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INTRODUCTION

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The idea of “automation” has been conceptualized since several years ago in the evolution of Home Automation Systems. It was started by a student who connected two electric wires with the help of an alarm clock for closing of a circuit having a battery and electrical light bulb. In the passage of time, a few automated systems were developed to control alarms, sensors, actuators, video cameras etc. In fact, the aim of developing these systems is to make automated buildings termed as “intelligent home”. According to the developers and researchers, to make such type of “intelligent home”, one or more automated systems should be required termed as “home automation system”. So, some developers introduce a few home automation systems which are becoming popular among the researchers as well as common people also because it represent a great opportunity for research in generating some new areas in engineering, architecture, computing and make the common people life more easy and comfortable. However, though these new technologies are still in their early stages, but people take it as an essential fundamental requirement in their day to day life [1]. As the integrated circuits and microprocessors become more and more accessible and the Internet communication is a fact of today with the improved availability of cellular networks, these advancements naturally should find use in modern home automation systems. These systems provide the consumers increased security and safety, economic benefits and convenience by giving them control over all the appliances in the house. Designing a home automation system for monitoring and controlling various devices in remote locations can be done through a variety of communication options such as wireless LAN technologies, dial-up modems, private radio networks, satellite communication, Internet, cellular network and so on. Several studies on home automation have been done using different types of control methods [2].

1.2 Motivation

In recent years, modern life style becomes so busy and full of task schedule that people often forget to do some simple duties. Such as forget to switch of their household appliances. People don't bother about their types of carelessness every time, but this can give

them real trouble sometime. Unnecessarily energy is consumed. For too much consumption of energy, the generated heat can damage the device. As a result, it makes a severe interruption in their job schedule, besides some loss of money and time also. Therefore, they want to manage home appliances from a remote location through an automated system. In general, every people use voice, internet, GSM and Wi-Fi service to communicate with each other. But, this system has to communicate between human and any electrical or electronic device by using lots of communication mechanism. As a result, people can access too many devices within a building or home at any time, from anywhere, resolves many of the problems that users often face when they return home, saving a significant amount of time. In fact, for above primary need of human day to day life, many companies and developers are motivated to the field of home automation which is still in an early stage [2]. In this work also an integrated system for device controlling is designed and implemented by motivating the willingness of people to access their home appliances through different way from a remote place at anytime.

1.3 Objective

The system would be designed such that the users can communicate with their household appliances remotely and locally through GSM, Web, Speech and IoT based communication mechanism. The system is controlled by the users' instruction that is frequently occurred in a particular manner and time. An integrated database is also designed for storing the all instructions of users that are sent via GSM, web, speech and IoT based communication mechanism. A switching circuit is designed and developed that is connected with the server through USB port. So, the entire system is a Home Automation System that can be handled by different four communication mechanism so that if one fails, then another can manage it. The real objective of this research focuses on developing a hybrid home automation system in an efficient manner with less limitation rather than the existing HAS with single communication mechanism [3].

1.4 Problem Definition

In Modern era, Information technology is becoming an essential part of human day to day life. When Time passes Human wants everything to be operational automatically with the help of computers. Internet makes it easier and people often becomes crazy to communicate with their electrical devices by using Internet, their mobile, own voice/speech

and Wi-Fi module etc. rather than communicate with the other people. Therefore, this type of expectation of any human being puts some queries into the Researchers every time.

i) Could we somehow control our household electrical devices automatically and remotely using a computer Interface with a human like performance?
ii) After having a few home automation systems to control Household appliances, why an another integrated one is needed?

The solution of the first expectation is Home Automation System. Home automation refers to the use of computer and information technology installed in a simple house in order to achieve automation of housework or household activity through automatic controlling of various home appliances and devices such as light, fan, AC, TV etc. There are a few Home Automation Systems that can range from simple remote control based lighting system through to complex computer/micro-controller based networks with varying degrees of intelligence and automation. Here four methods have different challenges individually. At first, SMS is used for the communication between a human being and machine rather than among the peoples. But, Challenges is that when the SMS is received by the server, only action command available in the text message is not only received, some other fields are also received by the server and from that only action command should be stored in the database. Secondly, the web page is designed in PhP and it is not too simple to integrate the web page with the microcontroller directly. So, the commands should be stored first in the database and microcontroller will be operated by triggered command from the server [4].

Here, it is the time for solution of second query. Although, a lots of design leading to a home automation system having home appliances over wired or wireless communication already developed, but in the present work a special impact has been focused to introduce an integrated platform combining different device controlling mechanism to make the life of the inhabitant simple and easier and it can be claimed that if any communication mechanism goes wrong, still the system will become operational through other communication options.

The module for speech communication is cost effective, efficient and easy to implement than the other system so that using this platform we can make the life of the inhabitant simple and easier and it can be claimed that unlike the other communication mechanism this system will response within a second according to our voice [3]. Actually, this system has to face some challenges during its development and implementation phase

like Noise, Speaker Variability because noise reduces the strength of a speech signal i.e. incorporate the speech signal. During of implementation period, accuracy of our speech recognition system may be degraded as every speaker has their special and unique voice. That is why it should be also maintained for a better speech based device controlling system.

Data capturing majorly occurs through various sensors, PLCs, etc., which are connected to IoT gateways to collect & transmit data to the cloud**.**

1.5 Contribution of the thesis

The major contributions of the present study can be highlighted as follows.

a) An effort is made to design an integrated platform for the four different types of communication mechanism based device controlling system through a common database. The four types of communication mechanisms are GSM, Web, Speech and Wi-Fi (IoT based).

b) A brief experimental study is made where the general SMS service through GSM network is used for the communication between the users and the Household appliances.

c) An additional effort was made establish communication between the users and electrical devices by using web services through Internet.

d) One of the major contributions of the present study is to design of Speaker Independent speech recognition system is designed to recognize the voice commands spoken by the users.

e) Generation of an Interactive Voice Response system for communicating with the web server where the devices are connected through a Telephony data acquisition setup.

f) A brief reflection on the experimental work which was made to design an ASR engine. The ASR engine is a Sub-word Hidden Markov Model (HMM) based ASR engines that is used for recognition of device names, responses (yes/no) and the action command (on/off).

g) An IoT based interface is designed in terms of a web page through the IP address of a Wi-Fi module to control the appliances from the range of Wi-Fi locally.

1.6 Organization of the Thesis

In First Chapter, a basic overview of automation system is described briefly. It is declared that this present study is also an automation system for controlling household appliance. The object of this present work is also mentioned in this chapter i.e. from where the motivation had come, why it is needed and how it is fulfilled in practical purpose. It covers the problem definition of this designed system i.e. after the availability of lots of home automation system why an integrated system is needed.

In Second Chapter, the literary survey is presented in a nutshell which had been done during the development time of entire system. This chapter covers a vast study of different hardware instruments or components, software packages, software tools and the environments where the system is brought up. Another addition to the chapter is related study where a brief discussion of some journal papers and a few books related to this work are made.

In Third Chapter, the present framework of the entire system is described in a diagrammatic block representation. The block diagram of this system layout contains mainly three modules, a user module, a server module and hardware interface. The Diagram of present system framework for three communications and the three modules are described in this chapter.

In Fourth Chapter, the implementation of the whole system is explained in various sections. This chapter covers overview of each and every communication mechanisms, database design and microcontroller programming design in details. The implementation of the software package and the whole system mechanism is also illustrated in this chapter. This chapter contains how the user command can be sent to the server through different Communications. The techniques, procedures, programming logics for the implementation of the system like SMS reading, Speech Training and Testing are explained here.

In Fifth chapter, the result is shown and discussed using some representation of the software interface. The accuracy of the system is analysed also with the help of some parameter and mathematical formula. It is claimed that anyone can visualize and control the proposed system easily with the help of this chapter. This chapter analyzes the efficiency of the mechanisms in term of values and graphs. It gives a little bit comparison also between the different mechanisms for speech recognition. This chapter discussed also the challenges regarding for creating the common platform for every users so that the system will become an integrated one in true manner.

In Sixth Chapter, points out some important features of this system that can be implemented in future so that the system will be an efficient home automation system with precision accuracy. Besides, this chapter also concludes the different aspects regarding the present system.