RESEARCH ARTICLE

# FRIENDLY HOME AUTOMATION SYSTEM USING CELL PHONE WITH INSTANT VOICE MESSAGES

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| Manuscript Info | Abstract |
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| *Manuscript History:*<br><br>Received: 11 October 2013<br>Final Accepted: 22 October 2013<br>Published Online: November 2013<br><br>*Key words:*<br>HAS, Home Automation, DTMF, PIC Microcontroller, J2ME, and Voice Message Feedback. | This paper introduces a friendly system to control the home appliances remotely by the use of mobile cell phones; this system is well known as "Home Automation System" (HAS). The designed system covers the most important required factors in home automation system such as flexibility, security, easy to use, the ability to feedback information to the client immediately, … etc. The proposed HAS in this paper is implemented practically, tested and gave the correct and expected results.<br><br>*Copy Right, IJAR, 2013,. All rights reserved.* |

This paper introduces a friendly system to control the home appliances remotely by the use of mobile cell phones; this system is well known as "Home Automation System" (HAS). The designed system covers the most important required factors in home automation system such as flexibility, security, easy to use, the ability to feedback information to the client immediately, … etc. The proposed HAS in this paper is implemented practically, tested and gave the correct and expected results.

## Introduction

The idea of home automation system (HAS) has been implemented for some years. It began with the concept of domotic which is the combination of computer application and robot technology. In other words, it is the control of home appliances by means of a computer. Then the concept is developed to a modern one, it is talking about the interaction of technologies and services applied to different buildings with the purpose of increasing security, comfort, communication, and energy saving. The main parameters by which the HAS can be estimated are: interoperability (the capability of devices of different types and from different manufactures to communicate and cooperate), scalability, security, availability, usability, existence of multiple standards, simplicity, the ability to feedback information to the client, friendly, and flexibility. These represent a good reasons which call the attention of companies to enter quickly this emerging market, also they represent great research opportunity in creating new fields in engineering, architecture, communication, and control, so HASs are becoming popular. The presented paper introduces a friendly HAS that complies the mentioned parameters using two mobile cell phones (client and server). The client cell phone is the master and contains the main menu of the HAS which is programmed by J2ME language. The server cell phone (situated in the home) to which the controller is connected which controls the operation of the home appliances. The controller consists of a DTMF (Dual Tone Multiple Frequency) and a PIC microcontroller. The interfacing circuit consists of an optocoupler and a static power switch (TRIAC).

## II. SYSTEM FEATURES

The system considered in the present paper introduces the following features:
**1**. Visual Menu of home appliances the user see all appliances he want to control and operation instructions on the mobile phone screen by J2ME software.
2. The system allows the user to control (On or off) nine of home appliances and can be expanded to 22 without adding any component (depending on the microcontroller programming).
3. Controlling a high voltage device.
4. Knowing the devices present state (On or off) at any time with voice message.
5. Knowing if the home AC main power is off via voice message.
6. The system will communicate with user, and gives information about device's state after controlling (on or

off) with voice message.

7. Any phone number can't access the home server by calling the server number, only the specify numbers will be answered, the specify numbers are of user choice. This feature has been added in the presented HAS for security.

8. Can add multi users to control this system this feature refer to user choice.

9. Server cell phone can be used for normal use without any effect in the home system, the system give ability of changing the server number by an option in the menu of master phone.

10. Server has a password at least 4 digits long and can be increasing by the user.

11. The controller will close the line automatically after entering three wrong passwords.

12. The Capability of changing the server password by user remotely at any times.

13. If there is no keypad pressed for more than 30 seconds, the controller closes the line automatically. This feature for don't keep the telephone line busy for unwanted reasons, this feature save user money.

14. Working at convention home power and need no specific electrical network.

15. The system is nonvolatile; that means information of appliance status and new password aren't lost if home power is off.

## III. SYSTEM ARCHITECTURE

The system architecture of the proposed HAS in this paper can be explained according to the block diagram shown in figure (1). The system mainly consists of two cell phones one remote cell phone which called Master cell phone (client) which controls the operation of the remote home appliances, this cell phone contains the main menu which it is programmed via J2ME language; and the other home cell phone which called server phone because it is fixed in home server controller board.

This system allows a user to control and communicate with home appliances by programming cell phone and built in the mentioned several features. The home appliances are controlled by the home server phone, which operates according to the user commands received from the master phone via the server phone. The control circuit which is connected to the home server phone consists mainly: DTMF decoder, microcontroller, interface& isolation circuit and voice message feedback circuit.

## IV. SYSTEM OPERATION

The system operation procedure can be summarized as follows:
1. Enter the required password.

2. Enter "0" followed by the number of a specific home appliance to know the present state of such appliances.

3. Enter "#" followed by the number of a specific home appliance to change the
present state from "Off" to "On" and vice versa.

4. Enter "*" followed by the new password the password will changed.

V. SYSTEM COMPONENTS

Referring to figure (1) the system consists of the following components, namely;

a. Master cell phone, which contains the main menu.

b. Server cell phone.

c. Control circuit.

a) The master phone serves as a remote control device through which a user can interact with the home automation system. User friendly graphical user interface is provided on the mobile phone through applications developed in Java programming language, which carries out the task of operating and checking sequence of home appliances.

b) The server cell phone, this phone resides in the home which receive the call from the master phone and to which the control system is connected.

c) The control circuit is the heart of the HAS and as we said earlier is connected to server cell phone, this home server

5. All the control states are feedback to the user by means of voice messages. communicates with the mobile phone via GSM network and call phone, at this call phone the user will send DTMF tones by pressing the mobile keypad these tones pass through ear phone to DTMF decoder that decode the DTMF tones in to binary code.

The DTMF outputs will be connected to the microcontroller to allow action to be taken corresponding to the received DTMF tone. The DTMF tones will produce varying outputs depending on the keys pressed by the user. The microcontroller will use this information to determine and validate the sequence of keys entered by the user.

The microcontroller programming will execute this sequence information as output order to power driver circuit or voice message unit.

## VI. OVERALL SYSTEM DESIGN
The following procedure of the PIC programming is realized.

1. Initialize the ports as: (port C) is an input and (port D, port A, Port E) are output.
2. Initialize the ports as: (port C) is an input and (port D, port A, Port E) are output.
3. The program waits until the user presses any keypad and releases it.
4. At this time the microcontroller will read the input code from port C, which connects to the DTMF output.
5. The programming will looped around the two last steps, until 4 digit codes will input (the password), then compared these input codes with the password stored in EPROM, to check the user.
6. If the 4 entered digits aren't correct the program will go back to check password this step repeats only three times after that will disconnect the call phone by send pulse from RA5 in port A to server cell phone.

7. If the 4 entered digit are correct the program will go to state action (label in program) and run out the procedure of program (change the state or read the state or change the password).

**Figure 7. Flowchart of the main program of proposed HAS.**
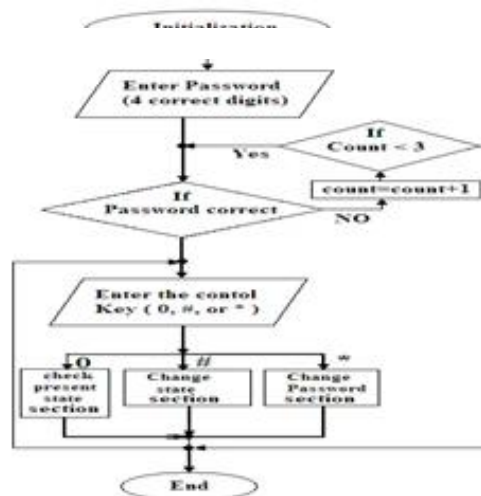


## VII. CONCLUSIONS

The presented HAS in this paper is realized practically, tested for multi modes of operation and gave an excellent control of the home appliances under test. The system presented in this paper introduced a friendly system to control the home appliances remotely by the use of mobile cell phones. The proposed system is characterized by its grand features required for the modern home automation system such as flexibility, security, friendly, in addition to the existence of feedback on line messages to inform the master about the state of the system and the appliances.

## VIII. REFERENCES

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