

**SURVEY ON AUTOMATION USING RASPBERRY PI AND ZIGBEE**

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**Abstract**

Home automation system is gaining popularity day by day. Everyday a new implementation to the existing system is made, though certain pain points such as Energy efficiency and Cost efficiency had not been addressed yet. The proposed system is implemented using low cost, open source modules such as Raspberry Pi and Zigbee. The integration of ZigBee protocol in single board computer Raspberry Pi, through the programming language Python, has successfully facilitated the reading and wireless transmission of the voltage or power consumption of the user. It is hoped that it will provide a better quality of life, while reducing the electricity wastage by giving user the power to control, conserve and react according to user needs, or also can be done by using the scheduling function for automatic operation of home appliances.

**Keywords:** Automation using Raspberry Pi, Integration of Raspberry Pi and Zigbee, energy and cost efficient product.

**1. Introduction**

The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the physical world and computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. Each thing is uniquely identifiable through its embedded

computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020. "Things," in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, or field operation devices that assist firefighters in search and rescue operations. These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. Current market examples include

smart thermostat systems and washer/dryers that use Wi-Fi for remote monitoring.

### 1.1 Architecture

The system will likely be an example of event-driven architecture, *bottom-up* made (based on the context of processes and operations, in real-time) and will consider any subsidiary level. Therefore, model driven and functional approaches will coexist with new ones able to treat exceptions and unusual evolution of processes (Multi-agent systems, B-ADSc, etc.). Building on top of the Internet of Things, the Web of Things is an architecture for the application layer of the Internet of Things looking at the convergence of data from IoT devices into Web applications to create innovative use-cases. In order to program and control the flow of information in the Internet of Things, a predicted architectural direction is being called BPM Everywhere which is a blending of traditional process management with process mining and special capabilities to automate the control of large numbers of coordinated devices. It also provides a blueprint for data abstraction and the quality "quadruple" trust that includes protection, security, privacy, and safety." Furthermore, this standard provides a reference architecture that builds upon the reference model. The reference architecture covers the definition of basic architectural building blocks and their ability to be integrated into multi-tiered systems. The reference architecture also addresses how to document and, if strived for, mitigate architecture divergence. This standard leverages existing applicable standards and identifies planned or ongoing projects with a similar or overlapping scope.

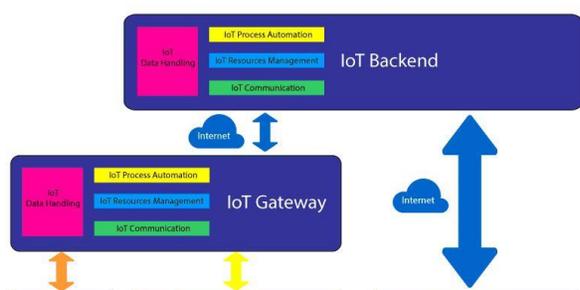


Fig 1. Architecture

This paper is organized as follows:

Section [1] describes the internet of things, Raspberry Pi and Zigbee.

Section [2] deals with the related works.

Section [3] deals with the research directions and the proposed work which will help in overcoming the problem.

Section [4] deals with the research directions and

Section [5] contains the conclusion.

### 2. Related Works

Narendran.M, Vijaylakshmi, proposed a system in which an advanced method of home automation with the application of Raspberry Pi (RPi) through reading the subject of the E-mail. An algorithm for the same has been developed using the python environment which is by default provided by Raspberry Pi. The automation process that is employed is a scheduled automation, which is done. The results show an efficiency of the algorithm employed to perform a scheduled automated. Murad Khan, Bhagya Nathali Silva, Kijun Han proposed a system which works in three fold, 1) smart interference control system controls the interference caused due to the co-existence of IEEE 802.11x based wireless local area networks (WLAN) and Wireless Sensor Networks (WSN), 2) smart energy control system is developed to integrate sunlight with light

source and optimizes the energy consumption of the household appliances by controlling the unnecessary energy demands, and 3) smart management control system to efficiently control the operating time of the electronic appliances. The performance of the proposed smart home is testified through computer simulation. Simulation results show that the proposed smart home system is less affected by the interference and efficient in reducing the energy consumption of the appliances used in a smart home. Greig Paul, and James Irvine, proposed a system in which Lower power alternatives, such as Bluetooth and ZigBee, have been proposed, but these have a much smaller installed base. In addition, many smart home products are currently available using 433-MHz technology. This system considers whether it is possible to reduce Wi-Fi power usage to the point where cheap Wi-Fi-based products can be used instead of other protocols. This system undertake the power analysis of a wireless sensor with a system-on-a-chip (SOC) Wi-Fi module, with and without a separate microcontroller optimized for low-power usage, which can be used to switch the Wi-Fi module on and off. This article is an extension of previous work comparing Wi-Fi and 433-MHz devices, and it compares 433-MHz devices to the optimized Wi-Fi sensor. Finally, we consider the energy usage of Dynamic Host Configuration Protocol (DHCP), demonstrating that further energy savings can be made if the application handles Internet protocol (IP) addressing and presents a static IP address to the Wi-Fi module. Yong Ho Hwang, Pil Joong Lee proposed a system which can utilized automated meter reading systems (AMR). The advantages these electric metering system offers make it a more accurate measuring device than the conventional electromechanical meter reading system being used in developing

countries. AMRs capacity to automatically transmit data real-time increases the reliability of this metering system, unlike electromechanical It also puts consumers at a disadvantage as the accuracy of power consumption readings is being compromised. The integration of ZigBee protocol in single board computer Raspberry Pi, through the programming language Python, has successfully facilitated the reading and wireless transmission of the voltage or power consumption of the user. Through Python, the raw data transmitted to the coordinator ZigBee is then converted to a CSV file, the data type required by the MySQL database for the received data to be uploaded in the Web site.

### 3. Research Directions

As technology advances, home automation systems, which allow the control of almost any devices, are becoming more attractive compared to non-automated conventional devices. The introduction of new low-cost systems has generated much interest by both consumers and developers. Currently, there are many wired and wireless protocols for home automation; however, wireless solutions are gaining ground because of their simple installation despite some limitations such as their coverage area that is restricted to the features of the protocol and wireless module. Wireless personal area networks (WPANs) are well adapted to these applications, however; as home automation in buildings become more complex, the wireless sensor and actuator networks (WSANs) are a better fit to these conditions. These networks can contain numerous interconnected nodes. One such network standard is the ZigBee protocol which provides a low power consumption, low cost and low data rate with mesh type network topology. This network can theoretically handle 65536 nodes. A very important

feature in this type of system is ease of use. In traditional home automation systems, panels are used in specific sectors and remote controls are used to command the actuators. New systems seek to exploit the capabilities of mobile devices such as tablets and smart phones allowing the user to access the system anytime from anywhere. Another important feature is the scalability of the system so that new devices can integrate easily. They must also contain a friendly user interface so that the devices are easy to install, use and monitor. The system will be secure and efficient data transfer through a wireless sensor and actuator networks..

#### 4. Discussions

As mentioned in section iii, the proposed system will be cost efficient and energy efficient automation system. Remote controls are a practical and affordable way to control your home's lighting system, as well as thermostats, appliances, home entertainment systems, burglar alarms and even lawn sprinklers. The simplest systems are based on controllers that plug into A/C power outlets and use your existing home wiring to send signals to modules throughout the house. More sophisticated home automation suites generally incorporate wireless technology and are controlled through a computer interface. These systems operate the way a television remote control does, sending wireless radio signals to modules controlling lighting, appliances, burglar alarms and home entertainment systems. Some of the common conventions are the INSTEON system from SmartHome ZigBee, an open-specification manufacturing system with more than 100 companies providing the technology wireless signals. The existing system suffers from power consumption issues due to the use of WIFI. The system is one the pricey side due to the high cost components and modules.

#### 5. Conclusion

This paper designs a Home Automation system using sensor node, Raspberry Pi as a base station, XBee as a networking protocol, and a number of open-source software packages. Comparing with collection and forwarding information or data of traditional base station (gateway), this system has low-cost, low power consumption, compact, scalable, easy to deploy, and easy to maintain. One major advantage of the system lies in the integration of the gateway node of wireless sensor network, database server, and web server into one single compact, low-power, credit card-sized computer Raspberry Pi, which can be easily configured to run without monitor, keyboard, and mouse. In addition, this system allows us to use it with implemented sensor networks using different hardware platforms. Such a system is very useful in many environmental monitoring and data collection. This work deals with smart home. The remote control includes software and hardware components such as web server, smart phone, Raspberry pi card and an interface card. Many codes have been developed and stored in the web server, smart phone and the raspberry pi card. An interface card has been realized to update signals between the actuator sensors and the raspberry pi card. The application has been installed and tested. This work can be generalized to remote command of multiple domestic equipments. In addition, it may be more autonomous, more practice, and quite scalable saw the giant step and progress in the areas of technology and communication in our time.

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