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Secured remote switching dc motors

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Abstract: - The notion of this work is to make use of GSM network to provide users mobility facility to support them while moving. The system is structured into three main parts: GSM network, controlling software, and boost circuits. The GSM network acts as low cost tool to aid in developing the system to cope with the upgrading requirements. The switching of motors is only performed by an authorized users. So that a controlling software used to strengthen the security feature to assist in preventing the system against unauthorized users. Besides, the controlling signal that transmitted by a distant user up to the controlling software is of TTL level nature. Therefore, different levels of boost circuits employed to assist in enhancing the signal level to be adequate to drive the motors.

Keywords*: - dc motor, DTMF, GSM network, mobile station.*

I. INTRODUCTION

In this paper, the integration concept is presented to show the transition of the control signal throughout the entire system when controlling process took place. The work is generally classified into three main functional areas to reflect the stages of integration and in the same time to aid in modification and maintenance process. The first principal stage is the signal source is refer to as GSM wireless network to act as flexible tool for user mobility as he controls the devices. The second stage is the boost circuits that take part in enhancing the control signal and assisting in securing the control process when initiated. The third stage is the switched devices. This classification of the system components reveals many different aspects such as the flexibility of design when comparing to the previous works. The paper presents the secured remote switching of three dc motors. One rotates anticlockwise, the second clockwise, and the last can rotates clockwise and anticlockwise
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II. THE SYSTEM COMPONENTS

This system is basically divided into two major classes to show the importance of each aspect and to aid in improving the system performance and enhancing the signal. The first aspect is the controlling hardware that manage the incoming signal from the GSM network across the DTMF receiver [1] and help in providing the authorized user to switch the motors on and off remotely. The second is the hardware that originates and makes routing process and enhancing the signal when transmitted through the different stages [3]

1. The signal source

In this work the signal which switches the devices remotely is originate in the GSM network by means of cell phone that acts as Mobile Station (MS) to manage the devices. The MS contains digital signal processor, radio transceiver, air interface to GSM network as well as DTMF to serve as switching signal generator [2].

2. CM8888

It is fully DTMF transceiver characterized with different capabilities such as automatic tone burst mode, call progress mode, fully compatible 8086/8 microprocessor interface, precise data handling, and highly accurate DTMF signaling. It consists of two control registers and two data registers to help in processing the incoming or outgoing signals [1].

3. PC

Both new interface devices and code modifications of the controlling software can be carried out within PC to improve the security feature in addition to the security issues in GSM network when control process took place. The controlling software acts as beating heart of the system as well as regarded as developing tool to strengthen the way of controlling.

4. The Boosters

Many different circuits are used in between the MS and switched devices to contribute to the enhancement of the signal transition. These circuits are: DB25 male connector, HD 74LS373, and L293. DB25 male connector is generally used to bypass the control data between the DTMF receiver and HD 74LS373. HD

74LS373 is 8-bit register designed specifically for driving highly capacitive or relatively low impedance load [3]. L293D is a dual H-bridge motor driver integrated circuit. It acts as current amplifiers as it receives a low current control signal and provides a higher current signal. This higher current signal is so adequate to drive the motor [4].

III. DESIGN THEORY

The theory of this design is fundamentally depends upon both diagram in Figure 1 and Table 1 that all together reflects the signal transition throughout the system and in the same time clarifies the importance of the system stages. In the beginning, the remote controlling user is refer to as MS1. MS1 transmits the switching signal to the MS2 which located together with CM8888. The CM888 is well-interfaced to MS2 via external RC circuit [9] while the MS1 and MS2 are successfully communicated. The GSM network performs all the required relevant security issues such as authentication, confidentiality, and integrity to enable an authorized MSs to securely exchange the signals [5].

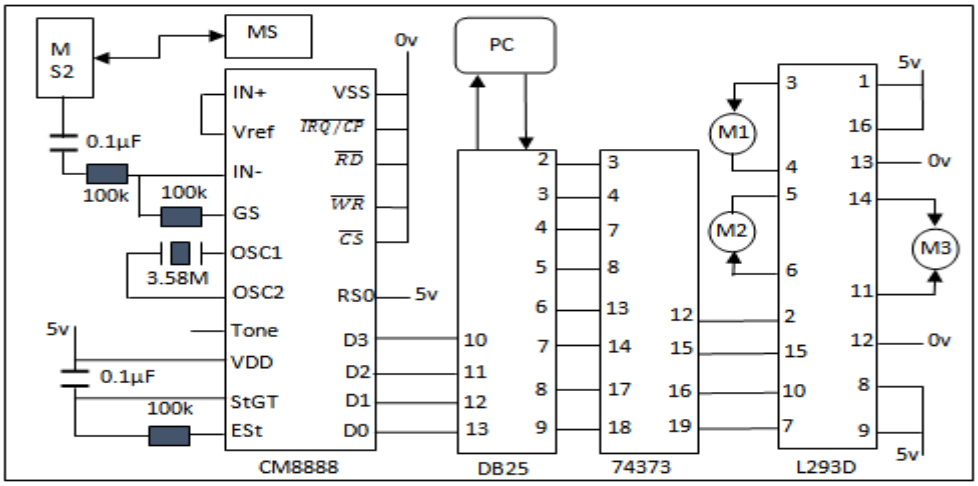

Figure 1 shows the pins configuration of the system

The exploitation of the GMS network adds some facilities to the MS1 such as mobility feature [8] and multi-tasks performance. For the receiving capability of the CM8888, the incoming signal is fed to the two six order switched capacitor bypass filter to eliminate the band of the signal and minimize the unexpected distortion and verify that the signal is correspond to the low and high group frequencies. Then, the signal smoothed by the single order capacitor filter prior to limiting process performed by means of high gain comparator [1]. Following the filter section is a decoder which employs digital counting scheme to specify the frequencies of incoming signal. The incoming signal is protected by a complex averaging algorithm against tone simulation which can be made by any external means other than the authorized MS [1]. To achieve well-designed performance, an external 3.58 crystal oscillator is employed to synchronize the process accurately with low distortion. The CM 8888 is directly interfaced to the PC by means of status lines of the connector to transmit the signal frequencies. The processor reads the incoming frequency values at the status register (0x379) and processes them with program codes. Then, reacts properly to the appropriate device through the data lines, which are related to the data register (0x378), up to HD74LS373 [6]. This circuit used to buffer and boost the signal while in its way to the L293D [4]. Therefore, the motor drive chip L293D respond to the input signals to drive. So that, Table 2 shows the relevant motors connections.

Table 1 Pins configuration of the system

keypad	CM8888		DB25		74373		L293D		
out	in	out	in	out	in	out	in	out	Devices
0	2	17	13	2	3	2	-	3	Motor1
1	3	16	12	3	4	5	2	-	-
2	-	15	11	4	7	6	-	6	Motor2
3	-	14	10	5	8	9	7	-	-
4	-	-	-	6	13	12	-	11	Motor3
5	-	-	-	7	14	15	10	-	-
6	-	-	-	8	17	16	-	14	Motor3
7	-	-	-	9	18	19	15	-	-
8	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-

IV. THE SOFTWARE

When the incoming signal receives to the to the PC program codes [7], the codes reacts to the signal according to the predefined scenario in algorithm of Figure 2 that specify the sequences of the dc motors operation mode. The sequences of the operation are: first to rotate motor1 (M1) anticlockwise, then motor3 (M3) in the same direction while the M1 is running. After that, stops the M1 and M3. Second step to rotate motor2 (M2) clockwise, then M3 in the same direction while the M2 is running. As a result, both M1 and M3 are operated together whereas M2 in idle state, or both M2 and M3 are operated whereas N1 in idle state. So, the performance of the system acts as follows:

- Initializes the system
- Puts all motors in an idle state (outport=0x00)
- If the input is 0x01 rotate M1 anticlockwise (outport=0x10)
- If the input is 0x02 rotate M1+M3 anticlockwise(0x60)
- If the input is 0x03 stops M1+M3 (outport=0x00)
- If the input is 0x04 rotates M2 clockwise (outport=0x80)
- If the input is 0x05 rotates M2+M3 clockwise (outport=0xc0)

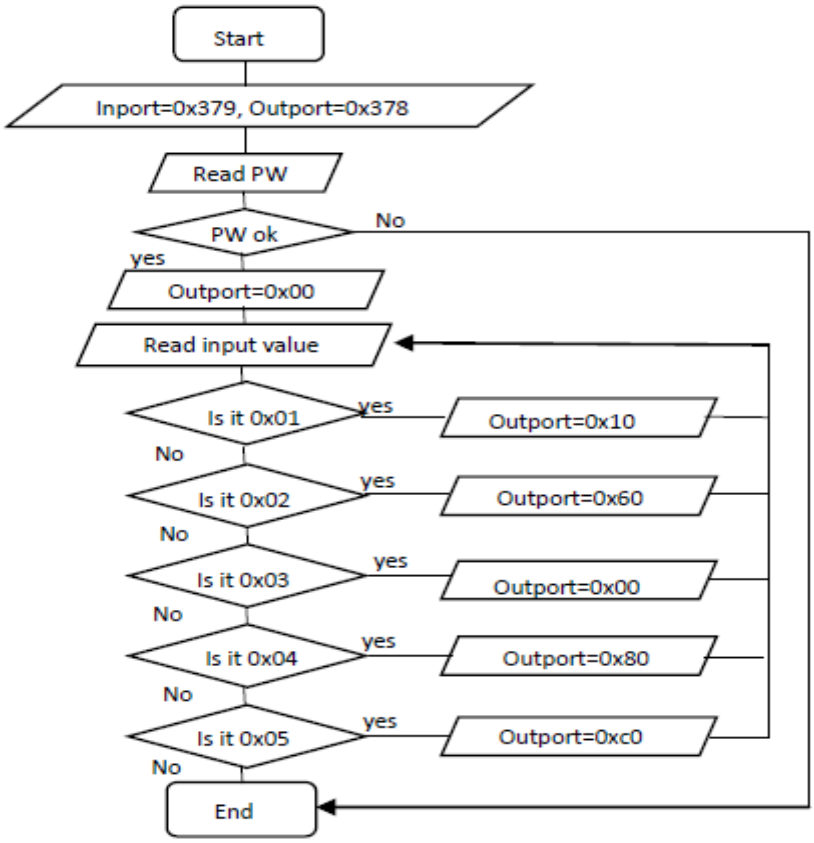

Figure 2 the program algorithm

V. RESULTS AND DISCUSSION

The secured remote operation of the dc motors is presented and tested. It gives suitable results according to the specified code. The predefined operation modes and the obtained results are all provide the same scenario. The obtained results are shown in the Table 2. The pressed key 0x03 stops any running devices.

Table 2 shows the obtained results

Pressed key	The operation mode
1	Rotates M1 anticlockwise
2	Rotates M1 and M3 anticlockwise
3	Stops M1 and M3, or M2 and M3
4	Rotates M2 clockwise
5	Rotates M2 and M3 clockwise

VI. CONCLUSION

In this work, the secured remote switching dc motors is depicted and tested. It provides good results that can be reliable on in many different applications especially in the industrial sectors. The only defect that might affect the performance of the system is the network congestion in peak hours and the devices response.

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