Design of Wireless to Wired Audio Conversation System

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ABSTRACT

We have design of the wired system as Audio transmitter and receiver with Microcontroller, LCD, Keypad, Audio amplifier, Speaker, Mike and Interfacing Circuitry is a wired communication system so there is no radiation effect on human body that's why we made wireless to wired audio conversation system. The design of this audio conversation system mainly consists of GSM Modem, Interfacing Circuitry and Microcontroller. The GSM Modem as wireless unit has antenna to receive and transmit the signal, and also it has SIM slot to keep the SIM card in that slot. It has Serial communication port for interfacing with other peripherals. We have used the Microcontroller as a central processing unit to perform different operations. We have used GSM Modem for transmission and reception of audio information from wired system through a SIM card which is placed in GSM Modem. At wired system there is hardware same like a telephone Receiver system. We made the connection between wireless system and wired system by using cables or wires. So as the distance increases away from cell phone handset of human body, the effect of cell phone radiation on it goes on decreasing, similarly it happens in this design.

Keywords - GSM Modem, Microcontroller, Serial Connection, I/O devices, Power Supply

1.   INTRODUCTION

PIC microcontroller PIC18F4520 is used in this System. Digital data comes from GSM Modem port and passes it to the microcontroller for incoming call.GSM Modem continuously sends data from the distant site. This system is interfaced with a GSM modem. This GSM Modem senses the conditions continuously and sent signal to the wired unit for incoming call. Incoming call indicated by Buzzer and the received data is displayed on the LCD. 16X 2 LCD is provided for user interface. After receiving the signal by the microcontroller it processes the data and sends the read data using keypad to mobile number through GSM modem. The GSM modem is connected to microcontroller using RS232 interface. Whenever user wants to make outgoing call, it send signal from wired unit using keypad and LCD to the GSM modem, the GSM modem receives the data and sends to another subscriber.
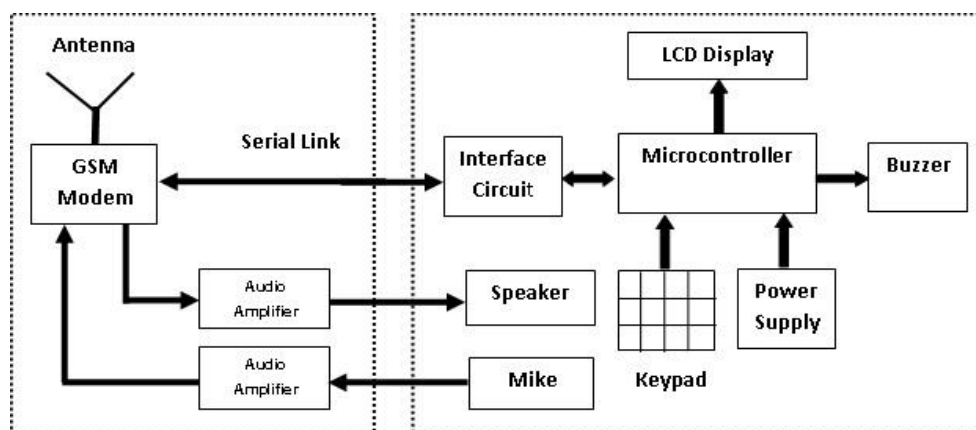
2.   Block Diagram

Figure 1 Design of Wireless to Wired Audio Conversation System

2.1 Working

- This system uses PIC microcontroller PIC18F4520. This system is interfaced with a GSM modem.
- RS-232 serial interface is used to transmit and receive the signal from Microcontroller unit and from GSM Modem.
- Since RS232 is not compatible with microcontrollers we need a voltage converter to convert the RS232's signals to TTL voltage levels. The MAX 232 converts the RS232 voltage levels to TTL voltage levels and vice versa.
  These are acceptable to the microcontroller's TxD and RxD pins.
- This transceiver data is sensed by the microcontroller and the system continuously monitors the data condition.
- The system monitors the conditions continuously and sends signal to and from SIM to the Microcontroller unit.
- This data is displayed on LCD every time.
- for incoming call to the system SIM or user, the GSM modem gets signal through antenna and transmits it to the Microcontroller via RS-232 serial interface then that signal is displayed on LCD and also buzzer provides beep indications by Microcontroller. Using ATA Command we can receive this call. This ATA Command is assigned with "R" button on Keypad. When we push "R" button on keypad the call may get connected. To disconnect the call we can use ATH Command. For this we can use "H" button on Keypad.
- for outgoing call Microcontroller sends data using RS-232 serial interface to the GSM modem using keypad. Using keypad we can dial a number, it is shown on LCD. After typing a number we can press "C" button on keypad for calling to other subscriber.

3. GSM Modem

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can either be connected to PC serial port directly or to any microcontroller. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. The Modem is designed with RS232 Level converter circuitry, which allows you to directly interface PC Serial port .The baud rate can be configurable from 9600-115200 through AT command. Initially Modem is in Autobaud mode. This GSM/GPRS RS232 Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS as well as DATA transfer application in M2M interface. The modem needed only 3 wires (Tx, Rx, GND) except Power supply to interface with microcontroller.

3.1 Features of SIM300 GSM Module

Uses the extremely popular SIM300 GSM module
- provides the industry standard serial RS232 interface for easy connection to computers and other devices
- provides serial TTL interface for easy and direct interface to microcontrollers
- Power, RING and Network LEDs for easy debugging
- can be controlled through standard AT commands
- Module's operation mode can be controlled through the PWR Switch connected to the PWR pin
- The SIM300 allows an adjustable serial baud rate from 1200 to 115200 bps
- Operating Voltage: 7– 15V AC or DC (board has onboard rectifier), Designed for global market, SIM300 is a Tri-band GSM engine.
- Works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz
- SIM300 can fit almost all the space requirements in your applications, such as smart phone, PDA phone and other mobile devices.
- Supports features like Voice, Data/Fax, SMS, GPRS and integrated TCP/IP stack.

3.2 Interfaces

RS-232 through D-TYPE 9 pin connector,

☐ Serial port baud rate adjustable 1200 to115200 bps (9600 default)

☐ BRK connector for MIC & SPK, SIM card holder

☐ Power supply through DC socket

☐ SMA antenna connector and Murata Antenna (optional)

☐ LED status of GSM / GPRS module

3.3 AT Commands

AT Commands are used to control a modem. AT means Attention. Every command line starts with "AT". These are of two types: Basic and Extended.

☐ ATEO – Echo off

☐ ATE1- Echo on

Initiating outgoing call:

☐ ATD+*mobile number*; *<enter key>*

For disconnecting the active call:

☐ ATH*<enter key>*

For receiving incoming call:

☐ ATA*<enter key>*

4. Wired Hardware Unit

This unit has Microcontroller, Keypad, LCD, Speaker, and Microphone. This Microcontroller family offers the advantages of all PIC18 microcontrollers namely, high computational performance at an economical price, with the addition of high endurance, Enhanced Flash program memory. On top of these features, the PIC18F2420/2520/4420/4520 family introduces design enhancements that make these microcontrollers a logical choice for much high performance, power sensitive applications. The PICkit 2 Development Programmer/Debugger is a low-cost development programmer. It is capable of programming most of Microchip's Flash microcontrollers and serial EEPROM devices. The PICkit 2 unit hardware prevents it from being powered by the target through the ICSP connector VDD pin. The PIC 18F4520 has 5 usable ports or I/O registers. These ports are labeled A-E with Ports A-D having 8 bits each and Port E having 4 bits.

4.1 RS 232 Circuit

Since RS232 is not compatible with microcontrollers, we need a voltage converter to convert the RS232's signals to TTL voltage levels. These are acceptable to the microcontroller's TxD and RxD pins. The MAX 232 converts the RS232 voltage levels to TTL voltage levels and vice versa. The chip uses +5V power source which is the same as the power source for the microcontroller. It provides 2-channel RS232C port and requires external 10uF capacitors.
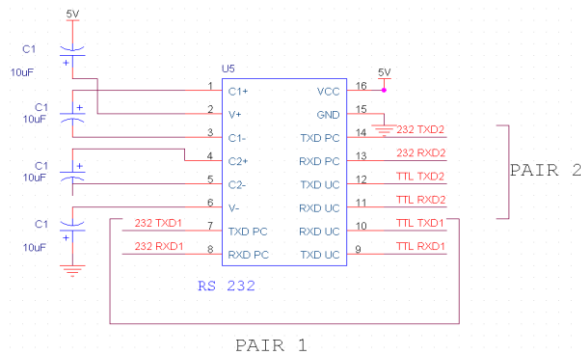

Figure 2: Interfacing of RS232

5.   SOFTWARE TECHNOLOGIES

The software part will consist of: 1. mikroC PRO for PIC 2. Orcad. These two parameters are useful for programming and drawing the circuits respectively. The mikroC PRO software is used for Programming code which is to be transplanted into PIC microcontroller and Orcad is used for circuit simulation and layout design. The mikroC PRO for PIC is a powerful, feature-rich development tool for PIC microcontrollers. It is designed to provide the programmer with the easiest possible solution to developing applications for embedded systems, without compromising performance or control. PIC and C fit together well: PIC is the most popular 8-bit chip in the world, used in a wide variety of applications, and C, prized for its efficiency, is the natural choice for developing embedded systems. mikroC PRO for PIC provides a successful match featuring highly advanced IDE, ANSI compliant compiler, broad set of hardware libraries, comprehensive documentation, and plenty of ready-to-run examples. The fast growing market of embedded systems there is an increasing need to write application programs in a high-level language such as C. Basically there are two reasons for this trend: programs for embedded systems become more complex (and hence are difficult to maintain in assembly language), and processor models for embedded systems have a decreasing lifespan (more frequent re-adapting of applications to new instruction sets). The code re-usability achieved by C- programming is considered to be a major step forward in addressing these issues.
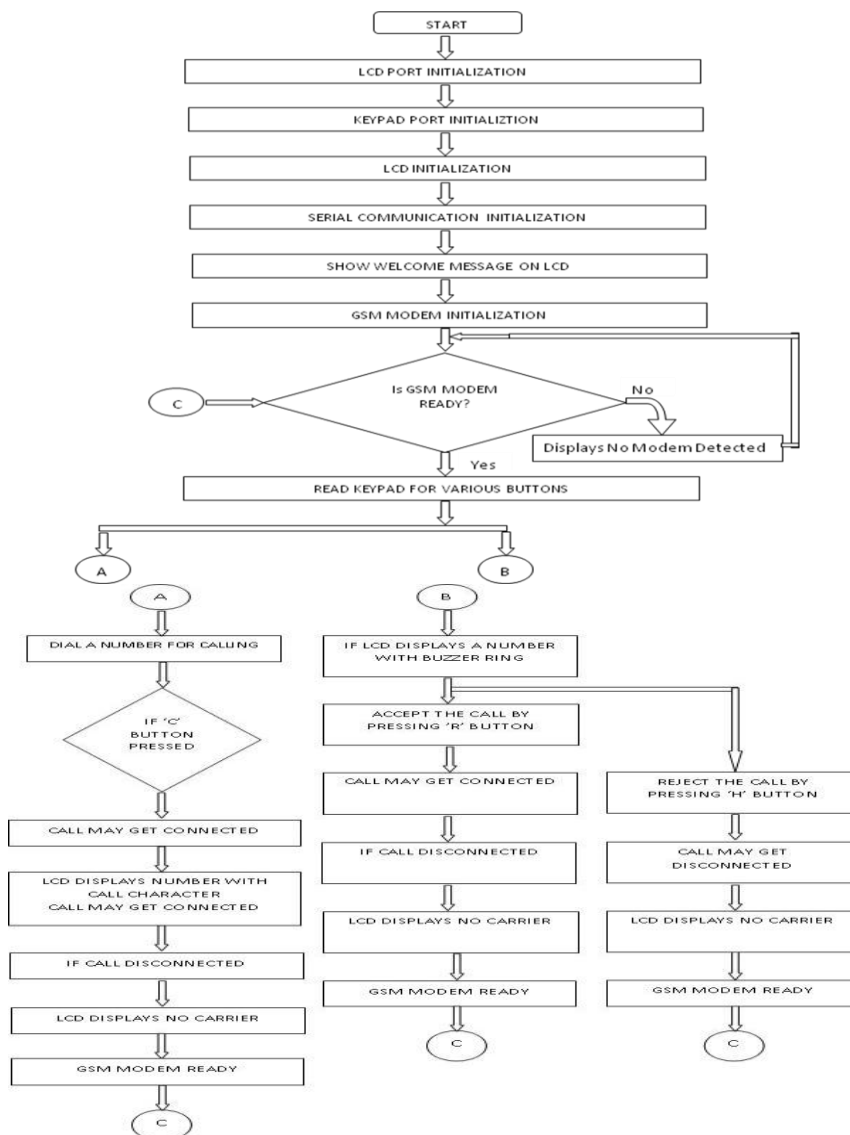
5.1 Flowchart of the System:

Figure 3: Flow Chart of System

6. RESULTS

Basically there are three conditions for this system. First, when there is no conversation using this system, system is Idle. Second, for incoming call to the system SIM or user, the GSM modem gets signal through antenna and transmits it to the Microcontroller via RS-232 serial cable then that signal is displayed on LCD and also buzzer provides beep indications by Microcontroller. Third, for outgoing call Microcontroller sends data using UART and RS-232 serial cable to the GSM modem using keypad to dial the number. In this way this design is used for audio conversation system.
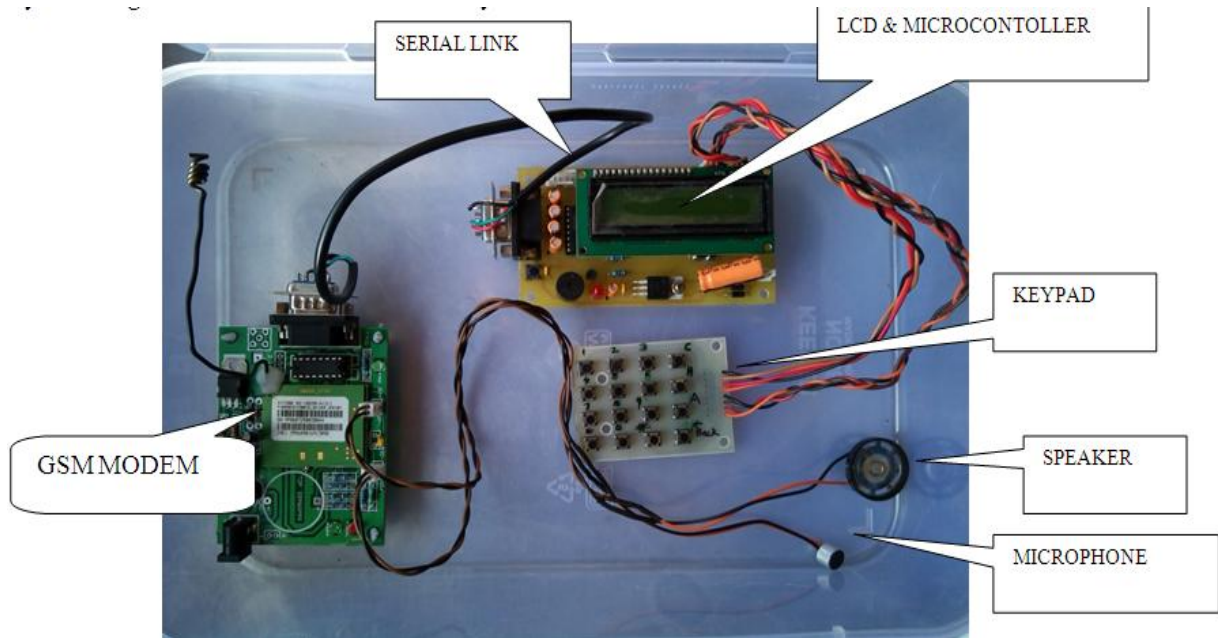

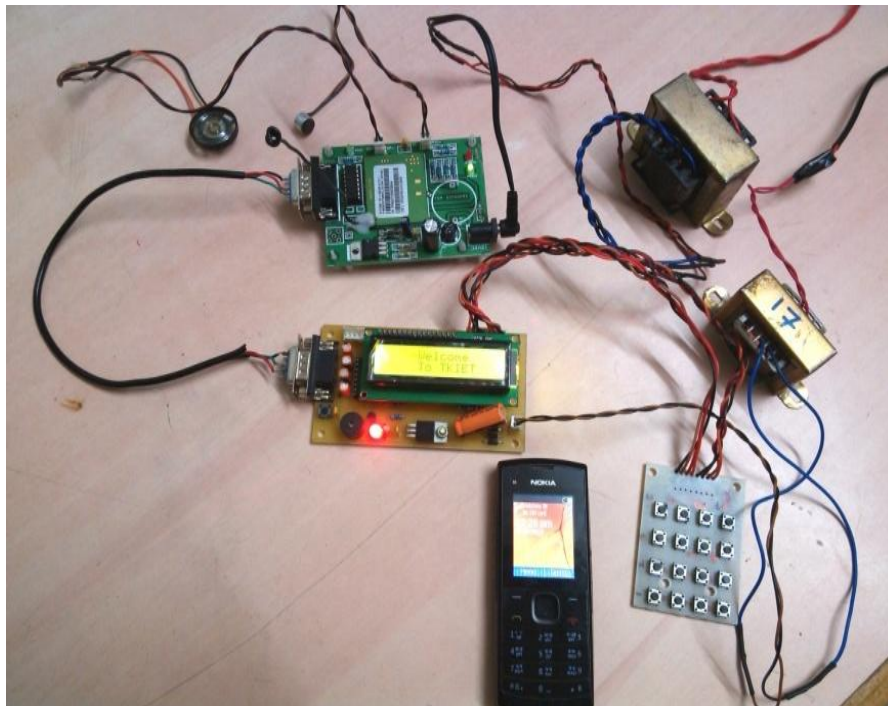Figure 4: Descriptive Hardware diagram of the Design

Figure 5: The experimental hardware unit.

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Now we can see some results obtained during operation of this conversation system as follows:

Figure 6: The experimental results

At first LCD displays Initial Message. If GSM Modem is not connected to MCU then it shows a message on LCD as No modem detected. If GSM Modem is connected to MCU then it shows a message as GSM Modem Ready on LCD. For Outgoing call, dial another subscriber number using keypad. For calling press "C"push button on Keypad. To end the call press "H" push button on keypad. After call disconnection, again it will display the initial message on LCD as Welcome to TKIET. For Incoming Call, When another subscriber calling to the SIM which is placed in our system i.e. to the user of this design then it displays a number of called party as shown above.

After call disconnection, it may be due to pressing "H"button by user of this system or by another subscriber in this conversation, LCD displays the same messages as shown in above figures. So these are the Results of this audio conversation system.

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