Review of IOT for Domestic Applications

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ABSTRACT

In this paper we deal with the review of domestic appliances which can make home automation as existing technologies. In recent years, there has been a huge growth in the world of intelligent devices for home automation. Such gadgets are designed in order to ease the interaction between people and daily home duties. Although individually they are simple to work with, each appliance has its own configuration interface which adds overhead to the general user experience. This paper presents a solution for connecting more devices into a signal entity which can be easily accessed at any time. The implementation integrates the functionalities of domestic appliances for internet of things in crucial manner, this paper deals with review analysis of of IOT For domestic appliances for smart home network structure have been implicitly provided.

Keyword: *smart; automation, remote, security, communication, sensor,Network*

1. INTRODUCTION

Smart Home or Digital Home [1] is also called as intelligent home, home automation, electronic home E-home, digital family, network home or intelligent building. With the development of information appliances and Internet, Smart Home network has the following specific functions:

1) **Information services**: Through the home gateway, people can get access to the network and achieve the operations like browsing the web pages, subscribing the electronic periodicals, receiving the broadcasting data and digital TV signals, and realizing the functions of video on demand and IP video telephone.

2) **Centralized management of household appliances:** Through the network management system software, people can monitor the household appliances, such as the control of lighting, the remote control of electrical appliances and the regulation of the indoor environment

.

3) **Three-meter record system:** People can collect the digital data of water, electricity and gas meters and send them to the home gateway, which are then sent to water, electricity and gas supply companies periodically

.

4) **Security and fire control:** Family security and fire detection are realized by installing the alarm system in the family. For example, Household environment and indoor special places such as baby's rooms can be monitored through the installation of cameras. Smoke sensor, temperature sensor and special gas sensor can be installed to prevent room fire and harmful gas accumulation. Infrared transmission device, door magnetic vibration sensor and wireless microwave alarm device can be equipped to prevent home invasion, etc.

Having understood the feasibility and potential of the IOT and the smart systems, in this paper, we propel the concept of smart systems toward the smart city development based on big data analytics. In the paper, we proposed the complete architecture to the developed smart city and did urban planning using IOT-based Big Data analytics. The system provides the guidance to all the government authorities to make their cities smarter and intelligent in order to take a decision at real-time based on current city scenarios. The complete system description is depicted in next sections. Having understood the feasibility and potential of the IOT and the smart systems, in this paper, we propel the concept of smart systems toward the smart city development based on big data analytics. In the paper, we proposed the complete architecture to the developed smart city and did urban planning using IOT-based Big Data analytics. The system provides the guidance to all the government authorities to make their cities smarter and intelligent in order to take a decision at real-time based on current city scenarios. The complete system description is depicted in next sections.

2. Related Works

The IoT supports various applications. Smart Life is one of the IoT supported applications that aims to make human beings' lives more convenient. In literature, a large amount of papers had proposed the design and implementation of the IoT gateway. However, there are several differences between commercial IoT gateways and the developed IoT AP. The following presents the major differences. In past literature, the communication technologies applied to home automation can be classified into three categories: the wired home automation system, the wireless home automation system, and the integrated home automation system. For the wired home automation system, Al-Aliand proposed a home automation system based on the Java language. This system implemented the home monitoring feature to electrical devices through the web service. Henceforth, this system needed to use the computer as a server, increasing the hardware and maintenance costs. proposed a remote system for controlling water temperature through transmission control protocol and Internet protocol (TCP/IP) protocol with lower hardware-cost. However, the remote controlling device needs to install a special software that poses inconvenience. Moreover, the operating procedure of multiple sensors at the same time is complicated. According to the complication, the wired home automation system encounters some difficulties in wire provisioning, such as the deployment of communication lines between devices and the installation of back-end systems. These difficulties increase the build-cost so as to reduce the interest of users to afford a home automation system. designed a home gateway for ZigBee networks and Ethernet networks in the air pollutant monitoring and homecare applications. However, the designed ZigBee/Ethernet gateway did not support the functionalities of traditional AP. That is, the gateway can only exchange sensing data or commends between two devices via Internet or Intranet but cannot provide mobile device with Internet access. Compared with the existing gateway, the proposed IoT AP integrates the functionalities of a gateway and an AP, not only supporting the capability of Internet access for handheld devices but also reducing the hardware costs and energy consumptions. By applying the implemented IoT AP, users can intelligently/automatically/remotely control home objects by smart phones without additional payment for Internet access. For the wireless home automation system, Zhang et al. [30] designed a home gateway for ZigBee networks and universal mobile telecommunications system (UMTS) networks. Without supporting Appl. Sci. 2015, 5 1886 Wi-Fi access, all sensors embedded in the home appliances transmit their sensing data only via UMTS, but it is costly. Yang et al. [31] implemented an APP on a mobile phone that establishes the connection to the existing AP and supports the remote controls of Wi-Fi based home appliances. However, this communication highly depends on the Wi-Fi protocol and is hardly able to meet the basic communication requirements of IoT applications where a variety of appliances are embedded with various wireless communication protocols, such as ZigBee and Bluetooth, in the heterogeneous networks. Alheraish et al. [32] proposed a home automation system based on the global system for mobile communications (GSM). In this home automation system, each device was required to configure the

GSM communication function and place in the location with high-quality GSM signals for connecting to other devices. Consequently, this system has not only the high cost, but also the straightlaced location restrictions. Study [8] adopted a ZigBee router to achieve the local monitoring and the energy conservation for biomedical and healthcare applications. However, the monitored data are utilized only in a single home network and hardly developed smart e-home applications in a heterogeneous network. The integrated home automation system is the integration of personal wireless local area network (LAN) and Internet home automation system. In study [33] proposed an integration system with various communication technologies, including Internet, GSM, wireless radio frequency (RF), etc. In this system, the status of each device is monitored through wireless RF by a PC server, which links to the Internet, whereas users can also remotely control each device on/off by using the GSM protocol. However, the system architecture proposed in [33] requires high equipment cost, resulting in the low interest of buyers. In study [34] had proposed a home automation system based on wireless sensor networks. However, it requires a high-performance PC as a server and, hence, results in high equipment costs. Gill et al. [25] proposed a smart life application based on a low-power ZigBee wireless sensor network. This study built three types of devices that have ZigBee communication capabilities, such as lightning control, heating machine, and environmental security system. To build a gateway with Wi-Fi and ZigBee communication capabilities, this system uses a notebook to remotely access and control ZigBee devices, e.g., turning the lamp switch on/off, setting the heater temperature, and setting a feedback threshold to the temperature sensors for indoor safety. Users applying the application [25] are able to control ZigBee devices through the Internet, however, the ZigBee devices needs to be attached to a notebook or desktop computer for connecting to the Internet, increasing the construction cost. In this paper, the considered home appliances are certified by ZigBee Alliance. In fact, we suggest that all home appliances should be ZigBee-certified to guarantee all the ZigBee devices successfully communicating with each other, even the ZigBee devices are made by distinct manufacturers. In addition, the proposed IoT AP simultaneously supports

ZigBee, Wi-Fi, and Internet communications because it has been integrated the firmware/hardware in a traditional Wi-Fi AP and the ZigBee protocol. It is a feasible solution upgrading an original Wi-Fi AP to an IoT AP. This paper also uses the IoT AP to construct a smart home application. For instance, the power meter and power switch can be connected to the proposed IoT AP, measured for the detailed power consumption, and turned on/off. This reduces the cost and helps developers prevent hardware revisions.

3. Smart Home Network Architecture

3.1 Functions of Smart Home network

Typical Smart Home network should have the following functions:
1. Appliance Control: Access to Internet through computer, mobile phone and PDA (Personal Digital Assistant) to realize the remote control of lamp, air-conditioning, refrigerator, television and other home appliances.
2. Home management: Three-meter (water, electricity and gas meter) record system
3. Family education and entertainment: Such as remote teaching system, home theater, video transmission system, online video and interactive video games, etc
4. Home business and office: Realize the online shopping, online business and video meeting.
5. Entrance control (entrance guard system): Employment of fingerprint recognition, vein recognition, iris recognition and smart card, etc.
6. Family medical treatment, health care and custody: Realize the remote medical treatment and care, call-

3.2 Basic framework of Smart Home network

The Smart Home network frame structure [2] is shown in figure 1. The system with household server as the core connects to the Internet and cable television network by the network interface and connects to the digital audio and video equipment using IEEE1394 high-speed data bus. The system use Bluetooth to connect all kinds of information appliances and use wireless coding communication to send and receive all kinds of sensor signals. The communication is realized by using various protocols in the household server gateway. Home server saves data information and provides the local service support of home appliance torealize the home control management, web browsing and other functions.

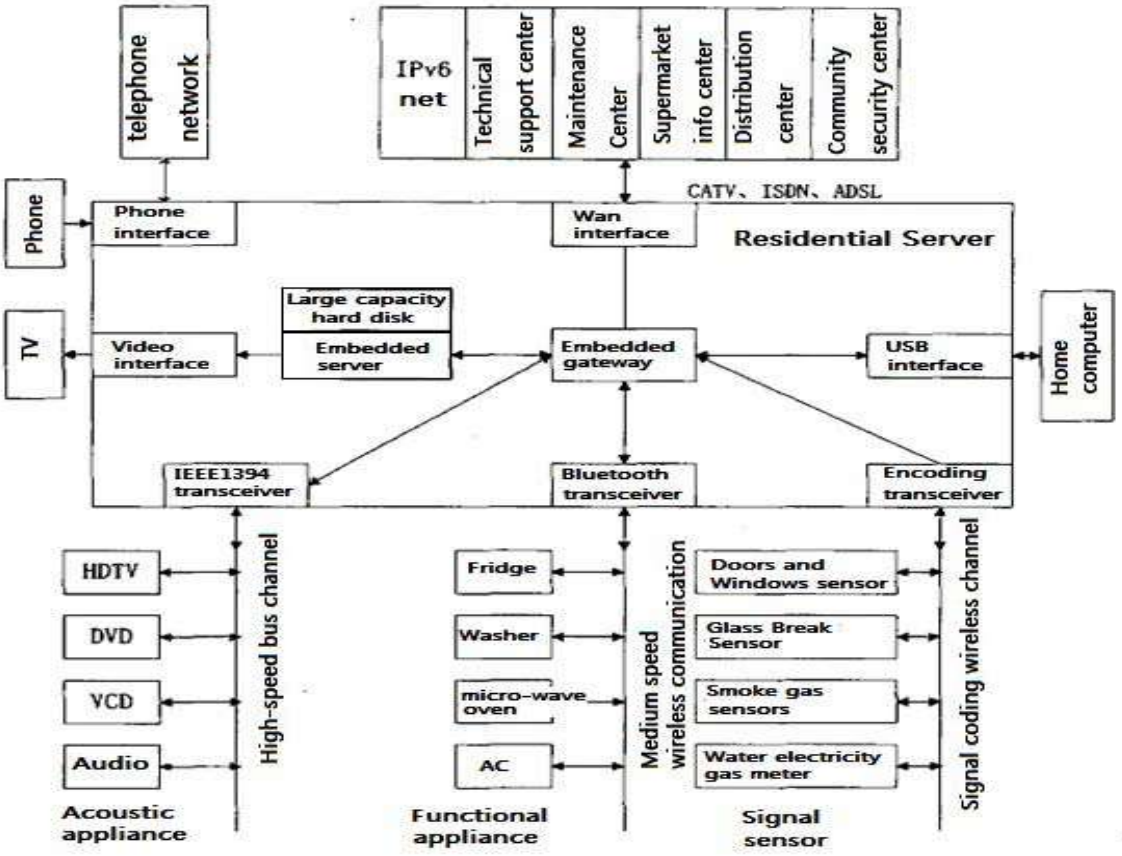

Fig.1 Smart Home network structure

Some important points are came out of discussion for home automation through IOT are as follows

1. **More Challenges and Technique Depth:**

The functionality of Internet access via Wi-Fi has been commonly supported in APs. However, most commercial gateways cannot support Internet access for handheld devices. Instead, they mainly support data exchange between two devices via the Internets or Intranets, such as sensing information or command. Compared with the gateway, the AP has complex firmware and hardware. This leads to more challenge for embedding ZigBee protocol into an AP. The proposed IoT AP is developed based on a traditional AP and therefore inherits advantages of an AP as compared with the commercial gateways. For example, the implemented IoT AP not only support Internet access for mobile devices but also connect to IoT objects, which apply ZigBee as their communication interface. We should take the big challenge up for designing the IoT AP, which supports a various firmware and hardware. For example, the developed ZigBee protocol should be compatible with the existing AP firmware and hardware. We have embedded a ZigBee module and implemented the ZigBee and UPnP protocols such that the proposed IoT AP supports ZigBee communication capabilities over the Internet.

2. **Convenience**

Most of recent studies [12,24,25] applied a gateway to receive the sensing data from IoT devices and forwarding data to the AP. However, the designed IoT AP combines the main functions of a gateway and an AP and, hence, allows a user to deploy a smart home with a convenient solution. It also decreases the deployment complex and reduces hardware costs.

3. **Efficiency**

Recent studies [12,24,25] applied the gateway to collect data from sensors and subsequently forward the data to an AP using Wi-Fi wireless technology. However, using both of a gateway and an AP, the wireless resource

must to be allocated to the additional data transmissions between them, reducing the throughputs and raising the contention problem. Applying the proposed IoT AP, the data collected from sensors are forwarded to the data server or data center via the Internet in a more efficient way because the gateway and AP has been integrated as an IoT AP

.

4. Flexibility

Nowadays, a complete coverage in most capitals or cities has been achieved by widely deploying Wi-Fi APs. It is especially important to achieve the full coverage at home because it supports mobile devices with Internet access. The proposed IoT AP simultaneously supports ZigBee communications, Wi-Fi communications and Internet access capabilities by integrating the traditional Wi-Fi AP and the ZigBee protocol. Once an emergency event occurs, the ZigBee device can ask the IoT AP for competing the wireless resources with other Wi-Fi devices by the Wi-Fi interface such that the obtained wireless resources are allocated to ZigBee transmissions. This improves the unfair priority between ZigBee and Wi-Fi transmissions.

5. Avoidance of Interference between Wi-Fi and ZigBee

To avoid the interference of wireless signals, the Wi-Fi interface in the proposed IoT AP first detects the channels occupied by the other APs and subsequently notifies the ZigBee device management module the information of channels. Afterward, the ZigBee interface chooses the optimal channel for data transmissions, avoiding the starvation problem. This paper had integrated ZigBee and Wi-Fi protocols in the designed IoT AP to automatically avoid the signal interference between ZigBee and Wi-Fi by identifying and selecting an idle channel to sending command messages. Consequently, the proposed

4. CONCLUSION AND FUTURE WORK

A. Conclusion

The home automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, gas, light, motion sensors, but also actuates a process according to the requirement, for example switching on the light when it gets dark. It also stores the sensor parameters in the cloud (Gmail) in a timely manner. This will help the user to analyze the condition of various parameters in the home anytime anywhere.

The various applications like collective combination of Wireless communication, IoT with smart phone application will provide the proof of concept “Advanced Domestic Alarms with IOT”. Further extension the camera visuals shall be captured and transmitted in real time.

B. Future work

Using this system as framework, the system can be expanded to include various other options which could include home security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring, or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.

REFERENCES

[1] J. Stragier, L. Hauttekeete, L. Marez, Introducing Smart Grids in Residential Contexts: Consumers' Perception of Smart Household Appliances, Belgium, pp. 1-2, 2010

[2] P. Waher, Learning Internet of Things, Birmingham, pp. 1-3, 2015

[3] J. Chase, The Evolution of the Internet of Things, Texas Instruments, Texas, pp. 1-3, 2013

[4] Benvenuti, Christian, Understanding Linux network internals. Dec 2012.

[5] Sang Hyun Park, So Hee Won, Jong Bong Lee, Sung Woo Kim. Smart Home digitally engineered domestic life, Personal and Ubiquitous Computing Springer-Verlag London Ltd July 2013

[6] D. S. Tudose, A. Voinescu, M.-T. Petrareanu, A. Bucur, D. Loghin, A. Bostan, and N. Tapus, "Home automation design using 6LoWPAN
wireless sensor networks," in 2011 International Conference on Distributed Computing in Sensor Systems and Workshops (DCOSS),
2011, pp. 1–6.

[7] González-Audícana, María, José Luis Saleta, Raquel García Catalán, and Rafael García. "Fusion of multispectral and panchromatic images using improved IHS and PCA mergers based on wavelet decomposition." Geoscience and Remote
Sensing, IEEE Transactions on 42, no. 6 (2004): 1291-1299.

[8] Celik, Turgay, and Kai-Kuang Ma. "Unsupervised changedetection for satellite images using dual-tree complex wavelet transform." Geoscience and Remote Sensing, IEEE Transactions on 48, no. 3 (2010): 1199-1210.

[9] Bruce, Lori Mann, Cliff H. Koger, and Jiang Li. "Dimensionality reduction of hyperspectral data using discrete wavelet transform feature extraction." Geoscience and Remote Sensing, IEEE Transactions on 40, no. 10 (2002): 2331-2338.

[10] Boyd, D., & Crawford, K. (2012). Critical questions for bigdata. Information, Communication and Society, 15(5), 662–679.