Design Of Gsm Based Voice Data Processing Through Bone Conduction Principle

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Abstract- *The GSM based Sound Bite hearing system allows people with to hear the sounds via bone conduction to wear an intraoral device and a small microphone in the deaf ear to regain lost hearing. This device consists of GSM modem PIC16F877A controller and audio amplifier unit. GSM modem will receive incoming calls and automatically answer the call via AT Commands. Then incoming voice signal is converted into low frequency vibration signal that fed through the teeth to cochlea. Unlike implantable bone conduction hearing aids, Sound Bite requires no surgery. Rather, it is the world's first removable and non-surgical hearing solution to use the well-established principle of bone conduction to imperceptibly transmit sound via the teeth. Custom made for each person, Sound Bite is simple, removable, and totally non-invasive.*

Keywords- Hearing aid; GSM based ; Bone conduction; Implant ear plug.

I. INTRODUCTION

This thesis presents some recent developments on ongoing challenges in implantable bone conduction hearing devices. In view of the large number of problems and challenges in designing implantable electronics for medical devices, this thesis focuses on areas that will advance transcutaneous bone conduction implant devices for hearing impaired patients. It will be described in greater details in the upcoming chapters that the implanted bone conduction transducers need to receive power and data wirelessly through the intact skin. Furthermore, this transmission should be designed to be very efficient to reach the desired output force levels in the bone and also to consume less power, which is an important factor of cost. E orts are focused on the de-sign and implementation of an efficient wireless power and data transmission system for the use in bone conduction implants. If successful, this device can improve the quality of life for patients suffering from different hearing impairments and make it feasible to use this technology all over the world.

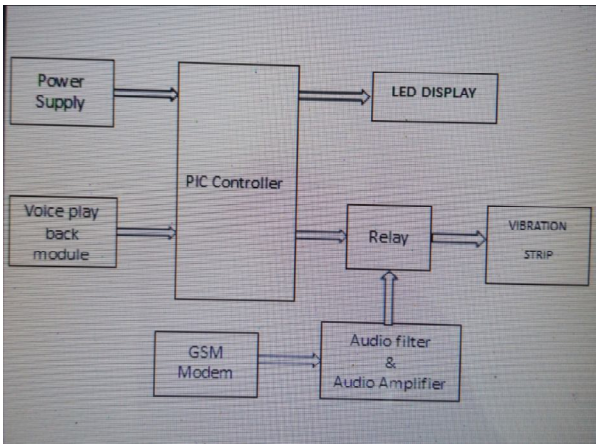
It is reported in the World Health Organization (WHO) fact sheet that in 2005, about 278 million people had moderate to profound hearing impairment (Deafness and hearing impairment Fact sheet N 300, April 2010). This shows the great importance of improving the design of hearing aid devices to the society.

Whereas conventional hearing aids transmit sound to the tympanic membrane via air conduction (AC), bone conduction (BC) devices transmit sound via vibrations through the skull directly to the cochlea. In most hearing impaired patients with conductive and mixed hearing loss and single sided deaf-ness who cannot sometimes be rehabilitated by air conduction hearing aids, a conventional bone conduction hearing device is an efficient alternative.

II. LIMITATIONS OF OBTAINABLE SYSTEM

Several hearing devices were found for outer drum problem only. Inner drum problem is usually a permanent condition which impairs one's ability to tell the direction a sound is coming from. It can also be responsible for difficulty understanding speech or conversations on the deaf ear side, particularly in a noisy environment. Some medical treatments has been proposed but that needs surgery. Due to that surgery it may leads to additional problems

III. PROJECTED SYSTEM



Block Diagram for projected system

This hearing device is designed to use the natural amplification of your ear. Any sound in that that coming from GSM Modem. It uses a digital processor (PIC16F877A) to transmit to the sound to a piezoelectric actuator which needs very little power to generate the vibrations that travel through bone, which in turn sends those sound vibrations into your cochlea through your teeth. This way, the sound is transported from your impaired ear directly to your hearing ear. This hearing device will be fitted to the upper left or right teeth in the back of your mouth. This doesn't require any of your teeth to be altered, and the device can be inserted and removed easily. This hearing device is a flat piece(in Real-Time Product) that contains a sealed rechargeable battery, and electronics and wireless capabilities that can pick up sound transmissions from the behind-the-ear microphone.

3.1 PIC ASSEMBLED PCB+UART+LCD

3.1.1 PIC MICROCONTROLLER

The microcontroller is a device that can perform a specific function according to the coding/program burnt into its program memory. The microcontrollers are special purpose devices used in many application like automobile, medical, instrumentation, battery management, smart phones accessories, motor and control drives, USB and wireless technology etc. One of the most reputed manufacturers of micro-controller is MICROCHIP. PCB design. They have the vast series of micro-controllers from 8bit, 16, 32 bit controllers both in SMD and through whole package.

Fig 1: **PIC- PCB Assemble**

3.1.2 UART

A serial communication is achieved by an UART protocol. This board is specially designed for connecting digital and analog sensors which has input voltage range 5 or $12V_{DC}$ as well as it can be interfaced with serial communication devices

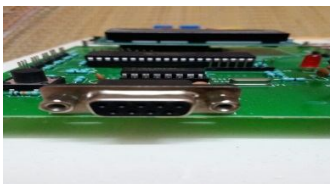


Fig 2: UART PIN

3.1.3 LIQUID CRYSTALDISPLAY

This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply.

Fig 3: 16x2 LCD

3.2 GSM

This GSM Modem can work with any GSM network operator SIM card just like a mobile phone with its own unique phone number. Advantage of using this modem will be that its RS232 port can be used to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily using this. This GSM Modem can accept any GSM network act as SIM card and 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.

Fig 4 : GSM Voice modem

3.3 VOICE RECORD/PLAY BACK MODULE

WTV-SR is one of the members of recording serial products. WTV-SR module can record as well as fixed voice playback, recording content uploaded and a variety of control modes can be chosen WTV-SR is provided with mp3 mode, Key control one by one, parallel interface, one-line serial interface, three-line serial interface. Therefore, WTV-SR module is suit for many occasions. It can be changed different control modes by setting I/O, which on the bottom of WTV-SR. It gives a Flexible power supply by either supply module or supply solution, so it is a effective recording solution.

Fig 5: **32 voice record/play back module**

3.4 USB TO RS232 CONVERTER

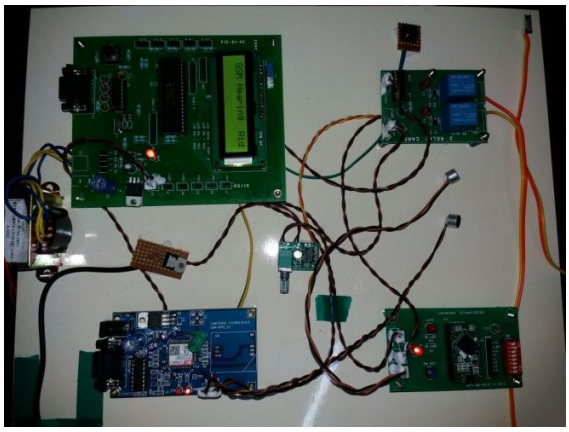
The USB_RS232 cables are a family of USB to RS232 levels serial UART converter cables incorporating FTDI's FT232RQ USB to serial UART interface IC device which handles all the USB signaling and protocols. The cables provide a fast, simple way to connect devices with a RS232 level serial UART interface to USB. Each USB-RS232 cable contains a small internal electronic circuit board, utilizing the FT232R, which is encapsulated into the USB connector end of the cable. The integrated electronics also include the RS232 level shifter plus Tx and Rx.

Fig 6: USB to RS232 convertor

IV. ADVANTAGES

High performance RISC CPU, Low power consumption Low power, high speed CMOS FLASH/EEPROM technology. No need of surgery. It should provide the removable hearing aid for the deaf people, it should avoid the surgery. It low cost compared to the deaf surgery.

V. OUTPUT



VI. CONCLUSIONS AND FUTURE WORK

The purpose of this thesis was to investigate the feasibility of designing and implementing an efficient wireless power and data transmission system for the BCI device. The most important factor was that the efficient transmitter design can deliver high enough power to the implanted transducer. Two main areas in this respect were explored in this study. First, better understanding and designing efficient radio frequency inductive links for the power and signal transmission was performed. the coupled resonators and loss mechanisms for transferring energy through the intact skin assisted in the design of the RF links were studied. Then it was very important to design the inductive link power driver to be efficient and fairly insensitive to variations in the transmitter circuit impedance and quality factor as the skin thickness (coupling between coils) changes between patients. Analog linear power amplifier and Class-E switching tuned RF power amplifier with minimized switching losses were implemented and investigated. Furthermore, during development of the BCI and particularly in previous cadaver studies (Hakansson et al. (2008); Paper I), it has been noted that the BCI device was less prone to fall into feedback problems than the BAHA especially at higher frequencies. Therefore, an investigation was done to measure the gain headroom (how much extra gain can be provided before the device will oscillate) in the BCI and in a generic bone anchored hearing device.

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