

## IoT Based Digital Smart Home

B S Archana, Deepthi S, Pooja K M, Tanuja T P  
UG Students, Dept. of Computer Science and Engineering  
Sri Revana Siddeshwara Institute of Technology  
Bengaluru, India  
[banavaras.archana@gmail.com](mailto:banavaras.archana@gmail.com),  
[deepthimiraskar1995@gmail.com](mailto:deepthimiraskar1995@gmail.com)  
[pooja.prasad400@gmail.com](mailto:pooja.prasad400@gmail.com)  
[tanujatprabhakar8795@gmail.com](mailto:tanujatprabhakar8795@gmail.com)

Vittal S, Asst. Professor  
Dept. of Computer Science and Engineering  
Sri Revana Siddeshwara Institute of  
Technology  
Bengaluru, India  
[vittal.dhl@gmail.com](mailto:vittal.dhl@gmail.com)

**Abstract— It is very essential to maintain a secure and comfortable life especially in today's generation where most of the members in the family choose to work and stay away from house for hours together. Hence the automation of home technology proposed provides a well monitored and easy control of the home appliances with an additional smart surveillance system that notify the owner about the visitors in specific location. The control ON/OFF position of the appliance is put in practice using numerous ways like GUI interface (Graphical User Interface), Internet, and sensors. The system has inexpensive design, handy and adaptable interface, and easy installation in various buildings. Utilizing this technology the client can remarkably limit the wastage of electricity by frequent controlling or appropriate ON/OFF operation of appliance. This paper explores about IoT and by what means it can be used for implementing smart automation using the raspberry pi board and web application.**

**Things to note—IoT, Home appliances, Surveillance, Raspberry Pi3(modelB), GUI, Sensors.**

### I. INTRODUCTION

The digital home automation technology is part of pivot components of grandeur house. Ample research work in this category has been done. [1] Praveen Kumar, Umesh Chandra Patil proposed a system that facilitated the automation and door permission system. The system made use of Raspberry Pi2 (model B) with Arduino components which dispatch and collect data from distant individual. It also provided a system that facilitated interaction between guest and the owner. [2] Pavithra D plus Ranjith Balakrishnan proposed another system which inculcated Wi-Fi as communication protocol. The server was interfaced with the corresponding relay hardware which controlled the appliance. An additional protection for accidents caused by fireplace was included.

[3] R Piyare plus M Tazil documented a system that emphasized on Arduino BT board where the appliances were connected to its port via relay. It also made use of cellphone to promote wireless communication. [4] N K Suryadevara plus S C Mukhopadhyay proposed a WSN emphasized sensor and actuator to the power management which basically detects galvanic

parameters such as current and voltage and eventually calculate the power consumed. [5] Matthias Kovatsch proposed IPv6 and 6LoWPAN which was solo network server meant for both classical and developing features of home automation. The drawback of this system was that the installation cost was a little expensive. [6] Ramlee introduced remote control operation using smartphones and Bluetooth which provided assistance to physically challenged people. [7] Yuksekkaya proposed the Global System for Mobile Communication (GSM) which made use of microprocessor and SMS control using GSM module.

This system is a combination of controlling the appliances and surveillance to detect intruders in particular location. The automation allows the users to control the home appliances through GUI and WWW by simply clicking on the ON/OFF status button provided on the web page. The surveillance detects any activity and if any found captures the respective image and send it to the e-mail address of the user.

Further work is documented in following divisions. The Division II includes the System Sketch. The overall Implementation of the proposed system is included in Division III. The Upshot and Discussion are included in Division IV. The whole system is summarized in Division V.

### II. SYSTEM SKETCH

The initiated digital home apparatus is an amalgamation of ample constituents. The constituents are picked on the basis of their demand. Raspberry Pi3 (model B), camera, PIR (Passive Infrared Sensor), relay and LED lights are the prioritized constituents. Illustration 1 projects the Raspberry Pi3 (model B) board. Raspberry Pi3 model B is used for many ventures. It is provided with Broadcom BCM2837 Arm7 Quad Core Processor, which comes with the memory of 1GB, LPDDR2 RAM at 900MHz and storage of Micro SDHC slot. It includes an interface with keyboard, a camera, an Ethernet cable, and mouse. This board has 26 GPIO pins for digital intake and output, 4 power pins, 8 pins for ground, and 2 pins for Micro SDHC.

The board is easily available in market and cheap hence widely utilized in hardware enforcement. The processing pace is faster than Raspberry Pi2 (model B). Illustration 2 gives the configured smart digital home. This throws light on the interaction between

system and the person, and system to system. The numerous methods of controlling devices are used in the suggested system.

The GUI method provided can be conveniently implemented by everyone. GUI on the 2.4-inch display can be used to control multiple appliances. An electrical switch is also inculcated. This contributes supplementary choice for switching devices (OFF and ON) of the digital home, in case of breakdown in network.

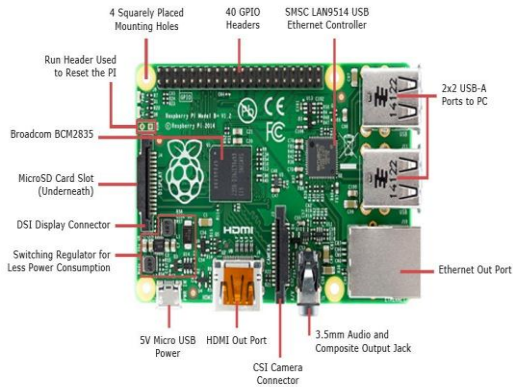


Illustration 1: Raspberry Pi3 (model B)

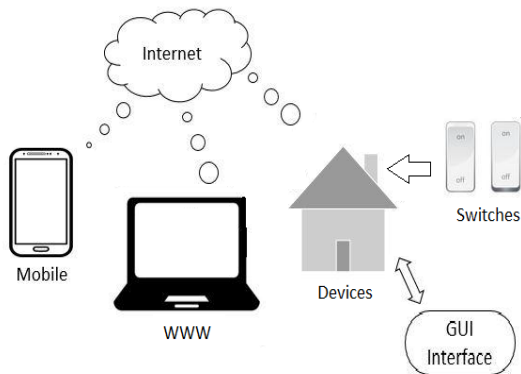


Illustration 2: Digital house layout

The most interesting technology for control and monitoring of machines for homes as IOT. It provides information sharing purpose from remote places to the digital home. The user can either regulate by laptops or smartphones. The software used hosting is raspberry model pi3. The server using apache tomcat for control the devices and also created the page for user, by using coding languages like JAVA/J2EE. Operating system like windows 7/8 . tools like JDK 1.7, Eclipse Indigo ,MYSQL5, HeidiSQL are the database usedpi4j.javamail,JDBC are the API. Intel i3 3.0GHZ processor ,10gb hard disk, RAM 1GB and PIR sensor is connected to interact between the digital home and the user. It provides OFF/ON the connected devices. The connections between switches are made available. The devices can be controlled or monitored either by using touch screen or electrical switches. The user interface for selection on device in digital home to check the status and to monitor of the device of home.

Since, the raspberry pi3 model B is used as processor to input-output signal of devices.

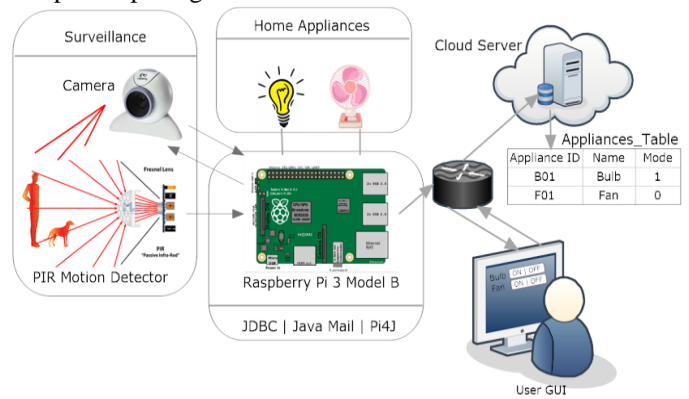


Illustration 3: Architecture design of smart home

Illustration 3 gives the information of the interaction between the hardware devices. The PIR(Passive Infrared Sensor) senses the intruder in the surrounding and the camera take snapshots of the scene surrounding the camera and send those pictures to the Raspberry Pi and intern it will send it to the database in the cloud and when the user types the URL, the user gets the GUI interface page from where he can monitor the home devices ,the user sees the status of the devices and wants to change the state then by turning it ON/OFF which gets changed in the database and which intern change the devices status which is connected to the Raspberry Pi model. The snapshots are sent to the users e-mail id, by which he can see and monitor and see the safety of his family and home. Illustration 4 shows the data flow diagram.

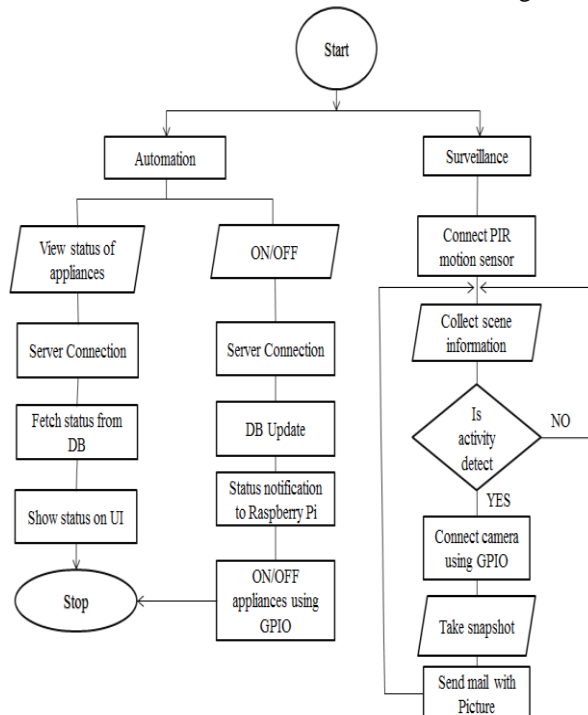


Illustration 4: Data flow diagram

### III. IMPLEMENTATION

Testing is done and the main pursuance of the surveillance, automation and system permission is checked. In this slot, we mainly discuss construction of hardware based on IoT monitoring, surveillance and control of devices in Digital home. The PIR Motion Detector, Mouse, Keyboard, Monitor, Speaker and Pi camera are connected to Raspberry Pi3 (model B). Switch and devices are connected to relay. The Raspberry Pi3 (model B) and Relay are interconnected. Illustration 5 shows the hardware components of the digital smart home system.

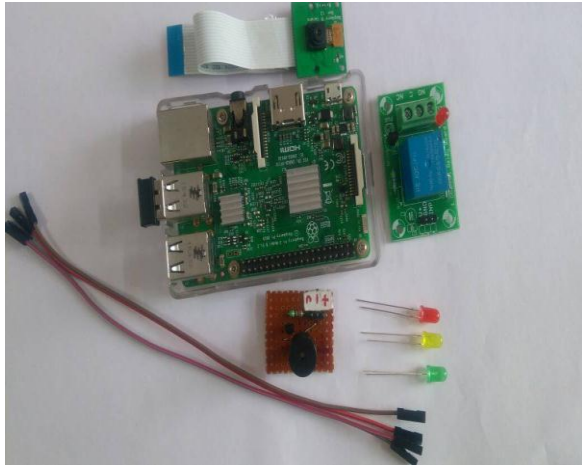


Illustration 5: Hardware Components

reaching the door. The system has two states i.e. high or low (1/0).

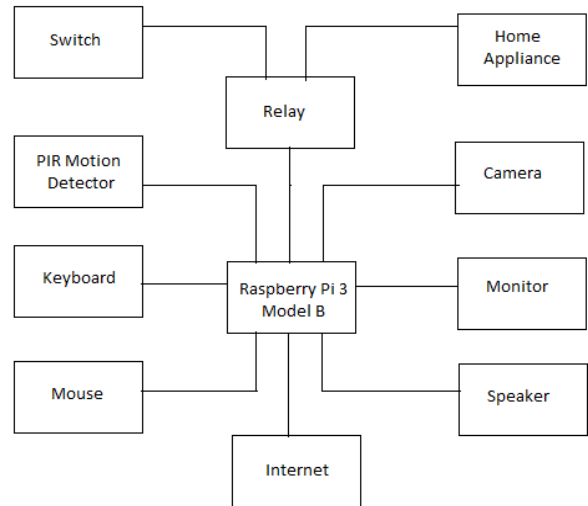


Illustration 6: Block diagram of smart home

Illustration 6 shows the block diagram of Digital smart home. It has the main controller as Raspberry Pi3 (model B) and with its interconnected devices. In the, Raspberry Pi3 processes the control flows within a device and communication between the system. The system accepts input from the user, updates the database every 3/5 seconds and output passes through the relay board, affect the status of the appliance (high/low). The surveillance is done by sending mail to the user whenever an activity is detected.

The block diagram represents how the components share the data and it also gives information about how the components are inter connected to each other i.e. input output devices. For example, speaker is an output device, touch screen as an input output device. The peripheral devices are connected to Raspberry Pi. Pi4J is the API used in writing codes for Raspberry Pi. The programming code is written using java language.

### IV. RESULTS AND DISCUSSION

The user makes use of an IP address, and access the digital home system on a smartphone. The user can control the devices by monitoring the status using a laptop or a smartphone. By receiving and sending data from remote server, the raspberry Pi hosts the cloud server of the digital home.

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The devices are controlled using GUI from a touch screen. User can comfortably access and control the devices of digital home. Through Pi camera fixed at door, user will get to know about the visitor without reaching the door. The system has two states i.e. high or low (1/0).

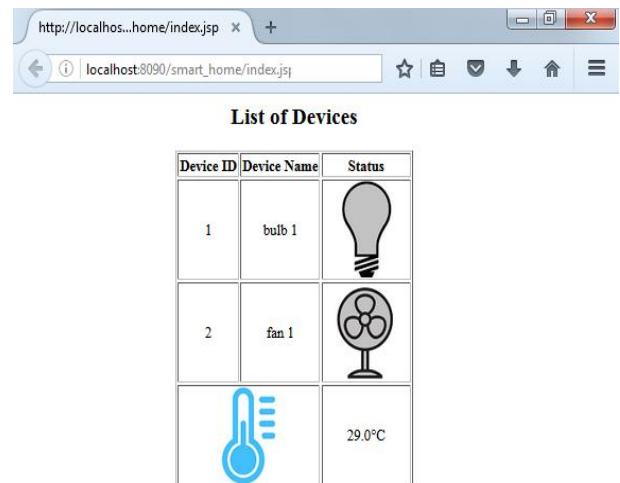


Illustration 7: snapshot of the digital home main page

Initially the user has to login to the webpage by the IP address provided. Authentication is done which asks for id and password. The unauthorized access is highly prevented by using this method. The contents of the main page of a website will auto adjusts depending upon the screen size. The main page consists of list of devices whose status can be modified. The network result or the response will be

high. The user will access the digital home through internet.

Illustration 7, shows the snapshot of the digital home main page. The Raspberry pi responds to the request made by the user and changes the device status accordingly.

The surveillance part of the system consists of a camera and a PIR sensor. Whenever an irrelevant activity is detected the system of digital home mainly the raspberry pie will stimulate the camera to take snapshots of the scene surrounding the camera.

The taken snapshot will be immediately mailed to the authorized user and the user will be notified about the activity going on.

Illustration 8 shows the snapshot of mail sending feature. This feature is very beneficial and the user can remotely watch the activities and be sure of personal family security.

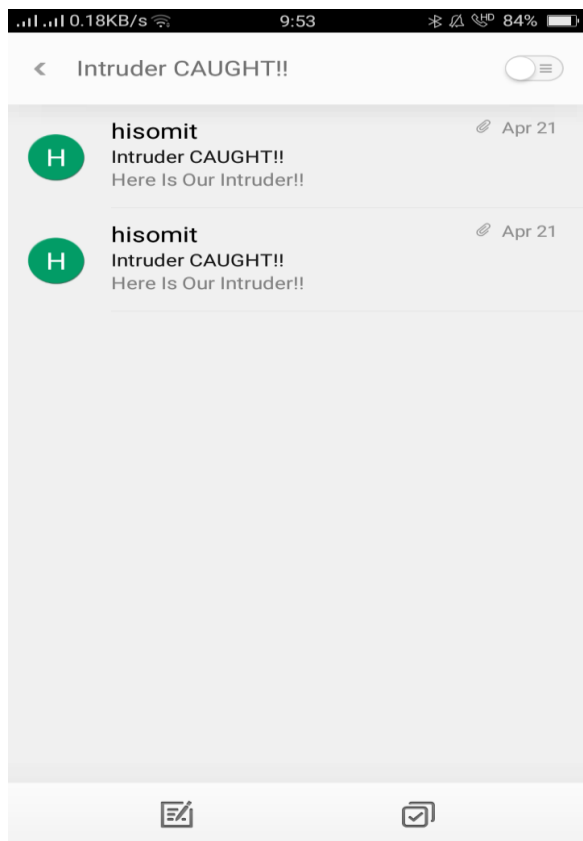


Illustration 8:Mail sending feature of digital smart home

## V. CONCLUSION

This paper offers a flexible and inexpensive solution for digital home. Devices of smart digital house can be controlled using ample methods like World Wide Web and GUI interface. The owner of house can ensure the safety of his family, anytime and anywhere as per his requirement and interest. The owner is alerted about the intrusion detected which allows him to carry out the required action. The apparatus minimizes the effort of a person as it involves only toggling between ON and OFF. An additional provision of camera is offered which helps to take the snapshot of the irregular activity in the surrounding and those snapshots is sent to the users e-mail id through which he can know what is going on in or around the home. This apparatus can also be used for limiting the access of electricity in the house by appropriate device monitoring. The system response is amazing and feasible for long time service.

## REFERENCES

- [1] Praveen Kumar and Umesh Chandra Pati, - IoT Based Monitoring and Control of Appliances for Smart Home, | IEEE International Conference On Recent Trends In Electronics Information Communication Technology, May 20-21, 2016,pp. 1145-1150.
- [2] Pavithra.D and Ranjith Balakrishnan, —IoT based Monitoring and Control System for Home Automation, || in *Proc. IEEE Conf. Global Conference on Communication Technologies (GCCT)* 2015, pp. 169-173.
- [3] R. Piyare and M. Tazil, —Bluetooth based home automation system using cell phone, || in *IEEE 15th International Symposium on Consumer Electronics (ISCE)*, pp. 192-195, IEEE, 2011.
- [4] N. K. Suryadevara, S. C. Mukhopadhyay, S. D. T. Kelly, and S. P. S. Gill, —Wsn-based smart sensors and actuator for power management in intelligent buildings,| *IEEE/ASME Transactions on Mechatronics*, vol. 20, no. 2, pp. 564-571, 2015.
- [5] M. Kovatsch, M. Weiss, and D. Guinard, —Embedding internet technology for home automation,| in *Proc. IEEE Conf. Emerging Technologies and Factory Automation (ETFA)*, 2010, pp. 1-8, 2010.
- [6] R. A. Ramlee, M. H. Leong, R. S. Sarban Singh, M. M. Ismail, M. A. Othman, H. A. Sulaiman, M. H. Misran, M. Said, M. Alice, *et al.* —Bluetooth remote home automation system using android application,| *The International Journal of Engineering and Science (IJES)*, vol. 2, no. 1, pp. 149 153, 2013.
- [7] B. Yuksekkaya, M. B. Tosun, M. K. Ozcan, A. Z. Alkar, *et al.*, —A Gsm, internet and speech controlled wireless interactive home automation system,| *IEEE Transactions on Consumer Electronics*, vol. 52, no. 3, pp. 837-843, 2006