Research Article

Microcontroller Based Visitor Indicator System using GSM Module with Text Message as Feedback

Rahul Nangare[Á*], Anupsingh Pardeshi[Á] and Pratik Painjane[Á]

[Á]Electronics and Telecommunication, P.E.S Modern College of Engineering, Shivajinagar, Pune

Abstract

This technical paper explains how a reliable and an authentic wireless communication could be easily developed for security and automation of a private area, house or restricted premises. This technical paper describes the visitor indicator cum survivalence. In this paper a microcontroller controls all the operations. The GSM module is interfaced with the controller. The automated notification is generated using the GSM module and sent to the host's or the operator's cell phone.

Keywords: P89v51RD2, GSM Module, PS2 Connector, AT Commands, Keyboard, LCD Display.

1. Introduction

Today's world is so advanced and automated. The automation has not only developed for the industrial use but nowadays the automation is been used for daily routine works. The household appliances can also be automated and gives the maximum comfort to the people. The communication industry has also developed very drastically such that you can make a call instantly, can send a text message and in addition to that we can connect to the internet easily on the go.

With improvement in technology, now in 21st century we are using wireless communication. Basically the use of mobile phone has increased to a very large extent. It has become one of the needs for human. So effort is being made to make use of this technology to make day-to-day life much easier. Basically mobile phones use the GSM modem. This GSM technology is being in many applications like home security, appliance control, voting, etc. Use of this technology is convenient, reliable and cheaper. This only requires a GSM module and knowledge of few AT commands. One can use it with computer also using serial communication. Keeping all the advantages in mind, we thought of making a system that will be useful in home. So looked around to use this technology in home for daily use. Then we thought of why not design a virtual home attainder. This will keep track of visitor who has person visiting home by storing his name. As we got to know about GSM technology, we decided to go for GSM based visitor indicator which will send the name of visitor to user via SMS instead of saving them and wasting the memory. A keyboard and LCD are also provided to enter the name from visitor and giving him/her instructions.

2. Literature Survey

Advance in technology has led to the development of the systems used for home security. Video door phone system is a system that's function is to allow one to communicate safely with visitors without any need for physical interaction with them. This system is a stand-alone intercom system used to manage calls made at the entrance of the building when the owner is available at home. This system enables the owner to identify the visitor first and then allow engaging in communication or allowing access by opening the door.

2.1 Microcontroller Based

Visual visitor verifier a project by Kishore G. R. and Y Manjula (International Conference on Computer science and Information Technology, Bangalore may 19th 2012), in this project user can use keypad and with the LCD choose a particular person, and micro-controller will read the data and it will send the same through the GSM module; which will send the SMS to the cell phone. This cell phone will be hidden and after receiving the SMS it will start recording the video of visitor for particular duration. Then it will send the video clip via MMS to the owner. Then the user will decide whether to allow the visitor to enter or not.

A Research by 'Alherasish' (2004) has implemented security system by means of GSM cellular communication network using microcontroller 89V51RD2 and Sony Ericson GM-47 GSM module. This system enables for end user through SMS facility to monitor the state of home door, provide password facility for keyboard based door lock and control home lighting system.

Similar research by 'Khiyal et al' (2009) proposed SMS based system of controlling of home appliance

---

*Corresponding author: **Rahul Nangare***

remotely and providing security when user is away from the place.

3. Hardware

Fig.2 shows the block diagram of system developed. Displaying the message, taking input and sending the message undergoes various steps. Power supply circuit is used as main source and further divided in order to give supply to microcontroller and GSM module etc.

For controlling the system, microcontroller 89V51RD2 acts a central control unit which controls the keyboard and other peripherals interfaced. The SIM 300 GSM module is used to send the message to the mobile number stored. The LCD display is used to the information to the visitor. The keyboard is provided using which the visitor enters his/her name. The instruction regarding entering and sending the name are displayed on the LCD display.

The LCD displays the message to the visitor indicating absence of the owner. The keyboard is used to enter the name by the visitor. The entered name is stored in the EEPROM of the microcontroller. After pressing the send key, the stored name is send to the owner using GSM module. AT commands is used to send the name to owner in predefined format. AT is used to define the mobile number to which the message is send.

3.1 Power Supply

A power supply is a device that supplies electrical power to a circuit. A 5V dc regulated power supply is used in this project. A transformer steps down the ac mains voltage to 9V ac. A full wave rectifier bridge is used to convert alternating voltage to a pulsating direct voltage, followed by a filter. A filter capacitor is used to filter out the dc pulsation. 7805 is used to regulate the output voltage to 5V. This power supply is used throughout the circuit instead of batteries.

3.2 89V51RD2 Microcontroller

The P89V51RD2 is a Philips made microcontroller with 64k of flash memory and 1024 data memory. It does all the main processing in its 8051 based processing unit by accepting inputs from keypad and sensors and sends output signals to LCD.

3.2.1 *Features*

5 volt operating voltage (0 MHz to 40 MHz)
16/32/64 kB of on-chip flash memory with ISP and IAP
Supports 12-clock (default) or 6-clock mode selection via software or ISP
SPI and enhanced UART
PCA with PWM
Four 8-bit I/O ports
Three 16-bit timers/counters
Programmable watchdog timer
8 interrupt sources with 4 priority levels
Second DPTR register
Low EMI mode (ALE inhibit)

TTL- and CMOS-compatible logic levels
Brownout detection
Low power modes

3.3 Liquid crystal Display

The LCD used is JHD162A SERIES. It is 16 characters x 2 lines LCD. Its data pins D0-D7 have been interfaced to the port 2 of the microcontroller. The microcontroller counts the heart beats for a span of 15 seconds, multiplies it by 4 and sends the data via port 2 to the data pins of the LCD which displays the final heart beat on it.

3.4 GSM Module

For sending message GSM module SIM300 is used. It accepts the commands serially from micro-controller. It uses AT commands to work. A GSM modem is a specialized type of modem which accepts a SIM card, and operates just like a mobile phone. A GSM modem exposes an interface that allows application like SMS to send and receive messages over the modem interface. The charges are applied for this message sending and receiving as if it was performed directly on a mobile phone. A GSM modem must support an "extended AT command set" for sending/receiving SMS messages in order to perform these tasks.

3.5 AT commands

AT stands for ATTENTION. These are used for communicating between GSM module and microcontroller. There are various AT commands like SMS send, receive. IN our project we use some of the AT commands as follows

Table1 AT commands

Command	Description
AT	Check if series interface an GSM modem is working
ATE0	Turn echo off, less traffic on serial line
AT+CNMI	Display of new incoming SMS
AT+CPMS	Selection of SMS memory
AT+CMGS	SMS string format, how they are compressed
AT+CMGR	Read new message from a given memory location
AT+CMGS	Send message to a given recipient
AT+CMGD	Delete Message

3.5 PS/2 connector

PS/2 is a 6-pin Mini-DIN connector used to connect some keyboards and mice to computer system.

3.6 PS/2 Keyboard

A keypad is a set of buttons arranged in a block, a very

Table2 List of Scan Codes

Key	Code	Key	Code	Key	Code	Key	Code
A	1C	2	1E	F2	6	D ARROW	E0,72
B	32	3	26	F3	4	R ARROW	E0,74
C	21	4	25	F4	0C	NUM	77
D	23	5	2E	F5	3	KP/	E0,4A
E	24	6	36	F6	0B	KP*	7C
F	2B	7	3D	F7	83	KP-	7B
G	34	8	3E	F8	0A	KP+	79
H	33	9	46	F9	1	KP EN	E0,5A
I	43	`	0E	F10	9	KP.	71
J	3B	-	4E	F11	78	KP 0	70
K	42	=	55	F12	7	KP 1	69
L	4B	\	5D	PRNT	E0,12	KP 2	72
M	3A	BKSP	66	SCRN	E0,7C	KP 3	7A
N	31	SPACE	29			KP 4	6B
O	44	TAB	0D	SCROLL	7E	KP 5	73
P	4D	CAPS	58		E1,14	KP 6	74
Q	15	L SHIFT	12		E1,F0	KP 7	6C
R	2D	L CNTL	14		F0,77	KP 8	75
S	1B	L GUI	E0,1F			KP 9	7D
T	2C	L ALT	11	[	54	]	5B
U	3C	R SHIFT	59	INSERT	E0,70	;	4C
V	2A	R CTRL	E0,14	HOME	E0,6C	'	52
W	1D	R GUI	E0,27	PG UP	E0,7D	,	41
X	22	R ALT	E0,11	DELETE	E0,71		
Y	35	APPS	E0,2F	END	E0,69		
Z	1A	ENTER	5A	PG DN	E0,7A		
0	45	ESC	76	U ARROW	E0,75	/	4A
1	16	F1	5	L ARROW	E0,6B		

common input device. This has been interfaced with micro-controller by using PS/2 connector. The keyboard has 4 wires. They are 5V supply line, data line, clock and ground. 5V line and the ground are power supply lines and have no contribution in data communication. The clock line and data line participate during communication. The key-board communication protocol is serial communication protocol. Key-board sends data in the following order.

-1 start bit (always 0)

-8data bits (LSB first)

-1parity bit

-1stop bit (always 1)

3.6.1 Scan Code of PS/2 keyboard

The scan code has two parts-

MAKE CODE and BREAK CODE. Both these codes combine to form scan code. The MAKE CODE is generated by the keyboard encoder when a user just presses the key and the BREAK CODE is generated when the user release the key.

The lists of scan codes of all the keys of key-board are given below.

The PS/2 keyboard implemented a bidirectional synchronous serial protocol (LSB first).The bus is "idle "when both lines are high. Thus is only state where the key-board is allowed to begin transmitting data.
All data is transmitted one byte at a time and each is sent in a frame consisting of 11 bits and is as follows:

a. 1 start bit (this is always 0)
b. 8 data bits (LSB first)
c. 1 parity bit
d. 1 stop bit (this is always 1)

The keyboard writes a bit on the data line when clock is high, and read by the host when clock is low. The parity bit is set if there is even number of 1's in the data bits. Odd number (odd parity) is the sum of number of 1's in the data bits plus the parity bit. This is used for the purpose of error detection. The keyboard must checks bit and if incorrect it responds as if it had received an invalid command.
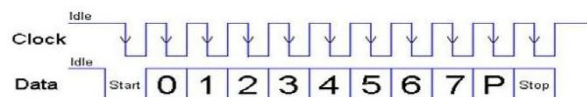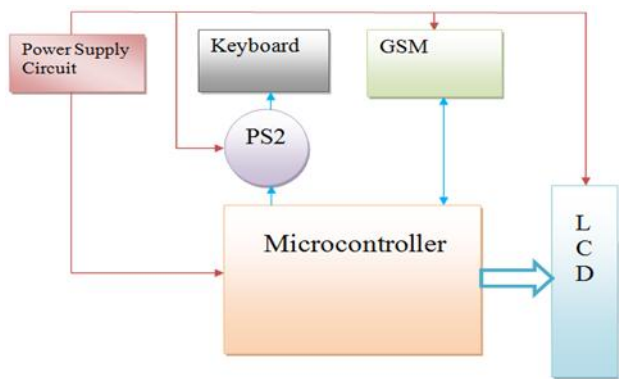

Fig.1 Data frame

Fig. 2 Block diagram of the system
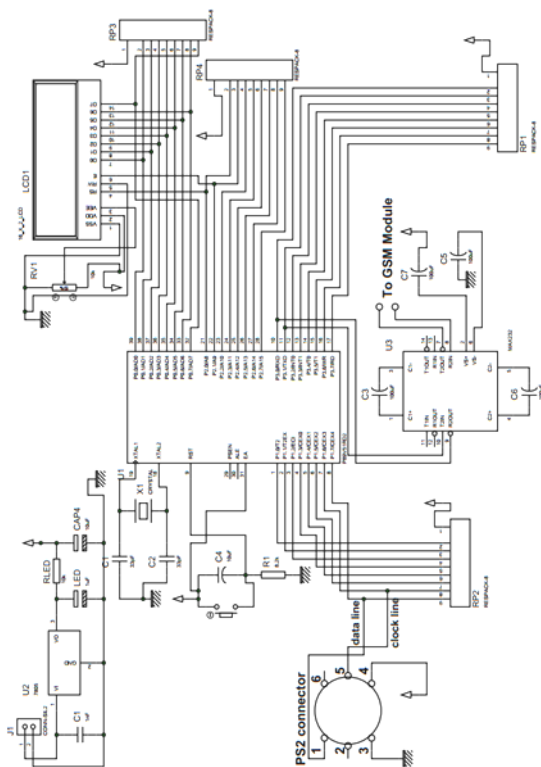
4. Implementation of the system

Fig. 3 Schematic of the system

The schematic for the system is shown in Fig.3. The system consists of P89V51RD2 microcontroller, PS/2 connector, GSM module, keyboard and LCD. LM7805 Voltage regulator is used to supply 5V to microcontroller and peripheral devices.

5. Algorithm

Initialize LCD.
Initialize serial communication and interrupt.
Message is displayed and system asks user to   press F1 to enter his/her name.
When F1 is pressed, user can enter the name. While entering the name he/she can see the name on LCD
The message is sent as soon as ENTER button is pressed.
The message "Message has been sent" is displayed on the LCD

System is reset after sending every message.

6. Results

An embedded system put together with software as well as hardware and the system was developed after step by step procedures.

The GSM module was successfully interfaced with the controller and was able to send message by the use of AT commands. The PS/2 keyboard was interfaced and was able to enter data using scan codes. The message regarding unavailability of the owner was displayed and the input from keyboard was stored successfully in the memory. Finally the message to stored mobile number was delivered successfully.

Conclusion

Designed prototype is a low cost microcontroller based system which displays the message and take input data which is feedback as text message. The principle used is very easy and simple to implement. Hardware required for the design is not very costly and easily available in the market.

References

Kishore G. R. and Y Manjula (2012), Visual visitor verifier, *International Conference on Computer science and Information Technology, Bangalore may 19th 2012*

Anshu Shrivastava, Balkrishna Dwivedi and Deepak parashar (2013), GSM Based Home Security System, *International Journal of Emerging Trends in Electronics and Computer Science (IJETECS),* vol.2,issue 4.

Aayush Aggarwal and R.C. Joshi (2012), WSN and GSM based Remote Home Security System, *International Journal off Computer Applications (IJCA)*

Visa. M. Ibrahim and Asogwa A Victor (2012), Microcontroller based Anti-Theft Security System Using GSM Networks with Text Message as Feedback, *International Journal of Engineering Research and Development,* vol. 2, issue 10, pp. 18-22.

Pawan Kumar, Vikas Bhrdwaj, Kiran Pal, Narayan Singh Rathor and Amit Mishra (2012), GSM based e-Notice Board: Wireless Communication, *International Journal of Soft Computing and Engineering (IJSCE),* ISSN: 2231-2307, Volume-2, Issue-3, July 2012

Kharik Abhishek R, Chaudhari Archana, and Prof.R.R.Bhambare (2014), A Smart Home Security System Based On Arm7 Processor, *International Journal Of Engineering And Computer Science*, ISSN: 2319 – 7242, Volume 3, Issue 4.

Mohamed Salman and Jayavrinda Vrindavanam (2013), Efficient Interactive Control System based on GSM, *International Journal of Latest Trends in Engineering and Technology (IJLTET)*, Vol. 3 Issue2.

Inderpreet Kaur (2010), Microcontroller Based Home Automation System With Security, *(IJACSA) International Journal of Advanced Computer Science and Applications*, Vol. 1, No. 6, December 2010