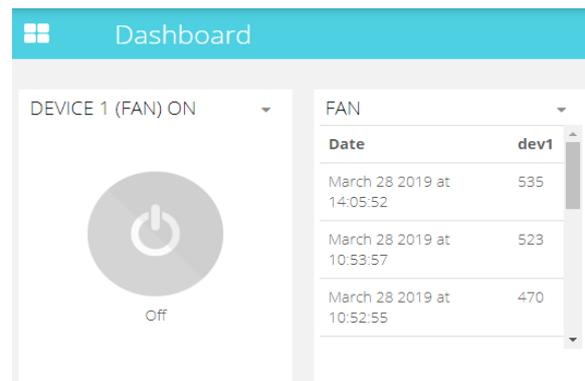


Figure: 14 second Page (Run time of device 1 Fan)

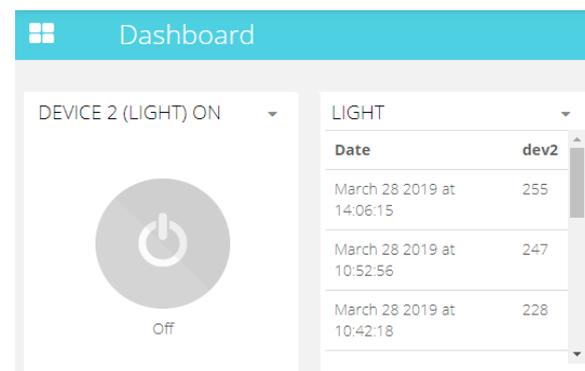


Figure: 15 Third Page (Run time of device 2 Light)

6. CONCLUSION

After examining the reference papers on various home automation field such as IOT based home automation using raspberry pi, IOT based smart security and home automation system, implementation of smart home automation system through e-mail using raspberry pi and sensors etc., the smart quality check for home appliances can be proposed which is the advancement technology of the survey works. It will help the user, manufacturer and also the second-hand buyers who needs the information or feedback about their products or home appliances. In future, this methodology can be used for several other advanced appliances such as fridge, washing machine, air cooler etc., and also automobiles. This can also be developed as a start-up business that can provide service to web-sites such as Quikrr and olx.

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