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CONNECTING THE INTERNET USING MULTIFUNCTIONAL DEVICE WI-FI IN HOME APPLIANCES

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Abstract- Nowadays most of the homes are started using smart technology which is more popular and wide spread all around the world. The communication networks are suitable with flexibility and low cost and which made the Wi-Fi technology as a popular wireless networking technology which uses radio waves to give wireless high-speed Internet and network connection. The major purpose and function of this paper is to propose a simple, flexible and low cost design of scheming and controlling all home appliances and connecting other hardware components using Wi-Fi network. The facilities to design and implement this modern technology in various environments by integration with other modern technology are considered as the main advantage of the proposed design. The proposed system provides connection between all the devices and it also controls all the devices within or inside home using sensors and actuators. The monitoring process is done by installing the proper software in user computer.

Keywords— Wi-Fi, Smart Home, Wireless Sensor Networks, WLAN, Home Monitoring.

I. INTRODUCTION

The wireless communication technology has become a standard technology which is widely used nowadays. It connects two or more devices with a wireless signal through wireless communication technologies. This wireless communication has made dramatic changes in data networking, telecommunication, and integrated networks and also in data security.

Many standard protocols are used for these technologies such as Wireless Personal Area Network (WPAN), satellite communications, Wireless Local Area Networks (WLAN), Wireless Wide Area Networks (WWAN) [1]. A WPAN (wireless personal area network) is a personal area network. This network will interconnect the devices which centered on an individual person's workplace. WPAN uses some technology which permits communication within 10 meters, one such technology is Bluetooth. A WPAN can interconnect all computing and communicating in their desk today. So this concept is used to control various home functions automatically such as lighting, heating, ventilation, security etc. [2].

Most of the modern homes automation systems consist of sensors and these sensor devices are connected to the central device. The central device is used to control all other devices home appliances by using software with user interface. A few general WPAN includes ZigBee, Bluetooth and all sensor devices. Wi-Fi plays a significant role in home network communication and in infrastructure such as flexibility, cost saving and wide usage in different surroundings as building, factories, hospitals and educational environments.

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1.1 LITERAL SURVEY

Several research and projects have been carried out and implemented in home automation. Remote control X-10 is a transmitter and receiver which is already exist [10]. It is used such as lighting, security sensor network with low speed and data rate [3]. A survey is conducted where many types of networks are used with more complex applications, to gain high speed data rate fig 1.
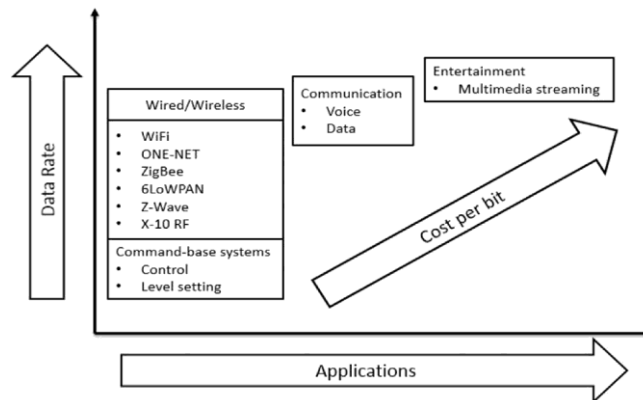

Figure 1: Types of Networks to gain High Speed Data Rate

An additional key element used in home appliance is the sensor networks. Sensor network consists of high number of sensing nodes with wireless multi-hop mode. Wireless sensor networks (WSNs) can provide a variety of useful data from different kinds of areas. Such as military, healthcare, home automation. Wireless Sensor Technology are used by decease the costs of ownership, increasing the technology by using smaller sensing devices and high level of radio frequency and digital circuits [4].

In [5]. The author analyzed a extensive collection of network technologies which are frequently used in home automation systems, and conduct "To construct a smart home, the infrastructure, collected of these technologies, needs to integrated". In [6] authors planned and proposed a design with implementation of new controlling and monitoring system that used Wi-Fi technology as a network infrastructure topology to connect its parts.

1.2 Problem Statement

The consumption and efficient use of home automation systems come across a several problems. These problems are related to dissimilar aspects of system design and implementation. First problem is ownership cost. Operation and wide use is inexpensive from communication network. Second Problem is home environment and scattering within home environment.

The broad extend use of cellular technology and the smart phones which don't require a wire for home automation system. The smart phone users interact from anywhere and whenever they are in needed.

II.   METHODOLOGY

The proposed method is planned to realize a system which perform a several functions and services.
The main functions of the proposed system are:
- Home Security and monitoring
- Power Utilization
- Distance control
- Growing home comfort.

According to the above functions, the system must be able to control the following devices such as:
- Door and windows lock
- Light status
- Camera
- Buzzer
- Ventilation and cooling systems

The proposed method of multifunctional Wi-Fi based system consists of two modules, hardware module and application module. Both the modules work together with each other to perform the required tasks.
Fig.:2, Shows the core hardware components with microcontroller (PIC MCU). The microcontroller performs all the

functions and control of home environment through Wi-Fi module.

The main hardware used to design the system is microcontroller which control and perform the system task such as force sensor, smoke detector, temperature sensor, dedicated Wi-Fi module, camera, GSM, Keypad and LCD, PC, and network router.

When the personal computer turned on and the power turned on the microcontroller starts collecting information and updates. The microcontroller sends the value through the RS232 port to Wi-Fi module which is connected to router. Now the router send the data for the PC system which on or / off the alarm.
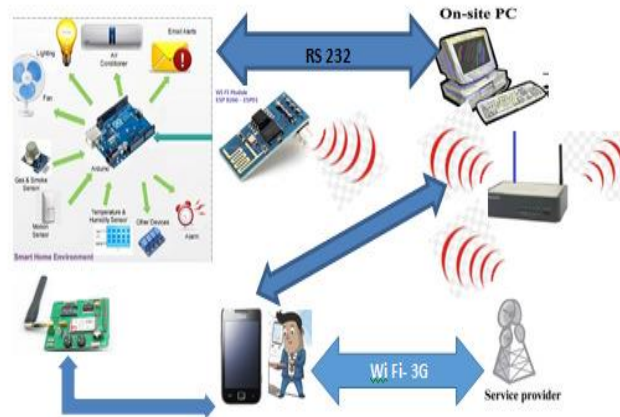

Figure 2: Proposed System Architecture

2.1 Hardware Specification

The hardware module is the microcontroller (PIC MCU). This component performs all processing tasks and controls the system. Arduino Mega 2560 microcontroller consist *of* 54 input/output pins, 16 analogy input pin, 4 UARTs, 16 MHz crystal oscillator, a USB connection, a power pack, an ICSP header, and a reset button. Arduino can be connected to a computer with USP cable or powered by AC-to-DC adapter or battery. ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol. The ESP8266 is presented in Fig.:3.

Figure 3: Wi-Fi Module Based on ESP8266.

The characteristics of ESP8266 module is:
• It sends *AT* commands from a computer via USB to serial adapter.
• Arduino and microcontroller uses peripheral as Interface.

Arduino Mega2560 work in 5vwhile ESP8266 Wi-Fi Module works in 3.3V. To solve this problem, a voltage separator circuit is providing Wi-Fi Module with voltage from Arduino.

2.2 Other Hardware Requirements

For other functions, Web camera is used to monitor the moving objects in the home environment, buzzer for emergency situations, servomotor to open and close windows and doors automatically. For home temperature, temperature sensors is used and switching the FAN or AC on and off. GSM (Global System for Mobile communication) allows Arduino board which is connected to internet, for sending and receiving SMS, and making voice calls using the GSM. A SIM card is used for communication. Keypad and LCD is used for entering code and displaying the operations. The hardware components of Proposed System is Fig 4.
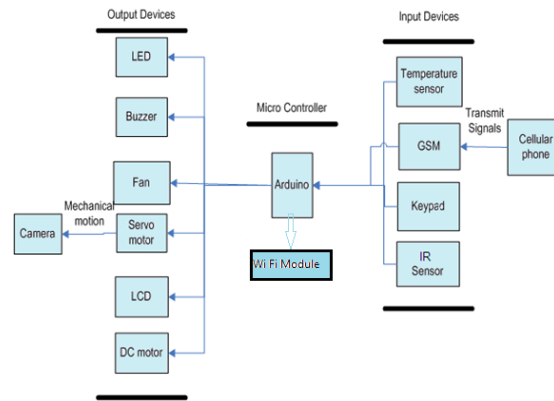
Figure.4: The Interconnected Hardware Components of Proposed System

2.3 Software Module

The software has two parts: the microcontroller software and the application software which is within the PC or server. Microcontroller with 32-bit ESP8266 is written in C++ programming language. The microcontroller is used to collect the data from sensors and actuators.

III. IMPLEMENTATION AND TESTING

Sending and receiving data by Wi-Fi technology using router, Wi-Fi module and the PC, has flexibility and mobility. The PC systems connect and communicate with the Wi-Fi CAM through the router. Switching the light in home using ON/OFF on alarm. Temperature sensors used for AC or fan. High connectivity and flexibility of Wi-Fi is against other technologies with high data rate, of 11Mbps. Bluetooth has a low data rate, about 1Mbps and ZigBee has a data rate with 250 Kbps . Wi-Fi is wide area coverage with 600 ft.

IV. CONCLUSION

The proposed system has been proved to work correctly by connecting and testing the system in different environments, with flexibility. Wi-Fi is everywhere and it is a backbone to the internet.

The proposed system will provide security, control, monitor, and cost effective with scalability and flexibility. It also decrease installation cost by using a single Wi-Fi system. Flexibility, installation, and maintenance are considered as the main requirements for developing home automation systems.

V. FUTURE WORK

Cloud technology can be used in future work with this technology for connecting more devices.

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