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Building Automation on Internet of Things

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ABSTRACT

The Internet of Things(IoT) is a paradigm where any electrical objects can be equipped with identifying,networking, sensing, and processing capability that will allow them to communicate with each other and services over the Internet to accomplish some objective. Ultimately, IoT devices will becontext-aware ubiquitous and will empower ambient intelligence. This article includes work with an intelligent building automation system to provide ease to humans to control electrical devices without being physically present over there. This device is feasible as well as flexible, a single device can be used over different sectors such as office, school/colleges, hospitals, malls, restaurants, industries, homes etc.,

Keywords: Internet of Things(IoT), Prototype, Web and internet services, Program processor, Ubiquitous.

I. INTRODUCTION

Internet of Things (IoT) is presently the most trending technology worldwide. Industry, and academic are involved in different aspects of research, andimplementation with Internet of Things. Internet of Things include healthcare, space, agriculture, manufacturing,healthcareand construction, which are presently transitioning their legacy infrastructure to support Internet of Things.. This allows user co control office appliances through the Internet of Thingsusing an easy to use GUI. This work deals with construction of a device which would be feasible as well as flexible. “ONE FOR ALL, ALL FOR ONE”,this statement perfectly define the work as a single device can be used for multiple purposes. All the electrical appliances can be monitored and controlled using this device. Moreover can be used in different sectors such as industries, colleges, restaurants, malls, hospitals etc..,

1.1OBJECTIVE

It is quite difficult for individual office owners to operate one or more than one Offices and keep track of each office appliances individually. At such circumstances we need an online solution for office appliances control. Her we suggest use of IoT technology for office appliance automation. This allows owner controls his office appliances through the internetusing Graphical User Interface. For this system demonstration our system uses an AVR family microcontroller for the purpose.

Human comfort and ease to control the work is the key objective of this project. The person can control the electrical / electronic appliances without visiting to the physical location.

1.2 LITERATURE SURVEY

In this section, discussed different Home Automation System with their technology with features, benefit and limitations they have.

- The Building automation system that 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), 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. User use the 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
- Shih-Pang Tseng et al. [2] 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 DTMF receiver and a data collector, all sensing data are delivered to the Virtual Memory in the cloud. The user can use the computer or Android to monitor and control through the Internet to save power.
- A.Z. Alkar and U. Buhur[3] have developed an internet based wireless home automation system for multifunctional devices. A flexible, low cost, wireless solution to the home automation is introduced. The transformation of the initial simple functionality control mechanism of devices to more complex devices has been discussed. The home appliances are connected through a server to a central node. The system is secured from unauthorized users by using SSL algorithm. During tests, the wireless communication was found to be limited to <100 meters in a concrete building.
- Shahriyar, E. Hoque, M. M. Akbar, S. Sohan, I. Naim, and M. K. Khan presented a GSM based communication and control for home appliances [4]. Different AT commands are sent to Home Mobile for controlling different appliances. The drawback of this system is that a Graphical User Interface (GUI) is not provided to the user. Different AT commands have to be remembered by the users to control the connected devices. Also, the system supports Java enabled mobile phones. The system thus becomes less functional as now-a-days the use of Java enables phones are reducing and the use of Android phones are increasing tremendously.
- JitendraRajendraRana and Sunil N.Pawar in their paper have implemented a ZigBee based home automation system. ZigBee is a high-level communication protocol used to create personal area network. It supports any kind of microcontroller. The system eliminates the complication of wiring in case of wired automation. Considerable amount of power saving is also possible. Operating range is more than Bluetooth. But the system does not allow remote monitoring and controlling of appliances. [5]
- Dual tone multi frequency (DTMF) used in telephone lines [6]. There are three components in the system interface unit and ring detector, IO DTMF receiver, PC. The PC detects the ring of line and authenticationof user is carried out and use the tones to control the devices as required. An example of stepper motor control is taken up. This system has the advantage of being secure and allowing international standardization. This is because the DTMF tones are the same all over the world. But the number of appliances is limited by the number of keys in the keypad.
- The application has been developed based on the android system [7]. An interface card has been developed to communicate between the raspberry pi card, server, remote user 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. Android smartphone issue command to raspberry pi card. An interface card has been to update signals between the actuator sensors and the raspberry pi card.

2. BUILDING AUTOMATION SYSTEM

The smart building is known as Building Automation with the use of IoT, to make the domestic activities more convenient, secure, comfortable and economical.

- User Interface: as a monitor, computer and tablet or phone.
- Mode of transmission: wired connection (ex: Ethernet) or wireless(Wi-Fi)
- Central controller: It is a hardware interface that work with user interface by controlling domestic services.
- Electronic Devices: a lamp, a AC and heater, which is compatible with transmission mode and connected to central control system.

2.1FEATURES

2.1.1 Reduced Installation cost

Installation cost are significantly reduced since no cabling is necessary.

2.1.2 Internet Connectivity

Control devices from anywhere in the world with use of mobile phones to control smarthomes.

2.1.3 Security

Easily add devices to create an integrated smart home security system and built in security enhances integrity of smart homes**.**

3. METHODOLOGY

- The internet of things was initially obtained by RFID community code. Who referred to the possibility of discovering information about a target object by browsing an internet address that correspond to particular RFID or Near Field Communication technology?
- RFID is the foundation and networking core of the construction of internet of things. The IoTenabled userto bring physical object into sphere of cyber world.
- It is also a new wave of IT industries since the application of computing field, communication network and global roaming technology has been applied.

3.1 RADIO FREQUENCY IDENTIFICATION (RFID)

RFID stands for Radio-Frequency Identification. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less.The RFID device serves the same purpose as a bar code or a magnetic strip on the back of a credit card or ATM card; it provides a unique identifier for that object. And, just as a bar code or magnetic strip must be scanned to get the information, the RFID device must be scanned to retrieve the identifying information.

RFID technology has been available for more than fifty years. It has only been recently that the ability to manufacture the RFID devices has fallen to the point where they can be used as a "throwaway" inventory or control device. Alien Technologies recently sold 500 million RFID tags to Gillette at a cost of about ten cents per tag.One reason that it has taken so long for RFID to come into common use is the lack of standards in the industry. Most companies invested in RFID technology only use the tags to track items within their control; many of the benefits of RFID come when items are tracked from company to company or from country to country.

3.2INTERNET PROTOCOL

The Internet Protocol (IP) is the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries. Its routing function enables internetworking, and essentially establishes the Internet. IP has the task of

delivering packets from the source host to the destination host solely based on the IP addresses in the packet headers. For this purpose, IP defines packet structures that encapsulate the data to be delivered. It also defines addressing methods that are used to label the datagram with source and destination information. Historically, IP was the connectionless datagram service in the original transmission control program introduced by Vint Cerf and Bob Kahn in 1974; the other being the connection-oriented Transmission Control Protocol (TCP). The Internet protocol suite is therefore often referred to as TCP/IP.

3.3 ELECTRONIC PRODUCT CODE (EPC)

The Electronic Product Code (EPC) is designed as a universal identifier that provides a unique identity for every physical object anywhere in the world, for all time. The canonical representation of an EPC is a URI, namely the 'pure-identity URI' representation that is intended for use when referring to a specific physical object in communications about EPCs among information systems and business application software. The EPC GLOBAL Tag Data Standard also defines additional representations of an EPC identifier, such as the tag-encoding URI format and a compact binary format suitable for storing an EPC identifier efficiently within RFID tags (for which the low-cost passive RFID tags typically have limited memory capacity available for the EPC/UII memory bank). The EPC GLOBAL Tag Data Standard defines the structure of the URI syntax and binary format, as well as the encoding and decoding rules to allow conversion between these representations. The EPC is designed as a flexible framework that can support many existing coding schemes, including many coding schemes currently in use with barcode technology. EPC identifiers currently support 7 identification keys from the GS1 system of identifiers, as well as a General Identifier and EPC identifiers that can be used for encoding supplies to the US Department of Defense.

3.4 WIRELESS FIDILITY

Wi-Fi is a type of wireless network technology used for connecting to the Internet. The frequencies Wi-Fi works at 2.4 GHz or 5 GHz, ensure no interference with cell phones, broadcast radio, TV antenna and two-way radios are encountered during transmission.To simplify, Wi-Fi is basically just radio waves broadcast from a Wi-Fi router, a device detecting and deciphering the waves, and then sending back data to the router. It works very similarly to an AM/ FM radio but it is two-way communication channel. Wi-Fi works over longer distances than Bluetooth or infrared and is also a low power unobtrusive technology, making it suitable for portable devices such as laptops and palmtops. Wi-Fi is governed by the Wi-Fi Alliance, an association of manufacturers and regulators defining standards and certifying products as Wi-Fi compatible.

3.5NEAR FIELD COMMUNICATION

Jointly developed by Philips and Sony, the standard specifies a way for the devices to establish a peer-to-peer (P2P) network to exchange data.After the P2P network has been configured, another wireless communication technology, such as or, can be used for longer range communication or for transferring larger amounts of data.

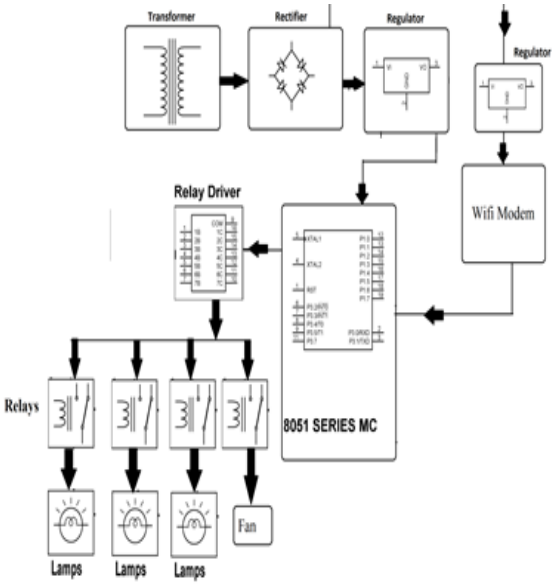
3.6 WIRELESS SENSOR NETWORK

A wireless sensor network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to monitor physical or environmental conditions. A WSN system incorporates a gateway that provides wireless connectivity back to the wired world and distributed nodes (see Figure 1). The wireless protocol you select depends on your application requirements.

Some of the available standards include 2.4 GHz radios based on either IEEE 802.15.4 or IEEE 802.11 (Wi-Fi) standards or proprietary radios, which are usually 900 MHz

4. PLANNING

4.1Architecture diagram



4.2

Fig. Architecture

4.2 Hardware Specifications

- 8051 series Microcontroller
- Wi-Fi Modem
- Diodes
- Transformer
- Relays
- Voltage Regulator
- Crystal
- Lamps
- LED
- Relay Driver IC

4.3 Software Specification

- Keil µVision IDE
- MC Programming Language: Embedded C

4.4WIFI Modem:

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime.

Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

4.5Features:

- 802.11 b/g/n
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLLs, regulators, DCXO and power management units
- +19.5dBm output power in 802.11b mode
- Power down leakage current of <10uA
- 1MB Flash Memory

5. CONCLUSION

The proposed Building (home, office, school and colleges) Automation System enhances mobility and supports monitoring and control of devices from any remote location. Being a simple and user friendly application it serves as an application of great help to the old aged or physically disabled people. Thus, the Internet of Things based Home Automation System is comparatively much better than all traditional existing Building Automation Systems.

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