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Microcontroller Based Anti-theft Security System Using GSM Networks with Text Message as Feedback

Visa M. Ibrahim[1], Asogwa A. Victor[2].
[1,2]*Department of Electrical and Electronic Engineering,School Of Engineering and Engineering Technology, ModibboAdamma University of Technology Yola, Adamawa State. Nigeria*

Abstract—Antitheft security system utilizes an embedded system design with Dual Tone Multi Frequency (DTMF) and a GSM to monitor and safeguard a car. It secures the car against theft. Upon activation, it automatically demobilizes the car by disconnecting the ignition key supply from the car battery. This now makes it impossible for anybody so starts the car, let alone moving with it. In an attempt of theft through the car doors or boot, the system sends text message to the car owner and at the same time starts up an alarm.This design popped out due to the increasing rate at which packed cars are stolen especially in our country, but with this design this packed car is being monitored irrespective of where it is packed, provided there is GSM network coverage.From the research conducted, it was found out that majority of the existing car security system uses only alarm, and doesn't send text message to the car owner let alone of demobilizing the car. But with the use of GSM network, the owner is guaranteed that the car will send text message to his phone, and at the same time, have people around alerted of what is happening. Added to this is that the car will not be move because it has been demobilized.

Keywords—Communication, DTMF, GSM, Networks, Microcontroller, Text message, Feedback.

I. INTRODUCTION

In a situation where there is high level of theft, there is need for better security system. It is much safer to have a system that monitors and communicates to the device owner without putting human life to risk in the name of "Watchman". This tends to utilize the availability of GSM network, mobile phone and electronics circuit to achieve an automated system which is programmed to work as a thinking device to accomplish this purpose.

By simply dialing the phone number of the mobile phone attached to the circuit and sending a code after the phone has automatically been answered, puts the system to either "active or inactive" state, and on any attempt of theft the system sends a text message to the device owner, demobilizes the system (car) and then starts up an alarm. With this, the car is always protected. The total absence of sufficient security personnel in a packed car is a great discomfort to car owners. This insecurity has paved way to increasing rate of stealing packed cars – even with security.

In order to enhance an improved and life risk free security system, the purpose of this study is to aid a better security system of cars with the use of GSM. This system monitors one's car against theft, and has a text message sent to the car owner, telling him that his car is being tampered, and at which part of the car (either doors or boot) is being tampered.
The system will also demobilize the car (that is stopping the car from moving), set up an alarm for the people around to notice what is happening.

1.1 System Description

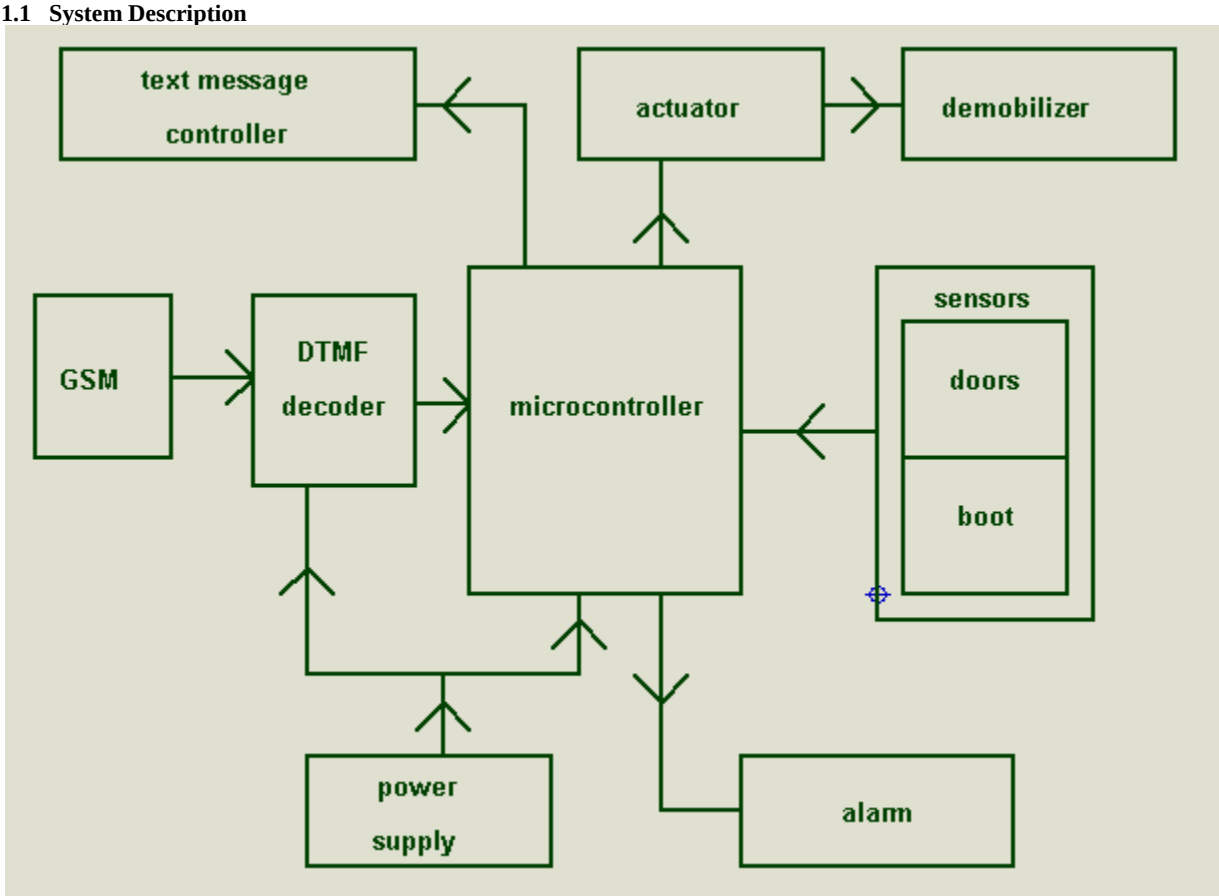

Figure 1: **Functional Block Diagram of the System**.

The diagram in figure 1. Describe the overall system. The system comprises of a GSM which serves as an intermediate between the outside world (car owner) and the entire system. It is responsible for both receiving of calls for system activation and deactivation, and sending of text message to the car owner. Its output in the form of frequency is feed into Dual Tone Multi-Frequency (DTMF) decoder IC, which converts these frequencies into digital voltage levels of zeros and ones. The digital voltage levels received from the DTMF decoder [9] is now fed into microcontroller Integrated circuit. The micro controller which is the brain and control circuit behind the entire design is controlled with a written program stored into its Read Only Memory (ROM). The controller with the direction of the written program co-ordinate the system's operation as follows:

i. If the system is active, it monitors both the car doors and boot to check if anyone is opened.
ii. Demobilizes the car by disconnecting the ignition line from the battery supply via the actuator [1].
iii. Sends text message to the car owner signifying where the attempt is made from, and finally
iv. Starts up an alarm for alert purpose.
v. But, if the system is inactive, the microcontroller disables all outputs and sensor inputs.

In this paper, the design utilized locally assembled microcontroller and few other basic electronics components to achieve both the control and the controlled. Evidently, microcontrollers have been used to perform such simple security task in which human performance might degrade over time. The reliability of this design makes it durable and capable for offering guarantee security at all time.

The power supply provides the voltage and current required for effective performance of the system. This supply is tapped from the car battery and then regulated before being fed to the system.

II. DESIGN FRAME WORK

2.2 System Design

The design process is divided into two: Hardware and Software designs.

2.2.1 Hardware Design

2.2.1.1 The microcontroller.

This microcontroller system is designed around the Intel's AT89C51 microcontroller [1]. The Intel AT89C51 microcontroller is a complete computer on a single chip. This is because it has Read Only Memory (ROM), Random Access Memory (RAM) and Central Processing Unit (CPU) embedded in it. The AT89C51 is a low-power, high performance CMOS 8-bit microcomputer with 8K bytes of memory. The device is manufactured using Atmel's high-density non-volatile

memory technology and is compatible with the industry standard 80C5l and 80C52 instruction set and pin out. The on-chip flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. It also provides programmable timer, programmable I/O ports together with 256 × 8-bit RAM for use as "scratch book" and also for stack purposes. The alarm was implemented using a 12V/15W siren.

The Dual Tone Multi-Frequency (DTMF) IC – MT8870/CM8870 is an IC which detects frequency in the form of tone and then encodes it into different digital voltage levels [12]. It principle is on combining two carrier frequencies of upper level and lower level which produces a unique tone. The DTMF is made to produce different voltage level for every key pressed on the connected phone.

Opto transistor CNY-17 is serving as a tap button contactor [9], which is used for initiating a keypad pressing command on the connected phone. FET (IRF3205) is a power mosfet [13]. It functions as an actuator to the demobilization unit. Relay is the demobilizer in the system. Voltage regulation is achieved by the use of LM7805 [13]. The fig. 2 below gives clearer view of thesehardware.

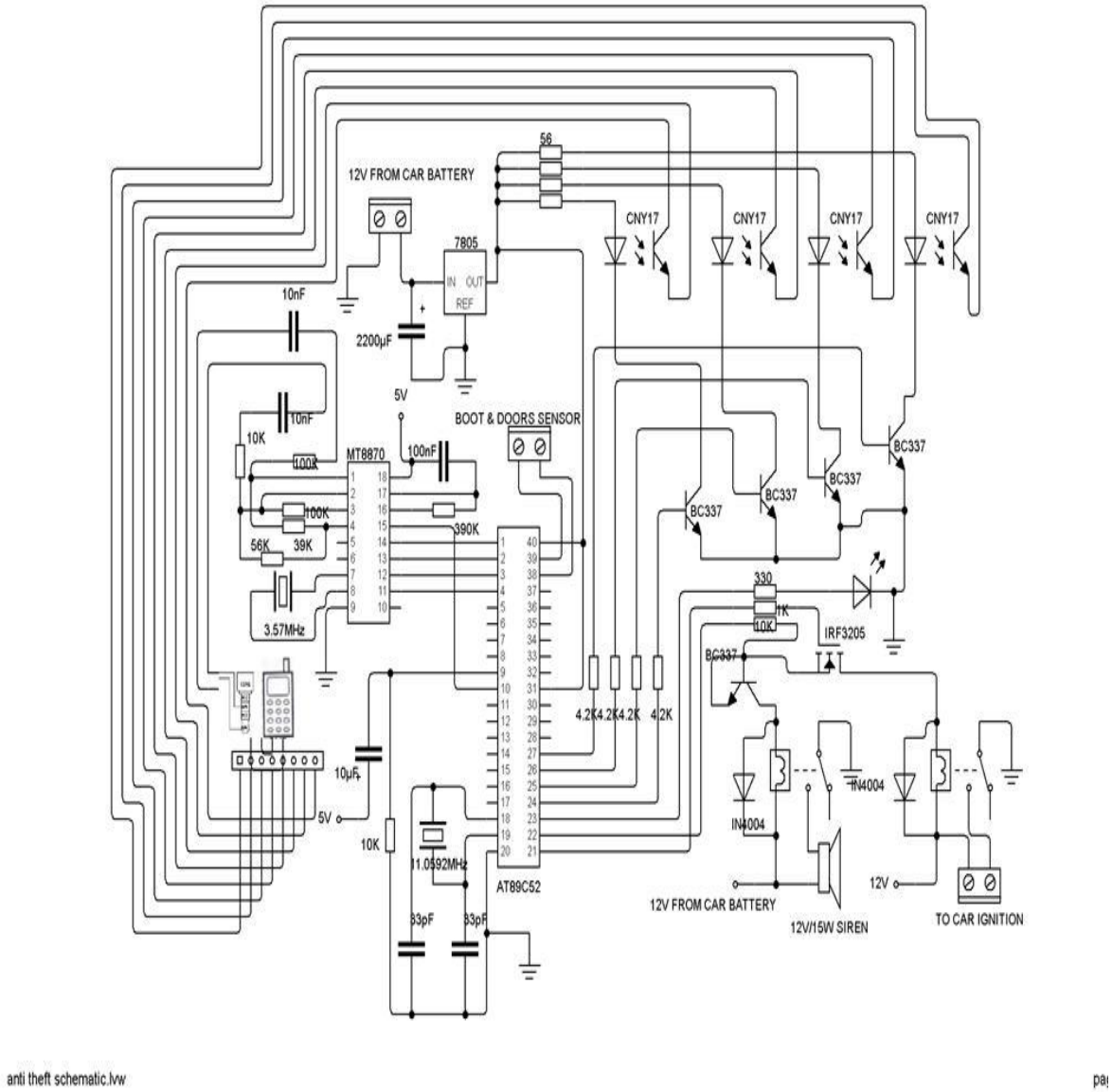

Figure 2: Complete circuit diagram.

2.2.1.2 Interfacing the microcontroller to coordinate the entire system.

Port zero (P0) of the microcontroller is used for collecting DTMF converted data for programming analysis. Port three bit zero (P3.0) is used as DTMF valid tone signaling. Port zero bit zero (P0.0) and Port zero bit one (P0.1) respectively are used as input for doors sensor and boot sensor. Port two bit zero through Port two bit three (P2.0 – P2.3) are used as output pins for text message(feedback) control. Port two bit four (P2.4) of the microcontroller is used for controlling the alarming unit and finally the actuator which demobilizes the car is controlled through Port two bit five (P2.5).

2.2 Software Design

The program was written in assembly language using the 8051 instruction set. The flowchart for the program is shown in Figure 3.

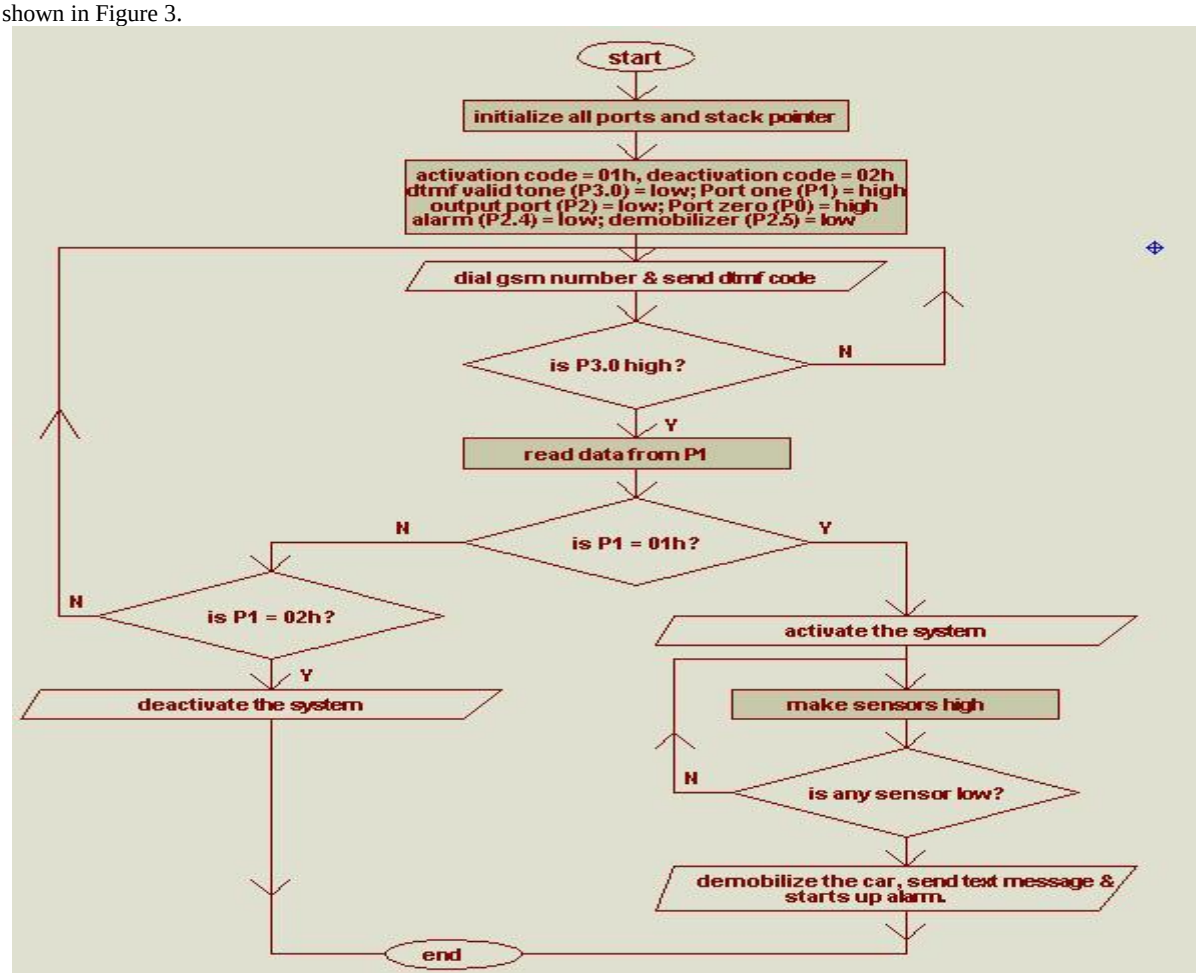

Figure 3: Controlled Program Flowchart.

III. PERFORMANCE EVALUATION ANDTESTING

Various test was carried out before, during and after the construction has been completed. The multi-meter was extensively used for carrying out most of these tests. Each subunit was tested and confirmed efficient.

After the construction of the entire system, the program was written and burned into the microcontroller chip. On interfacing it to the car, it tested ok as it performed the objective of the design. Satisfaction was gotten from the moment the system was activated and the car opened, the system automatically disconnected the ignition, sent a text message to a programmed recipient and then started up an alarm. The mission of the design was accomplished.

The entire system has three inputs, which are: - the output of the DTMF decoder, the output from the phone ear piece jack and the sensors from the car doors and boot. The system outputs are the text message controller, alarming system and demobilization unit. The system is battery powered and was tapped from car battery and for this reason it made it easier for dc use. With these a system that sends text message to car owner is designed and implemented.

IV. CONCLUSION

It is always better to start every design with a good proposal, which will stand as a reference point to the work as it proceeds. The result of any design gives joy if aims and objectives are gotten. Since the project performed its proposal, it indeed satisfactory. Now from the input to the output of each stage was a success. The major input is like an interrupt and upon reception by microcontroller it goes through the iteration of demobilizing the car, sending text message and starting up an alarm. The design is thus a huge success.

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