IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 18, Issue 3, Ver. I (May-Jun. 2016), PP 10-13
www.iosrjournals.org

Design and Development of an Integrated Platform for GSM, Web and Speech Based Device Controlling System

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Abstract: *In this modern era, as information technology is growing so far from the computing to communication, home automation is becoming a crucial area in research. In this proposed work, focus has been given on the design and development of an integrated platform for providing the facility to control the home appliances not only locally, but remotely also in an efficient way. The proposed system consists of two main modules; the first part is the server, which presents system core that manages controlling and monitoring of the home appliances available. Second part is hardware interface module, which provides appropriate interface to the devices of home automation system. In this server part, a server database is designed for storing the device controlling request as action and then firing the action to the second part i.e. hardware interface module. Hence, it can be claimed that this work is giving the facility for the remote user to send their request though SMS or Web and then it will stored in the server database followed by the action to be performed in the home appliances.*

I. Introduction

The concept of "automation" has existed for many years in evolution of home automation systems. Actually, it began with a student connecting two electric wires to the hands of an alarm clock in order to close a circuit of a battery and light bulb [1]. In recent years, modern life style becomes so busy that people often forget to switch off their household appliances. As a result, unnecessarily energy is consumed and too much consumption of energy can damage the device. This damage causes a serious interruption in their task schedule. Therefore they want to handle their home from a remote location [2]. Although several development leading to Automate the home appliances over wireless already developed, but in this work a special focus has been given to introduce a common platform integrating various device control mechanism.

II. Methodology

2.1 Proposed Framework

The proposed system is an integrate automation system for controlling devices consists of two main modules, the server and the hardware interface. User commands are transferred to the home automation server via one of these three alternatives. In the home automation server the incoming commands are processed, then digitized and sent to the relevant unit to be processed.

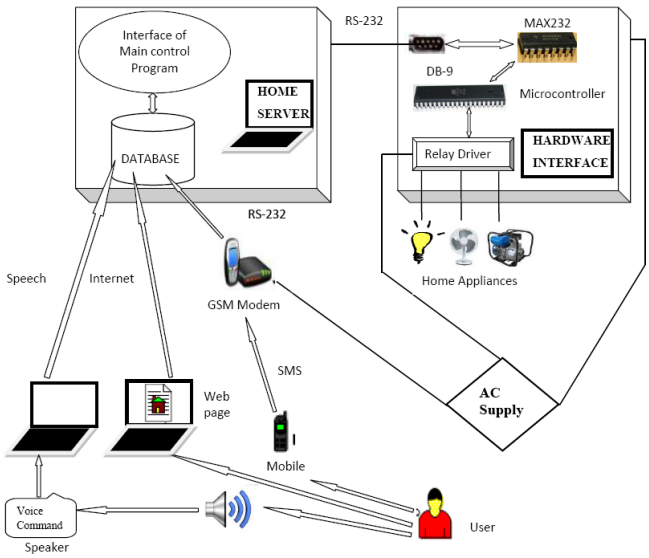

Figure 3.1: Block Diagram of overall proposed system

These hardware units have also the capability of sending their status back to microcontroller which is connected to the home automation server thus they can be monitored in real time. After receiving the feedbacks from the appliance nodes, the home automation server interprets them and performs the necessary tasks.

2.2 Functional Details of Different Modules

Server Module

The server module consists of two sub-modules as database and the software package. The database is the heart of the home server as it only can store all the information regarding the device controlling for the administrator. The database is fully responsible for the incoming information (command/action) to the server which is delivered through three methods, SMS, Web Page and Speech. Actually server can access the web page that is present in the user's PC via internet, can access SMS from the GSM modem via GSM network and voice command via the speaker of the system. Similarly, in reverse way, users can know the status of the device at a particular time when he/she wants, in that web page or that cell phone or GUI of the system from where the command was delivered. The remote communication between the server and the internet connected user's PC can be established by a real IP address (Internet IP). The GSM modem is simply connected to server by a USB to serial communication cable.

The server module also can be easily configured to handle one hardware interface module. Server machine is nothing but a normal PC containing software package. The server software is developed using Visual basic technology, so server should support VB application for windows operating System. The software package can access the database containing by the home server. The hardware module can be controlled by the server locally as well as remotely. RS232 communication protocol is selected to be the network infrastructure that connects server and hardware interface modules. The main functions of the server is to manage, control, and monitor distrusted system components, that enables hardware interface modules to execute their assigned tasks and to report server with triggered events.

Hardware Interface Module

The hardware interface module consists of two sub modules as microcontroller and the relay driver board connecting the home appliances. The AT89S52 microcontroller is the heart of the hardware interface and relay driver board is the bridge or medium between microcontroller and the electric devices. Apart from this, a software package is designed in embedded C programming using keil compiler for controlling the 8051 microcontroller. The serial port present in the hardware module is responsible for receiving the instruction given by the server machine. The server's instructions are transmitted into microcontroller via a TTL to serial convertor MAX 232. The microcontroller is connected with the relay driver board by simply a wired connection andboard is also directly connected to the devices through direct wired connections. Hardware interface modules has the capabilities to control electronic devices like lights, fans etc. Actually, the hardware interface is nothing but an electrical circuit with a relay driver board. The whole electrical circuit and relay driver board is supplied 12 V by an adapter.

Administrator or User can see the status and all the information regarding the device control in a LCD display locally. The LCD display is also controlled by the software package present in the microcontroller. In reverse manner, the hardware interface has the ability to send the status of the device or reply of the user's command.

III. Implementation

3.1receiving Command Through Sms

At the time of activating the server, first AT+CMGF=1 will be generated automatically i.e. the message will arrived in text format because by default the SIM messages are in PDU format. Secondly, AT+CNMI=1,2,0,0,0 i.e when an SMS is received by the GSM modem.it handles enabling the notifications to the terminal or port where the GSM modem is connected. After that, the AT+CMGR command read the message from the port selecting by +CPMS command. But in the message, there is not only the command. Apart from the command there are different parameters like source number of the message, message status (read/unread), user name, password etc. So, from those, the server extracts the actual command sent by the user and stores it in the database.

To accomplish web communication, a web server is built to take requests from remote clients. The system is modelled with three different units. The first unit is the PC side which is formed of a user interface component, the database and the web server components. When user gives the command in the web page by pressing the respective button present in the web page, then the command line with receiving system, system date and action is received by the server database. The two machine, user's PC and home server communicate each other through internet using a real IP address (Internet IP).

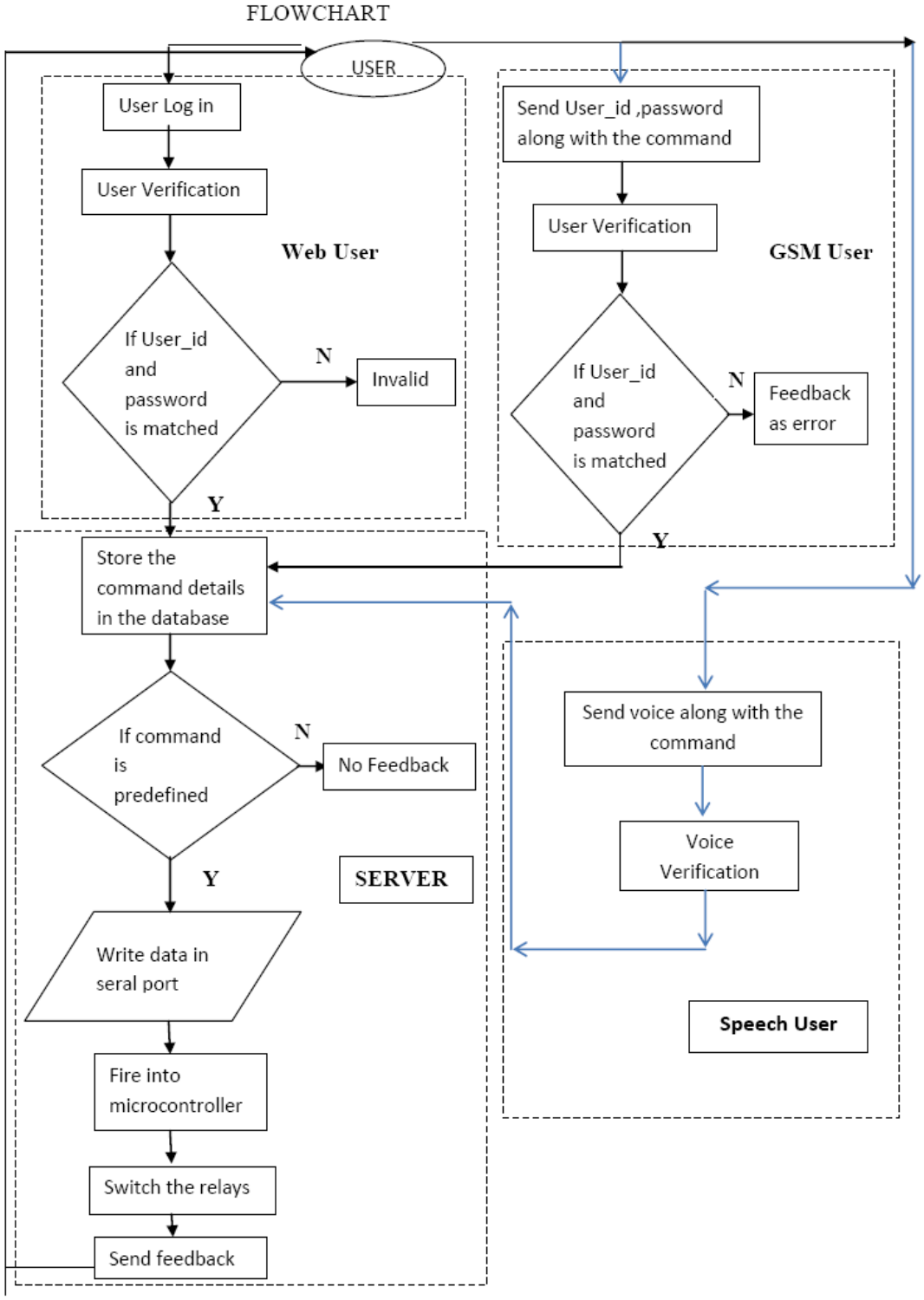

Figure 3.2 Proposed flow-diagram

3.2 Receiving Command Through Web

In order to achieve interaction with the home automation network from the outside, the other option is to use theInternet. To accomplish this, a web server is built to takerequests from remote clients.The system is modelled with three different units. The first unit is the PC side which isformed of a user interface component, the database and theweb server components. The user interface and the internetfront end are connected to a backend database server. The clients/users can send requests tothe server machine through a web page. A web page is constructed as an interactive interface wherecommands can be submitted by the client to change and alsomonitor the status of the devices. The web page is designed by the high level scripting language PHP. When

user gives the command in the web page by pressing the respective button present in the web page, then the command line with receiving system, system date and action is received by the server database designed by MyQql. The two machine, user's PC and home server communicate each other through internet using a real IP address (Internet IP). The WAMP server has the main responsibility for communication among the server database and user's web page.

3.3 Receiving Command Through Speech

In order to achieve interaction with the home automation network from locally i.e home, the other option is to use speech mechanism. In our system the Microsoft sdk for speech is used to receive the voice command generated by the user. The software is build up to learn the voice of the user by training a repetitive way by the user so that the other voice cannot control the system. After that, if the voice is verified, then the command is stored into the database and the same communication will be continued as like as the previous two mechanisms.

IV. Future Scope And Conclusion

The most emerging scope that can be implementing in this system is the application of Artificial intelligent. Using AI this system can learn the behaviour of devices controlled by the user and get some knowledge about the whole system regarding their operation. As a result, from those knowledge Which are extracted from users' previous work, the system can be controlled itself. This System presents the design, development and the implementation of an interactive home.

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