Data Encoding Over Voice

Shashank T S

Abstract—**There are various communication protocols that are used in data communication. In this paper a distictive method of communication is used. It is transmitting data over Voice. For example a cell phone user might be deprived of internet and needs to transmit data ,or recieve data but only phone calls can be made. In this method the data is transmitted over the phone call. Basically the carrier would be the voice traffic between the caller and the calling agent. The method used for transmission of data used would be Dual Tone Modulated Frequency. The transmitted data can be retrieved either by a Software Application installed on the phone or either by connecting external hardware to the phone. For instance there are many villages which do not have internet access and this is a useful method that can be helpful in transmitting data.The external hardware decoding circuit will be connected to the phone's audio jack. Advantage is that any phone can be used for this. And also there are some places where there are is not internet access this method not only fosters communication but also can be useful in transmitting photos and music over voice, One major application would be in providing authentication for a particular user.(the user will have to call a certain number and the auth code will be sent via the phone to unlock a particular feature.**

Index Terms—**DTMF, Phones, Microcontroller, Voice**

I.   INTRODUCTION

  In this age of Internet of things, people mostly use internet for all their needs, It also becomes important to foster data connectivity to people with internet access. By implementing suitable hrdware it is possible to transmit data over voice through any type of mobile phone.
The proposed system consists of the following blocks :

1. Phone-Tx
2. Phone-Rx
3. DTMF decoder
4. Relay Board
5. Power Supply
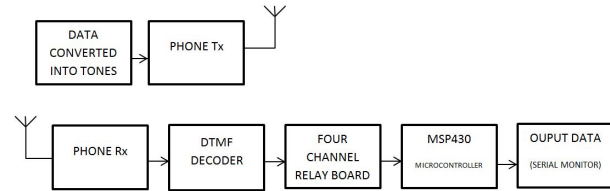6. Microcontroller
7. Regulators and Drivers

Figure 1:Functional Block Diagram

II.   PROTOCOL

The four output lines from the decoder is fed to the microcontroller.These lines can output around 16 combinations. Hence totally 16 different codes are available. To make it more reliable and to add more data, one code can be said to consist of two tones with a end one. The end tone can be used to mark the end of a character.

For example: If letter "S" is to be transmitted, tones corresponding to 5 and 3 are transmitted followed by the tone corresponding to * is transmitted.

Thus for transmission of a five letter word, fifteen tones are used.

III.   CM8870-DTMF DECODER

A Dual Tone Modulated Frequency signal is composed of an algebraic sum of two frequency, low frequency and high frequency. These are generally tones produced when a key is pressed in a phone. CM8870 is a DTMF Integrated Circuit which can decode phone's audio signals and has four output lines. Each key corresponds to a different set of output states.

The DTMF system uses a set of eight audio frequencies transmitted in pairs to represent 16 signals, represented by the ten digits, the letters A to D, and the symbols # and *.

F_{LOW}	F_{HIGH}	KEY	TOW	Q_4	Q_3	Q_2	Q_1
697	1209	1	H	0	0	0	1
697	1336	2	H	0	0	1	0
697	1477	3	H	0	0	1	1
770	1209	4	H	0	1	0	0
770	1336	5	H	0	1	0	1
770	1477	6	H	0	1	1	0
852	1209	7	H	0	1	1	1
852	1336	8	H	1	0	0	0
852	1477	9	H	1	0	0	1
941	1209	0	H	1	0	1	0
941	1336	·	H	1	0	1	1
941	1477	#	H	1	1	0	0
697	1633	A	H	1	1	0	1
770	1633	B	H	1	1	1	0
852	1633	C	H	1	1	1	1
941	1633	D	H	0	0	0	0
-	-	ANY	L	Z	Z	Z	Z
L = logic Low, H = Logic High, Z = High Impedance							

IV.   BUFFER, RELAY BOARD

The relay board for this experiment consist of four relays which are driven by a transistor. The relays used are 12V

relays capable giving signals to the microcontroller, in ordrer to eliminate the noise that can be obtained when connecting the DTMF decoder directly to the microcontroller. Buffers are normally used to provide extra current drive at the output but can also be used to regularize the logic present at an interface.

Transistors are used to drive the relays. The input to the transistors are the outputs from the DTMF decoder.
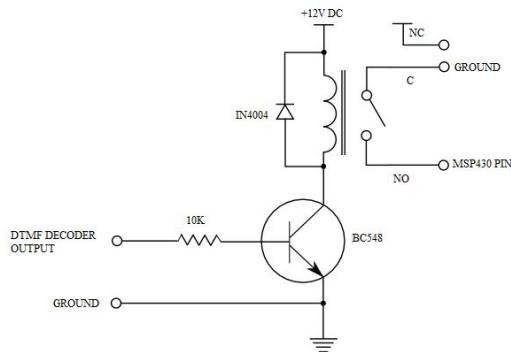

Figure 2:Relay with Transistor Driver

V. MSP430

The MSP430G2553 is a ultra-low-power mixed signal microcontrollers with built-in 16-bit timers, a versatile analog comparator, and built-in communication capability using the universal serial communication interface.In addition the MSP430G2x53 family members have a 10-bit analog-to-digital (A/D) converter.

The MSP430 Microcontroller is programmed using a software called Energia, which is similar to that of arduino IDE. The MSP430 is programmed such a way that for corresponding inputs(states on four pins) an output is generated. The input consists of two pulses.

Also the software energia has a inbuilt seril monitor, hence the output can be seen on the serial monitor itself:
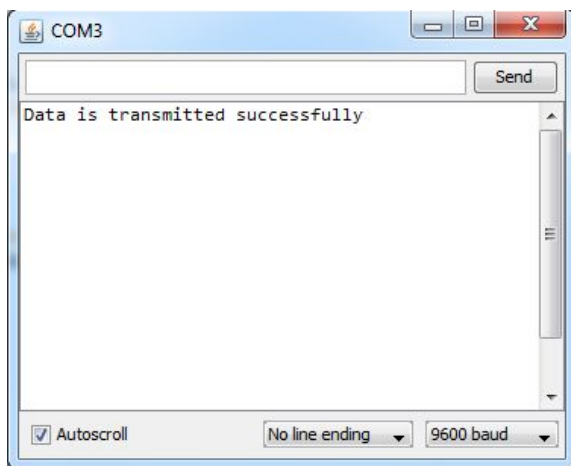
VI. IMPLEMENTATION

The method of implementing the whole system consists of the microcontroller board, relay board, DTMF decoder IC, and

various poer supply units. A phone call is being initiated from the Tx phone, the reciever phone is set to suto recieve. The data to be sent is sent sequentially in the form of tones which were converted from data using a audio software like audacity. The Rx phone's audio jack is connected to the dtmf decoder where the audio is decoded. Then the corresponding output is fed to the relay mechanism, which inturn controls states of the microcontroller pins.

In this way the states of the pins of the microcontroller is converted to useful data which is displayed on the serial monitor window. The setup is shown as follows:
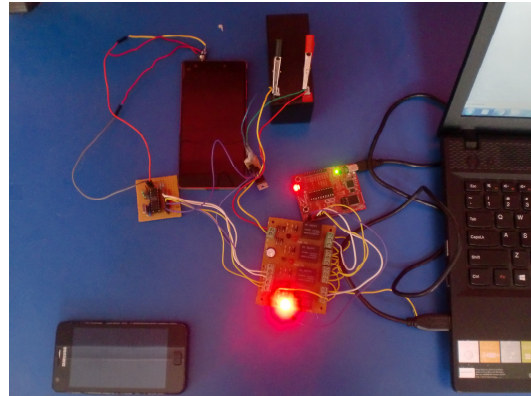
VII. RESULT

This methodology is meant for inbuilt data processing in the phone, although for demonstration purpose the external piece of hardware is used along with the phone.

The transmitting agent is in a different location as the recieving agent.

1) The data to be sent is converted to tones format. i.e one alphabet corresponds to two tones.

2)The data is sent through Voice carrier, which is sensed on the reciever side which does not underfo any encryption.

3)The tones are decoded by the DTMF decoder and sent to the MSP430 microcontroller.

4)The microcontroller after decoding the states of the pins outputs the corresponding data on the serial monitor window in the form of visible text.

CONCLUSION

This system greatly influences people and reaches people without internet access and also people to make in fast and quick transactions. It can be widely used in industry and in signboards where the data rate is not that important at all.Also it can forster cheap and quick transmission.

The major advantages of using this technique would be that data can be transferred to multiple locations all at once. i.e. there can be two or more recievers and a single transmitter. For example if there is a head office and there are say two branch offices, when the same data is to be transmitted to the branch offices it will be useful.

Another useful application of this project would be in places where there is a need for internet probably for a quick transaction or for recieving a important email or image. This techniques becomes useful in certain crusial circumstaces also.

REFERENCES

[1] K.Aruna, A.Sri Ramsagar, and G.Venkateswarlu, Mobile Operated Landrover Using Dtmf Decoder, International Journal of

[2] Modern Engineering Research, Vol.3, Issue.2, March-April. 2013 pp-898-902

[3] Er. Zatin Gupta, Payal Jain and Monika, A2Z Control System – DTMF Control System, Global Journal of Computer Science and

[4] Technology, Volume 10, Issue 11, October 2010.

[5] Tuljappa M Ladwa, Sanjay M Ladwa, R Sudharshan Kaarthik, Alok Ranjan Dhara and Nayan Dalei, Control of Remote Domestic System Using DTMF, ICICI-BME 2009 Bandung, Indonesia.

[6] G. Arangurenss, L. Nozal, A. Blazquez, and J. Arias, "Remote control of sensors and actuators by GSM", IEEE 2002 28th Annual

[7] Conference of the Industrial Electronics Society IECON 02, vol. , 5-8 Nov. 2002,pp.2306 – 2310

[8] R. Sharma, K. Kumar, and S. Viq, "DTMF Based Remote Control System," IEEE International Conference ICIT 2006, pp. 2380- 2383, December 2006.