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VOICE RESPONSE SYSTEM FOR WIRELESS

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Abstract- In this paper, a GSM based wireless home automation system is proposed and deployed which executes its function of controlling and monitoring appliances remotely. It is compliant, cost-effective, low power consumption, highly efficient GSM (Global System for Mobile Communication) based wireless home system. The Interactive Voice Response System(IVRS) is improvised to embellish the system's security and ease of operation. With the help of this system the user can access his home appliances from anywhere and at anytime as per the requirement aiding convenience. The system permits the user direct devices through his mobile by sending voice commands using IVRS system. It also enables the user to monitor the status of loads with SMS update. A detailed system analysis is carried out and presented in this paper.
Keywords – Automation, mobile, control, GSM, wireless network.

I. INTRODUCTION

Wireless technology has served in the field of automation since a long time. This can be achieved by implementing networks with the support of various wireless technologies such as Zigbee, Bluetooth.

Such automated systems deals with providing a network in an environment which links computers peripheral equipment, smart chip bearing appliances and sub-systems. It wired or radio link communication, each has its own limitations such as complex wire deployment, data rate, etc. The paper proposing another such system is implemented using Zigbee wireless personal area network which respects system installation. Also home automated systems based on Bluetooth technology enabling devices to be controlled using Personal Area Network is presented in this paper. All these papers suggesting systems have certain limitations cause network congestion, which is time consuming and complex in nature.

The GSM network that relies on radio wave communication conveying information to control devices. Mobile communication network coverage is bigger than that of LAN thus user can take benefit of portable phones to organize the system. SMS service of GSM is exploited efficiently. Easy implementation since it is highly compatible. Section II describes the system methodology along with the block diagram and operational working of each unit. Section III describes design. Section IV describes hardware implementation. Section V describes analysis of the system and final section presents the conclusion of the paper.

II. SYSTEM METHODOLOGY

The system consists of two main sections namely; transmitter side commanding unit and the receiver side appliance control unit.

A. GSM Module

GSM module is interfaced with MCU via the interface. Whenever GSM module receives any call, system verifies the user with password authentication and allows only the legitimated user. According to the command number and present status of the unit, an control action is executed. MCU gets interrupted which in turn wheels the GSM to update SMS to the programmed cell phone number. GSM module does not store any commands, MCU treats each command as a suspended action and responds instantly. Updates to the programmed number from next communication onwards.

B. Transceiver module

It is used to exchange of messages which helps MCU in execution as well as in termination of the user process. Its a true single-chip UHF transceiver designed for very low power and very low voltage wireless applications. It is suitable for our system since the distance between ACU units is not more than 2 Km.

C. Frequency Decoder

DTMF(Dual Tone Multiple Frequency) is a generic communication term used for the tones which are generated after pressing any keypad digit. The frequencies analogous to each key of cell phone keypad. It uses a dialling keypad of 12/16 buttons producing unique tones for each button. It decodes the input data processed by MCU in order to acknowledge the user. The frequency to each key of cell phone keypad are shown in Table 1.

Table I Frequency matrix for DTMF keypad

Frequency	1209 Hz	1330Hz	1477 Hz	1833 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

The system is implemented with the MT8870D-1 which is a comprehensive DTMF receiver.

D. Voice module

Voice module is a crucial part of the system to establish IVRS(Interactive Voice Response System) which provides real time communication. This device supports five message management which are defined by the MSEL1, MSEL2 AND M8 OPTION pins are as shown in Table II. In our system Random access mode with 8 fixed duration messages is preferred hence the pins are MSEL1 and MSEL2 are connected to Vcc.

Table II Selection of mode

Mode	MSEL1	MSEL2	M8 OPTION
Random access 2	0	1	Put this pin to vcc through resister
Random access 4	1	0	Put this pin to vcc through a resister
Random access 8	1	1	The M8 bigger becomes input pin
Tape mode, auto rewind option	0	0	0

E. Control circuit

The control unit mainly consists of relay and its corresponding driver circuitry. These transistors are controlled by the control output pin of MCU. The function of the relays is to provide between a control circuit and load. The rating of relay is determined by the load to be controlled. Hence it controls the switching operation of the load by controlling the relays.

III. IMPLEMENTATION OF IVRS SYSTEM

This section well implementation of IVRS section enables the user to take control action to the present status of parameters. It also enables to interact with the system.

Whenever the user calls on the SIM card number which is inserted in GSM, the pre-recorded messages are transmitted to user via GSM network radio link. Immediately after call: Enter your password. If password is wrong: Password wrong, try again.

Mode selection viz. MoD8, MOD4, MOD2 accordingly 8,4,2 messages can be recorded. MIC interfacing for audio input.

If device is off: press 1 to switch on the device. If device is on: press 2 to switch off the device. Voice quality control, determined by sampling rate which can be varied from 4 to 8 KHz and it depends on pot PR1 as depicted.

SW1 to select read or write. SW3 to enable to message recording. Messages can be recorded in any regional language hence system eliminates the language barrier difficulty.

IV. HARDWARE IMPLEMENTATION OF THE SYSTEM

The hardware implementation of appliance control unit which is to be implemented at the home. All the subsections such as transceiver unit, voice module.

Relay circuitry, frequency decoder explained in earlier sections are indicated. ELE: indicates the status of electricity. MV1: indicates number of On loads whereas MV2: indicates number of off loads.

When loads need to be remotely turned on, the commands are entered by user accordingly to the above Table I. These commands are received by the GSM and processed by the ACU.

As the system is designed to control the loads of two rooms on a floor, below given table III illustrates which particular key on the DTMF keypad is used to control the devices.

Table III Keys used for controlling loads

Command format	Key alloted	Task executed
Enter the keypad no	1	Room 1 selected
Enter the keypad no	2	Room 2 selected
Enter the keypad no	N	Room n selected
Enter *the keypad no*	*1*	Load 1 turned on
Enter *the keypad no*	*2*	Load 2 turned on
Enter *the keypad no*	*n*	Load n turned on
Enter #the keypad no#	#1#	Load 1 turned off
Enter #the keypad no#	#2#	Load 2 turned off
Enter #the keypad no#	#n#	Load n turned off

V. LATENCY ANALYSIS OF THE SYSTEM

The latency involved in the system is crucial parameter in the performance evaluation of the system. Automation systems like HAS, BAS, etc. Control actions have to be executed within the hard deadlines. Generally, latency involved in short range wireless technologies is less compared to the cellular communication. WPAN has limited coverage area upto 10 meter, whereas, cellular communication as long as 330 km, a single cell size area. The results in significant delay of operation thereby increasing the processing time. The T_{user} is the time required by the user for the authentication process and selecting the particular command.

$$\mathbf{T_{pot} = T_p + T_{BTS} + T_{pro} + T_{user}}$$

Total delay involved in arrival of the call at GSM is around 3-5 seconds. Processing time at BTS further at BTS further adds 0.3 to 0.6 msec. In addition to this, few seconds are taken ny the user to enter the password and desired command. MCU approximately takes 40-60 msec to execute the command and the program flashed in its memory. Hence, the latency involved for completion of first control operation is around 7-11 sec.

VI. CONCLUSION

The system elaborately described in the above sections makes efficient use of the latest technology to aid users in order to control the operation of the desired appliances or load in real time from remote location. It can be incredible solution to the faced by the occupants of the house who are not physically present at the location but can control the devices providing a real-time

automation. The paper provides the designing and implementation of GSM based real time automation system. It also elaborates the interactive voice response system designing integrated with voice circuitry. The latency involved in the execution of the operation is estimated and the detail analysis is demonstrated. Hence an IVRS based system facilitates user to interact with the system and it enables the user to control the loads remotely.

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