

Mobile Phone Based Multi-Devices Secured Control System

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ABSTRACT

In this paper, the integration or merge of technologies is presented to aid in reducing men-hands within the system as a total cost reduction especially in the industrial sectors as well as developing systems to comply with a running requirements instead of reengineering. The controlling system is regarded as a flexible tool to develop a way of traditional controlling technique. The structure of system is divided into three different functional parts which are: cellular mobile network, PC, and interface circuits to show, clarify, and make ease of the controlling signal transition from the user to the controlled devices. In addition, for well-designed process, interface circuits are utilized to enhance and boost the controlling signal. PC is the heart of the controlling process due to the reside program that decode and manipulate the incoming controlling signal from user to assist in making appropriate decision. The integration of technologies include both cellular mobile network and PC. Utilization of this integration or merge cause to accelerate decision making, and reduce men hand within the system as a total cost minimization.

KEYWORDS: Controlling Signal, mobile network, DTMF, interface circuit, controlled devices

I. INTRODUCTION

The rapid growth and deployment of the technologies drive users to exploit them in many different applications to facilitate and promote the systems management as well as reducing the overall cast. This paper introduce the merge of these technologies to show the advantages of such integration. To accomplish such integration, systems are designed to perform the different tasks according to the required functions that were well-specified. This work is parting into certain manner to facilitate the transmission of controlling signal. In contrast to the previous studies [1],the paper is used PC instead of microcontroller to increase the span of user mobility, strengthen the security process so as to enhance the control process to be performed by an authorized users, and add more interface circuits to make used of more interfaced devices as flexibility feature.In this work, a remote secured control devices is presented to control motor, valve, lever, and siren. These devices are only an example to prove that the controlling signal can be originated in the transmitter and passed through the system to the controlled devices such as home appliances. The remote control of multi-devices is carried out through the cellular mobile telephones and PC. The cellular mobile telecommunication technology introduces both the transmitter and receiver where the transmitter is used by the user or the controller and the receiver unit is reside with the controlled devices.

II. SYSTEM STRUCTURE

The system components is structured in two principal categories to assist in maintaining, interfacing more devices, testing, and modification:

- Hardware
- Software

The hardware of the system revealed the performance mechanism of each part as well as to smooth the track of the controlling signal. It grouped into four phases as shown in fig. 1: controlling signal generator and receiver, processing unit, interface circuit, controlled devices. The system is integrated from the services point of view. The integration of system is due to the state transition flow of the control signal to achieve appropriate control process. Accordingly, the hardware implementation of the system is structured properly to make a route of the control signal from the user through the system to the controlled devices directly and smoothly.

III. HARDWARE

1. The Controlling Signal

The cellular mobile network represents the source of controlling signal that should be received by the controlled devices. It partially consists of the physical equipment, such as the radio transceiver, digital signal processors, and air interface as well as signaling scheme (dual tone multi-frequency, DTMF). The DTMF signal is the sum of two tones, one from a low group (697-941Hz) and one from a high group (1209-1477Hz) with each group containing four individual tones to allow for 12 unique combinations [10].

2. MT8870 Receiver

It is an integrated IC characterized with low power consumption, adjustable acquisition and release time, power down and inhibit mode, single 5v power supply, and dial tone suppression. It consists of band split filter and decoder functions with few external passive components to achieve design flexibility. External low cost 3.58 MHz color burst crystal is used to synchronize the information transmission and to provide a power down option which, when enabled, drops consumption to less than 0.5 mW[11].The DTMF receiver is defined generally into three functional stages. First, the interface stage, is carried out through (RC) passive components to block dc components control signal gain. Second, the integrated DTMF receiver itself where the transmitting system signals can be processed as state transition flow for each specific signal delivered through the interface stage. Third, the output control logic[5]:

3. The Processing Unit

The exploitation of computers in this work made most of the operational and maintenance aspects of the system easy, feasible, and flexible. The PC program software is well-interfaced with the user and controlled devices. The predefined process that aid in making an appropriate decision of the controlled devices is done in turbo C++ language for both easy concepts and applications.

4. The Interface Circuits

The interface circuits are used to boost signal transition in between different phases. Here, DB25 male connector, HD 74LS373, and ULN2803A are used. The DB-25 male connector is used for device control and communication through software program.It consist of data, control, and status lines to be used as input/output buses. these lines are connected to relevant registers as stated in table 2.[7].To boost the signal level to drive the devices, the ULN2803A is used. The HD74LS373 is 8-bit register features totem-pole three-states output designed specifically for driving highly capacitive or relatively low-impedance loads. The ULN2803A is designed for general purpose applications with a current limit circuits. It consist of eight Darlington transistors with common emitters and internal suppression diodes for inductive loads. Each Darlington features a peak load current rating of about 500mA and can resist at least 95V in the off state[9].

Table 1: Parallelport address

Register	LPT1	LPT2
Data register(base address0)	0x378	0x278
Status register(base address+1)	0x379	0x279
Control register(base address+2)	0x37a	0x27a

5. The load

The controlled devices can be any low current devices such as zener diode for TTL circuits, relays, solenoids, stepper motors, magnetic print hammers, multiplexed LED and incandescent displays, and heaters[7]. In this case: dc motor, valve, lever, and siren circuit are used.

IV. The Design Concepts

For more simplification, both fig. 1 and table 2 are clarifying the concepts of design and the flow of the logical control signal sequences in between the user and devices via a communication channel. To fulfill such process, two mobile phones are used to transmit and receive data according to the network requirements.

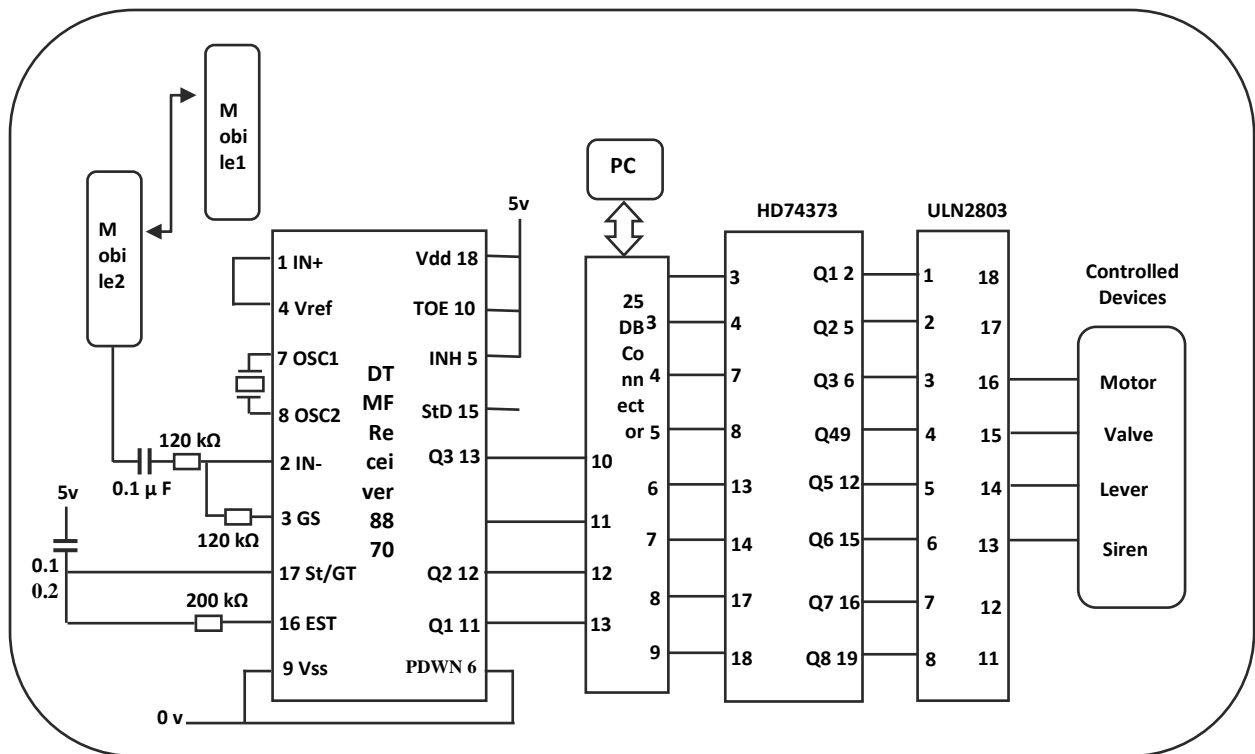


Figure 1 The pins configuration of mobile phone based multi-devices secured control system

1. The Cellular Mobile Network

In this circuit, the controlling signal is sent by the cellular mobile phone no.1 to the cellular mobile phone no.2 which is located together with the DTMF controller circuit[12],[2].Through this process, the mobile phone network performed all the security issues such as authentication, confidentiality, anonymity, and integrity[6],[3].The output of the cellular mobile phone no.2 is then directed via a coupling capacitor to the DTMF decoder circuit

Table 2: The pins configurations of the system structure components

Keypad	8870		DB25		74373		2803		Controlled Devices
out	In	out	In	out	In	out	in	out	
0	2	11	13	2	3	2	1	18	Motor
1	3	12	12	3	4	5	2	17	Valve
2	-	13	11	4	7	6	3	16	Lever
3	-	14	10	5	8	9	4	15	Siren
4	-	-	-	6	13	12	5	14	-
5	-	-	-	7	14	15	6	13	-
6	-	-	-	8	17	16	7	12	-
7	-	-	-	9	18	19	8	11	-
8	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-

2. MT8870 DTMF Receiver

In the first stage of the DTMF receiver, the incoming controlling signal that comes from far distant mobile station no.1 up to the mobile station no.2 represents the input conditions to the integrated MT8870 DTMF receiver through the RC adjustable gain circuit to set the signal according to the application requirements. Such a function is done inside the MT8870 by the buffer circuit which is represented by operational amplifier providing a unity gain and buffer the other input components from incoming into the DTMF receiver circuit. Then, the buffer circuit followed by the band pass filter which is minimize the incoming signal bandwidth.

This filter is succeeded by splitting circuit to feed high and low pass filters to drive a digital detect circuit through high gain comparators which are limiting the signal to prevent detection of unwanted low level signal. The digital detection circuit consist of digital counting technique to determine the frequencies of the incoming signal and to verify that the incoming signal components correspond to standard DTMF frequencies[11]. So, a valid DTMF signal decoded to yield the output combinations as Q_1 – to - Q_4 . [13].

The scenario that the system has to carry out sequentially depends upon the controlling signal that sent from user. The controlling signal is a combination of just decimal numbers:

- The operating software has to first put all the controlled devices in an idle state when starting.
- The Turbo C++ received only the correct password and initialized the system
- Reading the received signal from the user through the mobile phone no.1 as an output of the MT8870 DTMF at the relevant address of the parallel communication port.
- Reacting to the incoming signal as appropriate decision to drive specific device.
- Showing the device states as indicator of control process actions to reflect that the functions are performed in specific and well manner according to the codes.

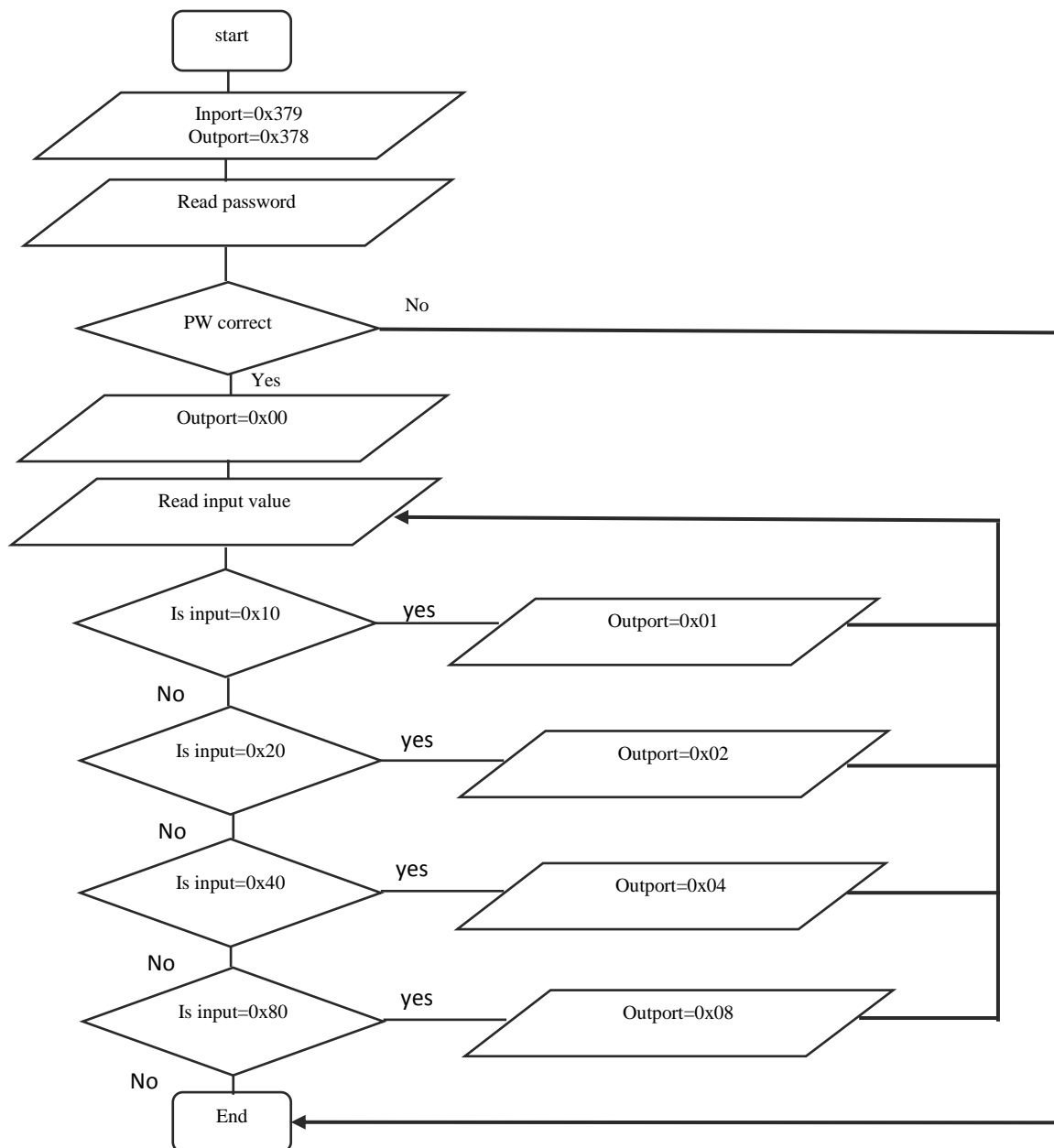


Figure 2the program flow chart

V. RESULTS AND DISCUSSION

The system is carried out perfectly according to the codes and resulted in good performance as stated before. But, there are several constrains that affect the operation of the system negatively. These constrains are due to the network performance which is affected by other uncontrollable parameters. These constrains are:

- The network diverge mostly due to the environmental conditions.
 - Handoff process as the user moving to high densely populated area when in progress.
- The aforementioned constrains may tend to completely loss, block or drop the controlling signal.

VI. CONCLUSION

In this paper, the mobile phone based multi-devices secured control system is presented. The control process is carried out securely and easily via both cellular mobile phones and PC. The exploit of technologies due to their rapid deployment and low cost, help in facilitating the controlling way or techniques as well as introducing many different advantages over traditional techniques. So, the transition of controlling signal through both cellular mobile network and PC to the controlled devices serve as developing tool to the security feature and enhance documentation, mentainance, and interfacing more devices to the system. Generally, the integration of technologies in this work is regarded as a flexible platform to the development.

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