

# **A Intelligence Communication Protocol Based Monitoring and Control Home Appliances**

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**ABSTRACT:** The project revolves around creating a home automation system with the main focus being controlling the electrical appliances through an android application. In recent years, there has been a rapid introduction of network enabled digital technology in the field of home automation. This paper deals with the design and control of the home automation system using raspberry pi as the central device, a web server a router and an android application on any smart phone which would act as a user interface. The proposed system is in no need of a dedicated PC with respect to similar systems and offers novel communication protocol to monitor and control the home environment with more than just the switching functionality. The mobile device will communicate with a home automation network through an internet gateway, but cannot directly communicate with the devices in the network. In this project the android devices would control the home appliances using the internet and raspberry pi as the server system. The relay circuit board will be interfaced by the raspberry pi. This relay circuit board will control the home appliances.

**KEYWORDS:** Raspberry, relay, RF, buzzer, PIR, temp sensor, LDR sensor

## **I. INTRODUCTION**

The motivation for developing smart home systems comes from many reasons, but most prominent are convenience, security, energy management, connectivity and luxury. Smart Home systems are one of the newer areas of research that have not been fully integrated into our society. This is because the research requires many other disciplines of research and engineering to produce a functional smart home. The cost of installing a smart home is also a large hindrance to the emergence of smart home systems into the market. The extra cost of the install is from the fact that even though a majority of homes were built in the near past, technology has been growing exponentially. This means that most homes were built before this technology was available, and this creates a barrier for the development and sales of smart home systems. However the technology is becoming better and cheaper, and this will help to make smart home systems an expense worth having when new homes are being built. The biggest motivation behind smart home systems is the convenience. Convenience is really another way of saying "time saver", and into day's world where everything is moving faster, every second has value. Most of the technology we use today is based of convenience, for example cars get us where we need to go faster, phones get us information from other people faster, and computer's get work done faster. Smaller conveniences in the home will be desirable because they allow the home to save the user time as well. There are already many convenient technologies in the home like the dishwasher, washing 3 machine, and microwave ovens. These technologies are more mechanical in nature and often there are much less computerized conveniences in the home. A Smart home systems goal is to introduce the benefits of computerized technology. For example, when using the smart home system, the user will not need to walk around turning off lights, they can save that little bit of extra time by just pressing a button on their phone, or even have the lights programmed to shut off after a certain amount of time. Maybe there is some music on the user's computer they would like to play on a sound system, smart home systems will allow the user to play the music from where ever they are without needing to go to their computer, find the song, and make sure the song is in a playable format for their sound system. There are many other small conveniences provided from the smart home.

Another reason for motivation on selecting this product is connectivity. The idea of connectivity is that having things connected results in communication or the transfer of information. By connecting everything in the home, so that everything can talk to each other, information about the home is easily attained. There are many benefits to increasing the amount of information available. Research and analysis are one of the main benefits because data extraction is

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much easier when things are connected into a single network. For example connectivity will lead to data extraction possibilities like how much power certain appliances or 4 components are using. Connectivity also increases control over assets. By having the data to make informed decisions the control of the home is increased.

## A. METHODOLOGY

Home automation is the control of any or all electrical devices in our home or office. There are many different types of home automation system available. These systems are typically designed and purchased for different purposes. In fact, one of the major problems in the area is that these different systems are neither interoperable nor interconnected. There are number of issues involve when designing a home automation system. It should also provide a user friendly interface on the host side, so that the devices can be easily setup, monitored and controlled. In smart home systems, the internet is also use to ensure remote control. For years, the internet has been widely use for the processes such as surfing on the pages, searching information, chatting, downloading and installation. By the rapid developments of new technologies, monitoring, controlling services have been started to be served along with internet as an instrument providing interaction with machinery and devices. The system can be use in several places like banks, hospital, labs and other sophisticated automated system, which dramatically reduced the hazards of unauthorized entry. The main reason to develop this system is to save time and man power along with maintaining security and convenient.

## B. BACKGROUND

Home automation system can be referred as a system which replaces human interactions by controls. This used connecting sensors and Internet of Thing (IoT). Devices uses internet to connect to each other and operate further. Internet of Thing is a dust that turns the automated home into the smart home. Internet of thing allows object to be controlled and sensed. Home automation is used for connecting various electrical devices in our home or office. These automation systems are designed or manufactured according to need of customer. Using home automation we can control devices remotely i.e. we can control lights, A.C., Cooking Stove, room temperature etc. Home automation systems are used for power saving. Home automation system requires computers which are large as well as heavy to carry around .In our project we are using Raspberry Pi which works as a card size computer and remove the overhead of carrying heavy size tools from one place to another place

## C. PROBLEM STATEMENT

Home automation is gaining popularity as one of the most notable applications of Internet of Things. Smart homes involve numerous gadgets and sensors which communicate and act autonomously. One major challenge for smart homes is ensuring their correctness and security. What if the controller of one device incorrectly sends commands to another device? What if personal information about the owner is sent to the cloud without permission or proper anonymization.

## II. REVIEW OF LITERATURE

“A Review of Smart Homes—Past, Present, and Future” Muhammad RaisulAlam, Student Member, IEEE, Mamun Bin IbneReaz, Member[1] A smart home is an application of ubiquitous computing in which the home environment is monitored by ambient intelligence to provide context-aware services and facilitate remote home control. A brief discussion on the building blocks of smart homes and their interrelationships is presented. It describes collective information about sensors, multimedia devices, communication protocols, and systems, which are widely used in smart home implementation. Advantage dwellings for comfort, healthcare, safety, security, and energy conservation. Disadvantage Necessary to healthcare service provider will consider the smart home an effective way of providing remote healthcare services, especially to the elderly and disabled who do not require intensive healthcare support

“Online SHM Optical Scanning Data Exchange” Wendy Flores-Fuentes, Juan I. Nieto-Hipolito[2] Online SHM Optical Scanning Data Exchange can provide practical monitoring and useful information for people associated with Structural Health Monitoring. The information obtained from the monitoring process can contain data about the behavior of structures such as bridges, buildings, tunnels or dams Possibility to test and monitoring the data remotely, improve our results.

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“A Survey of Research on Cloud Robotics and Automation” Ben Kehoe, Student Member, IEEE, SachinPatil, Member, IEEE, Pieter Abbeel, Senior Member[3]The Cloud infrastructure and its extensive set of Internet- accessible resources have potential to provide significant benefits to robots and automation systems. We consider robots and automation systems that rely on data or code from a network to support their operation, i.e., where not all sensing, computation, and memory is integrated into a standalone system. access to libraries of images, maps, trajectories, and descriptive data ,access to parallel grid computing on demand for statistical analysis, learning, and motion planning, use of crowd sourcing to tap human skills for analyzing images and video, classification, learning, and error recovery

“Advanced Universal Remote Controller for Home Automation and Security” Taewan Kim, Hakjoon Lee, and YunmoChung[4]

We need several receivers with wired or wireless communication methods to be connected to all appliances. The receivers have many channels and IDs to control many appliances at the same time and to support multi-zone services. In addition, we propose a PC-based interface for end-users to use the URC conveniently.Home automation and security

“A Remote Pointing Device by Using Modulated IR Signals with a 2-D Striped Pattern” Kwangjae Lee, Yong Sin Kim, Yong Wang, Suki Kim, Senior Member[5]Handheld pointing devices are increasingly in demand in digital TV market to provide intuitive human–device interfaces (HDIs). HDIs with directional buttons, joysticks, and trackballs are not very intuitive owing to their limited motions. To overcome this problem, cameras, gyroscopes, or ultrasonic sensors have been incorporated into HDIs at the expense of higher power consumption.With less mental effort, more natural, operation than the conventional devices. In low power Performance

“Energy-Responsive Aggregate Context for Energy Saving in a Multi-Resident Environment” Ching-Hu Lu, Member, IEEE, Chao-Lin Wu, Member, IEEE, Tsung-Han Yang, Hui-Wen Yeh, Mao-Yung Weng[6] Human activity is among the critical information for a context-aware energy saving system since knowing what activities are undertaken is important for judging if energy is well spent. Most of the prior works on energy saving do not make the best of context-awareness especially in a multiuser environment to assist the energy saving system.User to provoke more spontaneous energy saving, improve readability

“Brain Machine Interface System Automation Considering User Preferences and Error Perception Feedback” Christian I. Penalzoza, Yasushi Mae, Francisco F. Cuellar, Masaru Kojima, and Tatsuo Arai[7]The problem of mental fatigue caused by prolonged use of Brain Machine Interface (BMI) Systems. We propose a system that gradually becomes autonomous by learning user preferences and by considering error perception feedback. As a particular application, we show that our system allows patients to control electronic appliances in a hospital room, and learns the correlation of room sensor data, brain states, and user control commands.Used to correct system’s mistakes and improve its learning performance, error detectioncapabilities, and hospital room environmentNecessary to intend to test our system with disabled people to validate the usability and performance of the system.

**III.SYSTEM ARCHITECTURE**

**A. PROPOSED ARCHITECTURE**

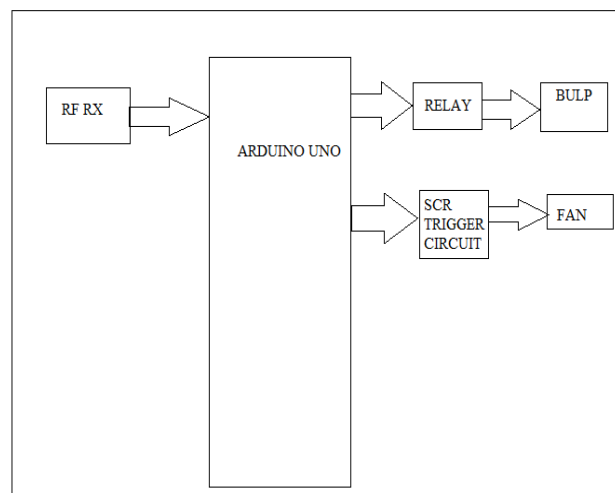
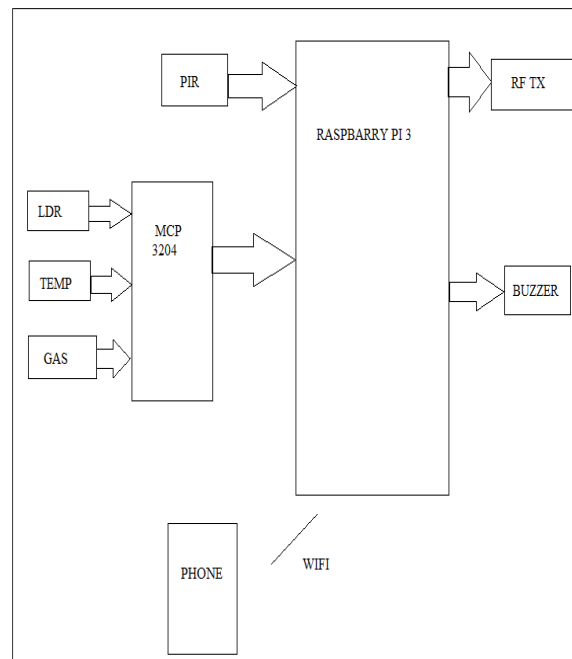


Fig.1. block diagram

**Working :**

Temperature sensor, gas sensor and LDR sensor detect the value of temperature, smoke and light intensity. PIR sensor detect the object or person than buzzer is on. these data send to mobile app by wifi. RF module send sensor information to Arduino. in Arduinobulb and fan control by Relay and SCR trigger circuit.

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Raspberry pi 3 board:

Raspberry Pi is a credit-card-sized single board computer developed in the UK by Raspberry Pi foundation with the intention of stimulating the teaching of basic computer science in schools. It has two models; Model A has 256 Mb RAM, one USB port and no network connection. Model B has 512 Mb RAM, 2 USB ports and an Ethernet port. It has a Broadcom BCM2835 system on a chip which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and an SD card. The GPU is capable of Blu-ray quality playback, using H.264 at 40MBits/s. It has a fast 3D core accessed using the supplied OpenGL ES2.0 and Open VG libraries. The chip specifically provides HDMI and there is no VGA support. The foundation provides Debian and Arch Linux ARM distributions and also Python as the main programming language, with the support for BBC BASIC, C and Perl, detailed description of Raspberry Pi board has been given in Fig. 2 (Raspberry Pi user guide). Python was chosen as the main programming language, as it is generally accepted to be both easy to learn and a fully fledged, programming language suitable for real world applications. With the addition of NumPy, SciPy, Matplotlib, I Python, and PyLab, Python can be used for computational mathematics as well as for the analysis of experimental data or control systems. Due to the unique advantages of the Raspberry Pi system, this technology holds great promise for providing solutions within the developing world. The most distinctive feature of the Raspberry Pi when used for educational purposes is the GPIO module

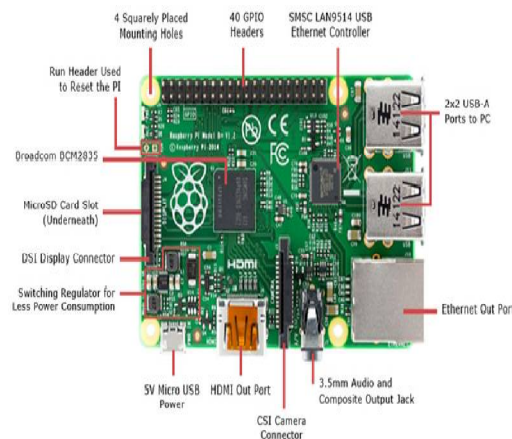


Fig.2. Raspberry Pi Board

Developed by Acorn Computers back in the late 1980s, the ARM architecture is a native uncommon sight in the desktop world. Where it excels, however, is in mobile devices the phone in your pocket almost certainly has at least one ARM-based processing core hidden away inside. Its combination of a simple reduced instruction set (RISC) architecture and low power draw make it the perfect choice over desktop chips with high power demands and complex instruction set (CISC) architectures. The ARM-based BCM2835 is the secret of how the Raspberry Pi is able to operate on just the 5V 1A power supply provided by the onboard micro-USB port. It's also there as to why you won't find any heat-sinks on the device the chip's low power draw directly translates into very little waste heat, even during complicated processing tasks. It does, however, mean that the Raspberry Pi isn't compatible with traditional software. The majority of software for desktop and laptops is built with the x86 instruction set architecture in mind, as found in processors from the likes of AMD, Intel and VIA. As a result, it won't run on the ARM-based Raspberry Pi.

#### IV. EXISTING SYSTEM

This work presents an intelligent universal remote control system for home appliances. A smart phone equipped with infrared (IR) capabilities is easier to realize functions of the Point-n-Press remote controller (PPRC). Otherwise, some IR universal serial bus (USB) dongles that can provide support

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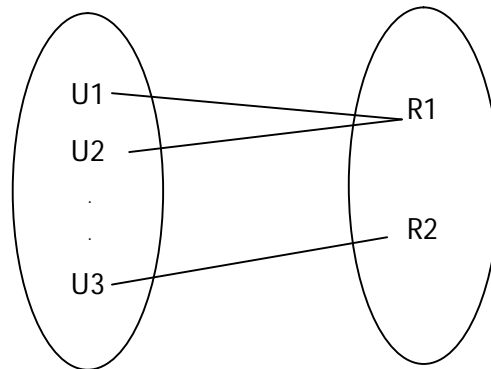
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for Android operation system are considered to be used. In addition, several open source universal plug and play (UPnP) libraries are useful to help us to greatly reduce the development time. Finally, for implementation of the Point-n-Press control box (PPCB), the design of the small and narrow hole is a trick for the IR mechanism. According to the design of this mechanism, only one device can be simultaneously pointed and controlled by the proposed control system. Therefore, the proposed control system always displays one control user interface of a single device. These details help us to achieve the purposes of the intelligent universal remote control system for home appliances.

## V. SYSTEM ANALYSIS

Mapping:-



Many users can obtain one result or multiple results.

### Set Theory:

$$S = \{s, e, X, Y, \Phi\}$$

Where,

s = Start of the program.

1. Log in user.
2. Get the data from sensors or Hardware (Temperature sensor, Humidity sensor and Environment Monitoring sensor, electrochemical sensor, IR sensor).

e = End of the program.

1. Display the captured data on the screen (monitor or mobile).
2. Log out the user.

X = Input of the program.

Input should be sensors data.

Y = Output of the program.

Finally we display the captured data on the screen (monitor or mobile).

$$X, Y \in U$$

Let U be the Set of System.

$$U = \{Client, I, S, H, A, D, R\}$$

Where Client, I, S, H, A, D, R are the elements of the set.

Client=User

I=Input data (sensors data).



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S=Sensor.

H=Hardware.

A=Application (Web or Mobile).

D= Display captured data.

R=Result or output.

Space Complexity:

The space complexity depends on Presentation and visualization of discovered patterns. More the storage of data more is the space complexity.

Time Complexity:

Check No. of patterns available in the database= n

If (n>1) then retrieving of information can be time consuming.

So the time complexity of this algorithm is  $O(n^n)$ .

Above mathematical model is NP-Complete

$\Phi$  = Failures and Success conditions.

Failures:

- Huge database can lead to more time consumption to get the information.
- Hardware failure.
- Software failure.

Success:

Search the required information from available in Datasets.

User gets result very fast according to their needs.

## VI. CONCLUSION

Our project is nearing the end of the design phase. The installation of many of the systems is feasible at this point, and many of the parts necessary to the construction of the prototype will be ordered soon. The physical portions of the media and security systems will be constructed soon after the parts arrive, and the lighting system should require minimal research before work on it can begin.

Most of the work in the project will lie in coding the GUI interface and the network core programming. More research needs to be done into the USB interfacing in particular, since this will prove critical towards the success of the project. However, this hurdle should not prove to be impossible, and hopefully the project will be completed in advance of the due date. This will allow some time to add more features, such as wireless communication, in order to increase the overall functionality of the Smart Home.

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