INTERNET OF THINGS (IoT) BASED ON USER COMMAND ANALYSIS AND CONTROL SYSTEM

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ABSTRACT:

IoT (Internet of Things) has been commercialized recently; studies are underway for user-customized services. Accordingly, the service should be changed according to the characteristics of the user rather than the unified service. However, when existing systems operate automatically, there is a problem of providing a uniform service to all users without providing a customized service. To solve this problem, in this paper proposes an IoT based control system for analyzing user commands. The system collects the user's remote control commands to organize the user data sets, classify the collected user's commands according to the devices, and classify the user's work orders in time to derive the average operation of the devices. Through this, it is possible to provide services with improved user convenience and system accuracy. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like Zigbee, Wi-Fi etc.

Key words: Data Analysis, IoT, Sensor, Smart Home, Visualization, Machine-to-Machine (M2M).

1. INTRODUCTION

The concept of Internet of things (IoT) was introduced by the growth of the widely used global network known as the internet along with the deployment of ubiquitous computing and mobiles in smart objects which brings new opportunities for the creation of innovative solutions to various aspects of life. The concept of Internet of things (IoT) creates a network of objects that can communicate, interact and cooperate together to reach a common goal [9]. IoT devices can enhance our daily lives, as each device stops acting as a single device and become part of an entire full connected system. This provides us with the resulting data to be analyzed for better decision making, tracking our businesses and monitoring our properties while we are far away from them. Automation is a technique, method, or system of operating or controlling a process by electronic devices with reducing human involvement to a minimum. The fundamental of building an automation system for an office or home is increasing day-by-day with numerous benefits. Industrialist and researchers are working to build efficient and affordability automatic systems to monitor and control different machines like lights, fans, AC based on the requirement. Automation makes not only an efficient but also an economical use of the electricity and water and reduces much of the wastage [17]. IoT grant to people and things to be connected Any-time, anyplace, with anyone, ideally using any network and any service [10]. Automation is another important application of IoT technologies. It is the monitoring of the energy consumption and the Controlling the environment in buildings, schools, offices and museums by using different types of sensors and actuators that control lights, temperature, and humidity. The Smart home known as House automation, with the use of new technology, make the domestic activities more convenient, comfortable, secure and economical.

The home automation system includes main components which are:

- User interface: as a monitor, computer, or Phone, for example, that can give orders to control System.
- Mode of transmission: wired connections (example Ethernet) or Wireless (radio waves, infrared, Bluetooth, GSM) etc.
- Central Controller: It is hardware interface that communicates with user interface by controlling domestic services.
- Electronic devices: A lamp, an AC or a heater, which is compatible with the transmission mode, and connected to the Central control system.

Features of Home Automation System

In recent years, wireless systems like Remote Control have become more popular in home networking. Also in automation systems, the use of wireless technologies provides several advantages that could not be achieved with the use of a wired network only:

- ✓ Reduced Installation costs
- ✓ Internet Connectivity
- ✓ Scalable and Expandable

Easily add devices to create an integrated smart home security system and built-in security ensures integrity of smart home. Here we discussed some of the early challenges faced by home automation systems. These include high manufacturing costs, high development costs, high installation costs, additional service and support costs, lack of home automation standards, consumer unfamiliarity with technology, and complex user interfaces. With the advancement of time, rapid development in technology and processing power which leads to a considerable reduction in device cost and size. All of these factors have contributed to the popularity of electronic devices today, so people are no longer confused or unsure about the use of the computer, mobiles, or tablets. Moreover, a lot of home automation protocols, communication and interface standards. The Home automation system uses Wi-Fi technology [1]. System consists of three main components; web server, which presents system core that controls, and monitors users' home and hardware interface module(Arduino PCB (ready-made), Wi-Fi shield PCB, 3 input alarms PCB, and 3 output actuators PCB.), which provides appropriate interface to sensors and actuator of home automation system. The System is better from the scalability and flexibility point of view than the commercially available home automation systems. The User may use the same technology to login to the server web based application. .If server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser. The application has been developed based on the android system [2].

An interface card has been developed to assure communication between the remote user, server, raspberry pi card and the home Appliances. The application has been installed on an android Smartphone, a web server, and a raspberry pi card to control the shutter of windows. An interface card has been realized to update signals between the actuator sensors and the raspberry pi card. Design and implement a home gateway to collect metadata from home appliances and send to the cloud-based data server to store on HDFS (Hadoop Distributed File System), process them using Map Reduce and use to

provide a monitoring function to Remote user [3]. It has been implemented with Raspberry Pi through reading the subject of E-mail and the algorithm. Raspberry Pi proves to be a powerful, economic and efficient platform for implementing the smart home automation [4].Raspberry pi based home automation is better than other home automation methods is several ways. For example, in home automation through DTMF (dual tone multi-frequency) [11], the call tariff is a huge disadvantage, which is not the case in their proposed method. Also, in Web server based home automation, the design of web server and the memory space required is ejected by this method, because it simply uses the already existing web server service provided by G-mail. LEDs were used to indicate the switching action. System is interactive, efficient and flexible.[5] proposed Smart House Monitor & Manager (SHMM), based on the ZigBee, all sensors and actuators are connected by a ZigBee wireless network. They designed a simple smart socket, which can remote control via ZigBee. PC host is used as a data collector and the motion sensing, all sensing data are transferred to the VM in the cloud. The user can use the PC or Android phone to monitor or control through the Internet to power-saving of the house.

Arduino microcontroller to receive user commands to execute through an Ethernet shield. Our house network used together both wireless ZigBee and wired X10 technologies [6]. This system followed smart task scheduling with a heuristic for the Resource-constrained-scheduling problem (RCPSP). The mobile device can be either wired to the central controller through USB cable or communicates with it wirelessly, within the scope of the home. Arduino contains the web server application that communicates through the HTTP protocol with Web-based Android application. The system is highly flexible and scalable and expandable. The home network monitors the appliances and sensors and transmits data to the cloud-based data server. It manages the information and provides services for users by transmitting data and receiving user commands from mobile application [17]. The proposed system has good modularity and configurability characteristics with very low power consumption in cost efficient way. Application developed using the Android platform controlled and monitored from a remote location using the smart home app and an Arduino Ethernet based micro web-server [8]. The sensors and actuators/relays are directly interfaced to the main controller. Proposed design offers are the control of energy management systems such as lightings, heating, air conditioning, security, fire detection and intrusion detection with siren and email notifications. Embedded system Raspberry Pi serve as a communication gateway between mobile

devices and Konnex-Bus (KNX) home automation systems [9]. Store the information of all actors and sensors within a Smart Home, instead of using separate profiles. Ensures energy-consumption could be reduced, compared to a standard desktop computer. Dual tone multi frequency (DTMF) is used in telephone lines [13]. There are three components in the system DTMF receiver and ring detector, IO interface unit, PC.

2. INTERNET OF THINGS

IoT is growing; it is stepping into every aspect of our lives. This leads to an easier life through wider range of applications, such as electronic health care solutions [12] and Smart city concept. The concept of Smart city aims to making a better use of resources, increasing services quality overfed to the citizens, and reducing costs of the public administrations [10]. Another application is home automation which is the focus of this project.
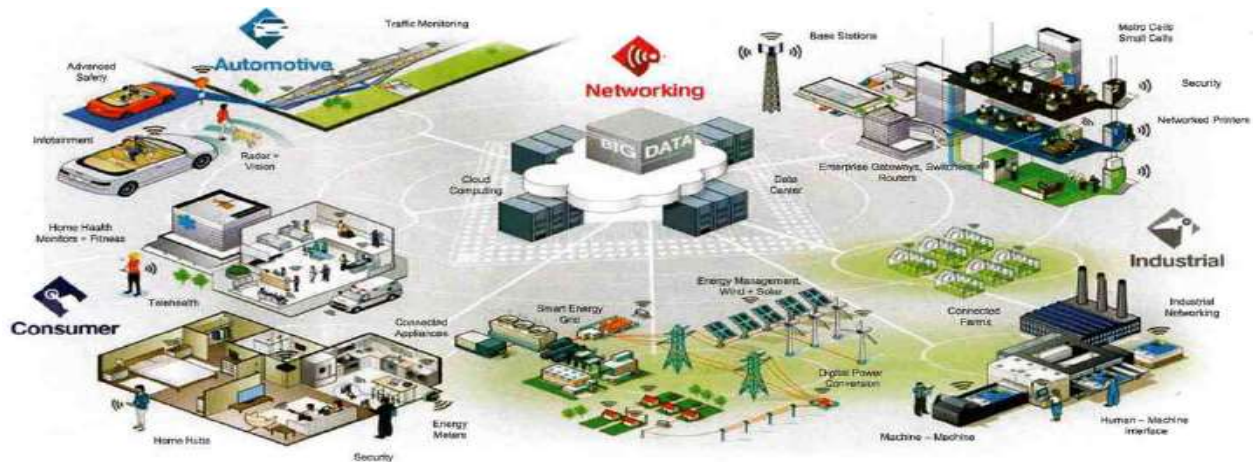

Fig.1: Shows different applications of internet of things in all aspects of life

The internet of things (IoT) is expected to be the next revolution following the World Wide Web. It will provide new bridges between real life and the virtual world. The internet will no longer be merely a network of "human brain ", but will integrate real life objects, sensors and physical activities. The internet of things is defined by ITU and IERC as a dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where the physical and virtual "things" have identities ,physical attributes and virtual personalities ,use intelligent interfaces and are seamlessly integrated into the information network. Over the last year, IoT has moved from being a futuristic vision –with sometimes a certain degree of hype-to an increasing market reality. The EU has already for some time invested in supporting research and innovation in the field of IoT, notably in the areas of embedded systems and cyber-physical systems,

3. RESULTS

Oriented to the realization of a wireless sensor network, as part of the implementation should be considered the right platform, one of the best services coupled to the Iot platform is the implementation of this service will allow providing information management in a robust manner. To do this, function programming is done

through the DTMF Signal is a standard, which allows structuring the data frame coming from the sensors and thus the manipulation of the information. All this in a context enabled for the subsequent implementation of visual interfaces in which the information can be presented in a more orderly way. To implements our home automation system we designed an experimental setup as shown in figure, where we used Arduino Uno as a main controlling unit. And a four channel relay board to control electrical home appliance. And we have included a Wi-Fi module in our system to connect android and local Wi-Fi present in the home of user. We have tested the experimental setup on various loads.
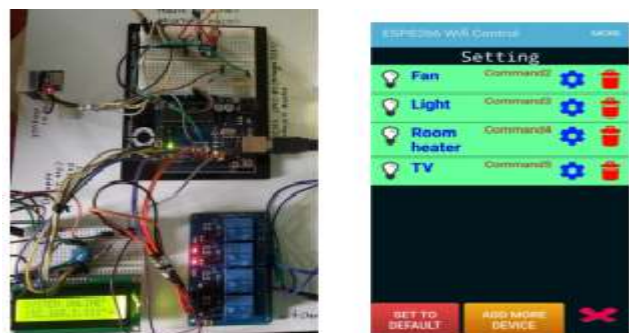

Fig.2: Experimental setup

4. CONCLUSION

Recently IoT has been used in various fields. The smart device can be connected to the network and communication can be performed to operate the device or to provide the sensor data to the user. Accordingly, methods of providing services in various ways are being studied. Existing systems provide only the same service on the basis of the set threshold value, and operation of the device operation judgment is performed according to the environment inside the home rather than the user. Also, the user can not control the device. To solve this problem, this paper collects and analyzes user's remote control command. Based on this, we propose an automatic control system. When a user performs remote control using an application, the system collects the commands, loads them in the database, and sorts the data according to devices and time. Once the analysis is complete, device averaging is derived and the device is automatically controlled based on the analysis results

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