

Smart Office Area Monitoring and Control Based on IoT

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Abstract :- — Internet-of-things (IoT) is the significant integration of electronic devices, vehicles, buildings, and other articles to collect, capture and exchange the data. The project proposes an effective system that can be implemented using IoT (Internet of Things) for controlling and monitoring of office and home electronics applications using World Wide Web. The smart office referred to as a wireless automation system that can be supposed to be implemented in existing office area environments, without making any changes in the infrastructure. The proposed system is designed to control and monitor electrical appliances using a smartphone via bluetooth as communication protocol and also raspberry pi as server system. The office monitoring system prototype includes a gateway with user interactions capabilities, this experiment demonstrates that the proposed gateway work efficiently by transmitting and receiving instructions from different protocols, a Graphical User Interface (GUI) allows user to interact with the ambient environment settings.

Keywords: - Smart Office, internet of things, raspberry pi

I. INTRODUCTION

Internet of Things is leading to the development of a plethora of smart objects that can be intended to transform homes and office area into real smart office. In this technique, taking the advantage of the recent innovations in the communication and information technology [1]. Nowadays the Wireless technologies are becoming highly efficient and more popular all around the world and end users show appreciation for using wireless technologies, that gives them relief of the tedious wired cable connections. Recently with the use of embedded Bluetooth, RF, Zigbee technologies and digital devices forms a network where electrical devices can communicate with each other. Currently the office and home automation are one of the prime applications of Bluetooth technology [2].

Internet of Things is a system that uses computers or mobile terminals to control the basic home functions and features automatically through Internet. Basically office automation can provide convenience, comfort, security and energy efficiency to the occupants. The system architecture is divided into three layers: office work environment, office Gateway and remote environment. Remote environment can inform authorized users, who can access the system on their smart phone applications using the Internet via Wi-Fi, 3G or 4G internet network. The office or Home automation surroundings consist of Home Gateway and the hardware interfacing module. The fundamental role of the Home Gateway for the proposed system is to

provide the data translation services between Internets. A smart phone based on android technology provides built in Wi-Fi and can be used to access the devices at office and home [3]. The spread of computing environment is undoubtedly changing our lifestyle. Our working environments have changed to the better. For example advanced home automation can create comfortable home atmosphere. These who are seeking a luxurious lifestyle as well as people with special needs can both benefit from home automation as wireless control mode may help them to carry out their daily activities with ease and accuracy. Besides, voice control access will be used as command for better purpose [4]. Voice is not only the simplest and the most commonly used tool of information exchange among people, but also one of the important means of communication between people and machines.

II. OVERVIEW OF INTERNET OF THINGS

The Internet of Things (IoT) can be defined as connecting everyday objects like smart-phones, Internet TVs, actuators and sensors to the Internet where the devices are smartly linked together enabling new forms of communication between things and people, and between things themselves. Presently internet of things being used in the fields of automobiles, agriculture, security surveillance, building management, transportation, smart-homes, and health care.

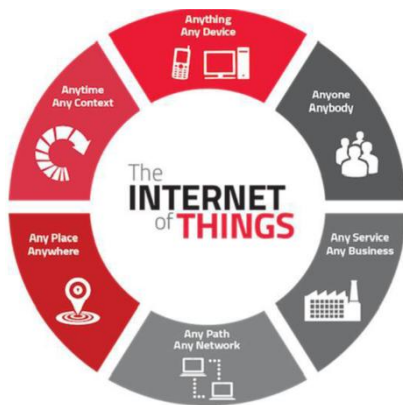


Fig. 1 Internet of Thing

The Internet of things can be considered as a technology for connecting the various types of smart devices such as smart phones, personal computer and tablets to the internet, which can bring in very modern type of communication between things or objects, people and also between things. The introduction of Internet of things have provided the research and development of home and office automation which are becoming popular in the recent days. Most of the devices in smart office can be controlled and monitored to help the disabled persons. There are different wireless technologies that allow terminals to connect from remote places to improve the intelligence of office environment. An intelligent network of IoT is formed when any individual is in need of connecting with other things or objects. IoT technology is emerging with more revolutionary idea and significant growth for smart homes and smart office to improve the living standards of life.

III. RELATED WORK

It is considered that one of the most exciting developments in the technology stemming from Internet of Things is the home automation system. This paper explores the design and implementation of the Internet of things and also the way it can be utilized in office and home automation. Smart homes can be said to have more benefits for energy management, comfort and conveniences [5]. The access to internet has become a common interface, hence devices use it in order to simplify and ease the daily routine of many people. Internet helps to bring in with the immediate solution for many problems and also able to connect from any of the remote location. It contributes to the overall cost reduction and energy consumption. An effective implementation for Internet of things is to monitor and control the home appliances through World Wide Web. The home automation system uses

the manageable devices as a user interface. They can respond to the home automation network through Internet connectivity, by using resources of low power communication protocols like Bluetooth, Zigbee, RF, Wi-Fi etc. This system aims to control home appliances using smartphone by means of Wi-Fi for communication and raspberry pi as a server system. By Through a web-based interface, the end user can move directly with the system. The home appliances like lights, fan and door lock are remotely controlled through an easy website [6]. The voice recognition as well as touch screen button are successfully developed for home appliances using android via smart phone. This paper proposes the development of home appliances based on voice command using Android. This system has been designed and developed to assist elderly people. It also provides support to disabled people at home. The google application has been used as voice recognition. It processes the voice input from the smart phone. In this paper, the voice command input has been caught by the android phone and will be sent to the Arduino Uno. Bluetooth module in Arduino Uno received the signal to control the light and fan. The proposed system is intended to control electrical appliances with a fairly user-friendly interface and ease of installation [7]. A home automation system based on Bluetooth technology is proposed to be able to implement a product using the current technology that will enhance the lives of others. It will simplify the daily living and act as a huge contribution to the community. Also this paper presents the design and implementation of a system that provides cost effective, highly efficient, flexible and more secured mobile phone based home automation system. The design is based on a stand-alone Arduino BT board. The office and home domestic appliances are connected to the input/output ports of arduino board through the relays. The communication between the cell phone and the Arduino BT board is wireless. This system is designed to be low cost and resizable so as to allow various devices to be controlled with minimum changes to its core [2]. Everyone wants that the complete control such as switching on/off the lights, fans, televisions and other appliances through one device. The paper provides automatic switching systems that can provide switching control of various household appliances. Voice based home automation, as well as a universal remote control application on an Android platform, has been presented. The efficient use of various available applications on Google play store has been done. Using the Bluetooth module HC-05, Arduino Uno, and Android application, voice controlled automation [8]

IV. PROPOSED SYSTEM

The proposed system is intended to overcome the shortcomings of previous system and to improve the security, flexibility, efficiency.

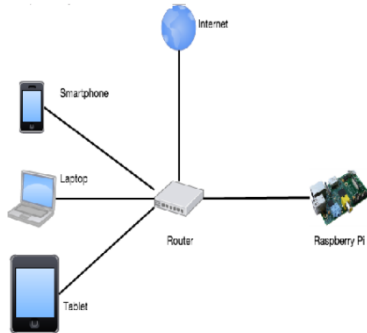


Fig.2. The proposed office automation using Raspberry pi

The system is interactive to provide ease in day to day life, also saves electricity, human efforts. This system presents a wireless solution based on Internet protocol to manage the smart office entities easily.

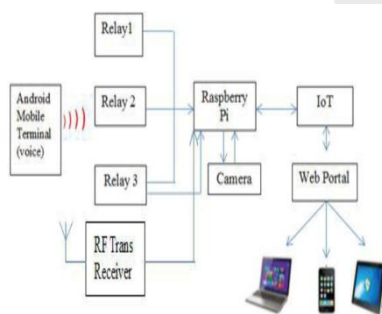


Fig.3 Block Diagram of Central Control Unit

Based on this approach, we proposed a smart office area monitoring system with the execution of related software and hardware. The Voice-operated android phone and Raspberry Pi office automation system uses an Android technology. It is based on the Bluetooth enabled phone to turn ON/OFF of devices. Raspberry Pi ascertains to be a powerful, economic and an efficient platform for implementing the smart home automation. It can react to the voice commands and control the on/off position of electrical devices, such as lamps, fans, television etc., in the office. The Bluetooth module supports the use of this system from various locations in the office. For security system, camera is attached to the raspberry pi. Web Cam is used for security and surveillance.

Blocks of Central Control Room:

The system comprises of Raspberry Pi, PIR sensor and Web Camera. The system is monitored using Internet of Things.

1. Camera:

A Web camera is attached to the system. The camera takes the snapshot of the accident or undesirable entries by which the user can take the immediate action.

2. Raspberry Pi:

It is a credit-card-sized single board computer. A computer with CPU, GPU, RAM, some I/O ports. Additionally it adds wireless LAN & Bluetooth connectivity creating it the ideal solution for powerful connected designs.

3. Android based Mobile Terminal:

It is user friendly display through which we can monitor and control the appliances and machine. Android technology use an operating system (OS) based on the Linux kernel.

4. Relay Unit:

Relays are used to switch ON-OFF the devices. It is also known as on/off switch. A relay is an electromagnetic switch. It is activated when a current is applied to it.

RF Tran receiver: An RF Transmitter and Receiver pair is used for wireless communication. An RF Transmitter and Receiver pair is used for wireless communication to transmit data between central control room and office area unit.

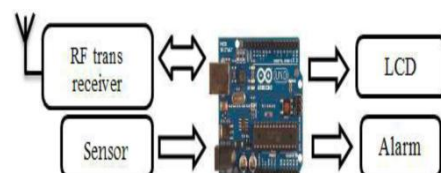


Fig. 4 Block Diagram of Office area unit using Arduino

Blocks of Office Room using Arduino:

Today, with the improvement in Information Technology, the next generation of user interface is desired to be relatively user-friendly and powerful. As the choice for natural and expressive means of communication, voice commands are more needed for human-computer interaction.

This system aims for enhanced continuous communication between automated home and it's resident. To achieve the goal, this paper projected voice input command to control any electrical device. Voice command proceeds recorded sound captured

from central control unit by Raspberry Pi and convert it into text format to display on LCD.

The office appliances can be monitored with the internet of things technology. Arduino microcontroller is used to receive user voice commands to Text message on display using wireless RF trans receiver technologies The RF Trans receiver module is used to transmit data using RF communication from central control unit to the office area. Also PIR motion detector is used so as to sense movement of people.

The system consists of Arduino controller board, PIR sensor, alarm.

1) *Arduino microcontroller:*

The Arduino Uno is a microcontroller board based on the ATmega328. Arduino board is comparatively cheap, plugs straight into a computer's USB port, and it is more simple to setup and use.

2) *Sensor:*

A PIR-based motion detector is used to sense movement of people, animals, or other objects. They detect the infrared radiation emitted or reflected from an object .The PIR sensor is fixed on a printed circuit board containing the necessary electronics required to interpret the signals from the sensor itself.

3) *Alarm:*

Alarm or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. It is ON for any unauthorized entry detected.

V. SYSTEM DESIGN

A. *Sensor and Camera Interfacing:*

Webcams can be used as security and surveillance cameras. Using the powerful Raspberry Pi processor we are interfacing a USB camera directly to monitor the office area for any unauthorized entries or theft detection. The Video will be displayed on the LCD Display. A webcam is a video camera that feeds or streams its image in real time to or through a computer to computer network. Passive Infra-Red (PIR) sensor has been used to detect human. The PIR sensors are tuned to detect when a human being or obstacle arrives in their proximity.

B. *Raspberry Pi :*

The Raspberry Pi is a low cost, credit-card sized computer. Raspberry Pi is small, inexpensive, portable credit-size single board computer with support for a large number of peripherals and network communications.[10]

C. *Arduino Board:*

The Arduino Uno is a microcontroller board based on the ATmega328 microcontroller. Arduino is a microcontroller board which can execute different functions using IDE tools.It is capable of very easy accessibility of interacting environments. This board has a specially designed circuit board for programming and prototyping with microcontrollers. Arduino is an open source platform. It can interface many real times hardwires with greater compatibility. The arduino board operate on an external supply voltage from 6 to 20 volts.[9]

VI .EXPECTED RESULTS

The office monitoring system works by using Raspberry pi as hardware tool. A Raspberry Pi board made according to the specifications of an individual will be fitted at each power points or switch boards. It will act as the control for all electrical devices (lighting, fans, air conditioners etc).The Raspberry Pi board can have relays fixed on it.The relays will control functioning of all lighting and fans or any other electrical appliances. This board will have a wireless connection that connects to an Internet hub.

VII. CONCLUSION

The proposed system introduces the event of an office management and accomplishment of security system using Raspberry pi and Internet of Things technology. This paper introduces a wireless solution based on Internet protocol to manage and monitor the office units easily. The application of the IoT technology, in Office area automation means combination of all appliances and the electronic devices like smart mobile phone, personal computer, tablet, and also the monitoring, control of work environment. This proposed system provides many advantages towards security, improved comfort and energy ,and cost savings. Thus it builds an autonomous environment in work area.

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