Design of GSM based Voice Data Processing Through Bone Conduction Principle

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***Abstract*— Recent hearing aid systems (HASs) can connect to a wireless microphone worn by the talker of interest. This feature gives the HASs access to a noise-free version of the target signal. In this paper, we address the problem of estimating the target sound direction of arrival (DoA) for a binaural HAS given access to the noise-free content of the target signal. To estimate the DoA, we present a maximum likelihood framework which takes the shadowing effect of the user's head on the received signals into account by modeling the relative transfer functions (RTFs) between the HAS's microphones. We propose three different RTF models which have different degrees of accuracy and individualization. Further, we show that the proposed DoA estimators can be formulated in terms of inverse discrete Fourier transforms (IDFTs) to evaluate the** likelihood function computationally efficiently. We extensively assess the performance of the proposed DoA estimators for various DoAs, signal to noise ratios (SNRs), and in different noisy and reverberant situations. The results show that the proposed estimators improve the performance markedly over other recently proposed "informed" DoA estimator.

***Index Terms*—**Sound Source Localization, Direction of Arrival Estimation, Hearing Aid, Maximum Likelihood, Relative Transfer Function.**keywords@ieee.org or** http://www.ieee.org/organizations/pubs/ani_prod/keywrd98.txt

I. INTRODUCTION

N realistic acoustic scenes, where several sound sources are present simultaneously, the auditory scene analysis (ASA) ability in humans allows them to focus deliberately on a sound source while suppressing the other irrelevant sound sources . Sensorineural hearing loss degrades this ability , and hearing impaired listeners face difficulties in interacting with the environment. Hearing aid systems (HASs) may take some of these ASA responsibilities to restore the normal interactions of the hearing impaired users with the environment. Sound source localization (SSL) is one of the main tasks in ASA, and different SSL approaches have been proposed for various applications, such as robotics , video conferencing surveillance , and hearing aids . SSL strategies using microphone arrays can be generally categorized .

The HAS consists of two hearing aids (HAs) connected wirelessly and mounted on each ear of the user, and a wireless microphone worn by the target talker. The target signal s(n) is emitted at the target location, propagates through the acoustic channel hm(n) and reaches microphone m 2 fleft; rightg of the binaural HAS. Due to additive environmental noise, the signal captured by microphone m, denoted by rm(n), is a noisy version of the target signal impinging on the microphone. The problem considered in this paper is to estimate the target signal Direction of Arrival (DoA) _ based on the wirelessly available target signal s(n) and the noisy microphone signals rm(n). Estimating the target sound DoA in this system allows the HAS to enhance the spatial correctness of the acoustic scene presented to the HAS user, e.g. by imposing the corresponding binaural cues on the wirelessly received target sound. The "informed" SSL problem for hearing aid applications was first investigated via a TDOA-based approach in. The method proposed in uses a cross-correlation technique to estimate the TDOA, then uses a sine law to map the estimated TDOA to a DOA estimate. The approach proposed in has relatively low computational load, because it does not take the shadowing effect of the user's head and the ambient noise characteristics into account. Disregarding the head shadowing effect inevitably degrades the DOA estimation performance, especially when the target sound is located at the sides of the user's head, where the head shadowing has the highest impact on the received signals. Moreover, neglecting the ambient noise characteristics causes the estimator performance to be sensitive to the noise type.

EXISTING 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

PROPOSED 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 microprocessor.

LITERATURE REVIEW :

A Probabilistic Modeling Approach to Hearing Loss Compensation - Generative probabilistic model for the hearing loss problem and provides for automated inference.

Change of Cochlear Micromechanics due to Different Types of Hearing Loss - The reasons for hearing loss are complex and currently the mechanics are not entirely clear.

Sound Vibration in Human Auditory System using Microcontroller - The system will redu;/ce the noise in the signal and better sound signal is developed and send to ear as form of vibration. Thus improve the ability of impaired people to hear .

overview of Informed sound sorce separation system in Hearing loss - signal-based informed source separation recently appeared as a desirable framework whenever some signals are available, such as score-sheets or cover version, which are related to the unknown sources to estimate.

COMPONENTS DESCRIPTION :

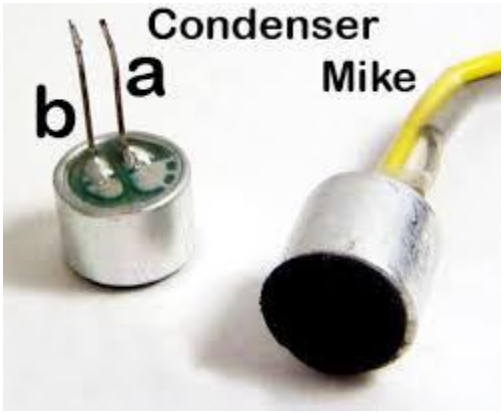
- PIC Controller
- Condenser Mic
- GSM Modem SIM800
- Sound Bite Sensor
- LM358 Audio Amplifier

PIC MICROCONTROLLER:

The pic microcontroller is one of the most renowed microcontroller in the industry .This controller is very convinent to use the coding or programming of this controller is also easier .One of the main advantages is that can be erase many times as possible because it use FLASH memory technology .It has a total number of 40 pins and there are 33 pins for input and output .PIC16F877A is used many pic microcontroller projects also have many application in digital electronics circuits.It is used in remote sensors, security and safety devices , home automation amnd many industrial instruments. The cost of controller is low and its handling is also easy .It flexible and can be used in areas where microcontrollers have never been used before in co processor applications and timer functions.

CONDENSER MIC :

Condenser mic require external power for their internal electronics .Early specimens has produced condenser which were powered by external size this was inconvinent many ways especially when many microphones were used at the same time because they required and dedicated in multiple cable . power condenser mic directly from the mixing desk without need of cables .Due to it convinence power soon became a world standard .condenser microphone can follow the sound waves more accurately than that dynamic with heavy moving coil attached it has superior sound quality of all microphone types condenser have the widest frequency response and the best transistent response.Also condenser microphones usally offer much sensistivity and lower noise than dynamic microphones it require an external power supply because tubes consume more energy than power is able to provided .



GSM MODEM SIM800:

The GSM Modem can accept any GSM network operator SIM Card and act just like a mobile phone with 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. GSM modem is class of wireless modem devices that are designed for communication of a computer with the GSM network .It

requires a SIM card just like mobile phones to activate communication with the network .Also they have number similar to mobile phones for their identification.The modem send backs result

after a command. Different AT commands supported by the processor to interact with the GSM cellular network.

VIBRATION STRIP :

Vibration strip is also called as vibration motor .
It is based on the principle of induction .vibration motor is an eccentric rotating mass vibration motor (ERM) uses a small unbalanced mass on a DC motor, when it rotates it creates a force that translates to vibrations. A linear resonant actuator (LRA) contains a small internal mass attached to a spring, which creates a force when driven.

PLAYBACK MODULE :

Single chip, high quality voice recording and playback solution .User friendly, Easy to use operation. WTV040S inbuilt ADC and DAC.

Non - Volatile - flash memory technology, no battery backup required 4-8 Khz sampling rate Audio output to drive a speaker or audio out for public address system Can record voice with the help of on-board microphone or via any audio input.It can record voice for 20 minutes ULL 2003 is used for drive the relay .

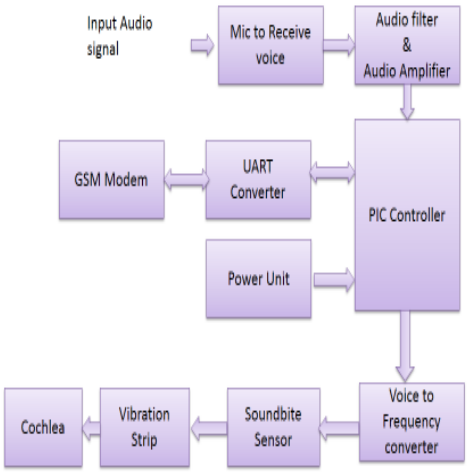
SOUND BITE SENSOR :

Soundbite sensor sensor is a device that transisimit sound via the teeth .It is an alternative to surgical bone conduction which require surgical implantation into the skull conduct sound . soundbite sensor uses the teeth instead of the implanted component and elimates the need for surgery .conventional hearing aid which a amplify sound can cause distortion for these patient .sound vibration travel through the medium and sound is heard when sound waves travel through medium of bones to arrive at the inner ear it transmit suitable vibration .It processes sound and wirelessly transmit the sound signals to the device. The receive signals convert them into sound vibrations although the vibrations are strong enough to picked up cochlea.

LM358 AUDIO AMPLIFIER :

The lm358 series consists of two indepent high gain, internally frequency compensated amplifiers which were designed specially to operate from a single power supply over a wide ranges of voltage operation from split power supplies is also possible and the low power suppliy current drain is independent of the magnitude of the power supply voltage. Application areas include transducer amplifiers , dc gain blocks and all the conventional op amp circuits which now can be more easily implemented in single power supply system .For example the LM358 series can be directly operated of the standard +5 power supply voltage which is used in digital system and will easily provided the required interface electronics without requiring the additional power supplies.

BLOCK DIAGRAM :



The block diagram represent a person is a strong acoustic sound field, sound waves arriving to the head can cause the skull bones to vibrate. These vibrations can be transmitted to the inner ear through the temporal and frontal bones as well as through the jaw and soft tissue. As a result, the cochlea system are mechanically stimulated which may cause displacements of the BM and activation of the hearing organ . The sequential vibrations of the auditory ossicles (i.e., hammer, incus, and stapes) are transmitted to the inner ear through its oval window and ultimately create motion of the fluids within the cochlea. One of the most important sounds transmitted between humans is speech. The correlation between bone vibration velocities at 2 measuring sides were significant and relative median data showed similar trends for both methods. However, low correlation between the vibration velocity and hearing threshold was found at the individual level.

FUTURE SCOPE :

It can be used by common people. It does not have any duration. It is a life time process. It is more flexible, durable and convenient product

CONCLUSION :

we proposed three maximum-likelihood-based DoA estimators for a hearing aid system (HAS) which has access to the noise-free target signal via a wireless microphone. The proposed DoA estimators are based on three different models of the direction-dependent relative transfer functions (RTFs) between the HAS' microphones. These RTF models, which we call i) the free-field-far-field model, ii) the sphericalhead model, and iii) the measured-RTF model, represent, with increasing accuracy and complexity, the head shadowing effect of the user's head on impinging signals. The proposed estimators rely on spatio-spectral signal characteristics, which are assumed fixed across a short (in the range of milliseconds) duration. It is a topic of future research to extend the estimators to take temporal characteristics of the acoustic scene into accounts, e.g. by modeling the relative movement of the user's head and the target source.

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