

Silent Sound Technology: A Solution to Noisy Communication

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Abstract— when we are in movie, theatre, bus, train there is lot of noise around us we can't speak properly on a mobile phone. In future this problem is eliminated with the help of Silent sound technology. It is a technology that helps you to transmit information without using your vocal cords. This technology notices every lip movements & transforms them into a computer generated sound that can be transmitted over a phone. Hence person on another end of phone receives the information in audio This device is developed by the Karlsruhe Institute of Technology (KIT).It uses electromyography, monitoring tiny muscular movements that occur when we speak and converting them into electrical pulses that can then be turned into speech, without a sound uttered .When demonstrated, it seems to detect every lip movement and internally converts the electrical pulses into sounds signals and sends them neglecting all other surrounding noise. So, basically, it reads your lips. It is definitely going to be a good solution for those feeling annoyed when other speak loud over phone.

Keywords-- silent sound, electromyography, electromyograms, digital image processing

I. INTRODUCTION

Silent sound technology enables speech communication to take place when an audible acoustic sound is unavailable. By acquiring sensor data from elements of the human speech production process- from the articulators ,their neural pathways ,or the brain itself –it produces a digital representation of speech which can be synthesized directly, interpreted as data, or routed into a communication networks[2].

Sound Technology is a technology for mobile phones that helps you communicate in noisy places too. It is a technology that will help reduce noise pollution to a great extent. The uses of this technology are immense for people who are vocally challenged or have been rendered mute due to accident.

Humans are capable of producing and understanding whispered speech in quiet environments at Silent remarkably low signal

levels. Most people can also understand a few words which are unspoken, by lip-reading The idea of interpreting silent speech electronically or with a computer has been around for a long time, and was popularized in the 1968 Stanley Kubrick science-fiction film “2001 – A Space Odyssey ” [7].A major focal point was the DARPA Advanced Speech Encoding Program (ASE) of the early 2000's, which funded research on low bit rate speech synthesis “with acceptable intelligibility, quality , and aural speaker recognizability in acoustically harsh environments”.

In the 2010 CeBIT's "future park", a concept "Silent Sound" Technology demonstrated which aims to notice every movement of the lips and transform them into sounds [6]. This new technology will be very helpful whenever a person loses his voice, while speaking to make silent calls without disturbing others, and even when we want to tell our PIN number to trusted friend or relative without having other person to listen it secretly. At the other end, the listener can hear a clear voice. Another important benefit is that it can be translated into any language of user's choice. This translation works for languages like English, French & German. But, for the languages like Chinese is difficult because different tones can hold many different meanings.



Fig. 1 Many people talking at one place

II. PROCESS OF SPEAKING

The air passes through the larynx and the tongue and the words are formed with the help of the articulator muscles in the mouth and the jaw. The articulator muscles are activated irrespective of the fact that no air passes through them or not. The weak signals are sent from the brain to the speech muscle. These signals are collectively known as the electromyograms.

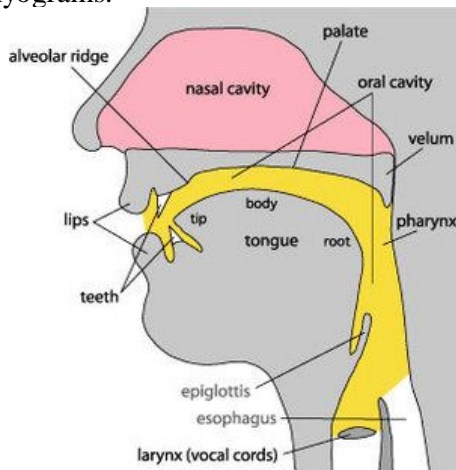


Fig. 2 Speaking Process in human body

III. METHODS

Silent sound technology is processed in two ways. They are

- A. Electromyography (EMG)
- B. Image Processing

A. Electromyography

Electromyography is a technique used in silent sound technology that monitors tiny muscular

movements that occur when we speak and converting them into electrical pulses that can then be turned into speech, without a sound utter. Electromyography (EMG) is a technique for evaluating and recording the electrical activity produced by skeletal muscles. EMG is performed using instrument called an **electromyograph**, to produce a record called an **electromyogram**. An electromyograph detects the electrical potential generated by muscle cells when these cells are electrically or neurologically activated [2].

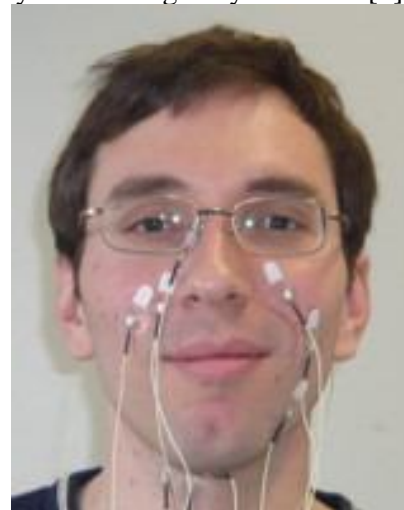


Fig. 3 Electromyographic sensors attached to face.

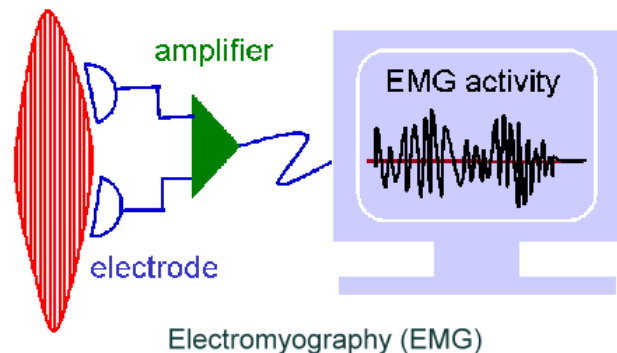


Fig. 4 Electromyography activity

B. Image Processing

The simplest form of digital image processing converts the digital data tape into a film image with minimal corrections and calibrations. Then large mainframe computers are employed for sophisticated interactive manipulation of the data. In the present context, overhead perspective are employed to analyze the picture. In electrical engineering and computer science, image processing is any form of signal processing for which the input is an image, such as a photograph

or video frame; the output of image processing may be either an image or, a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it [1].

Analysis of remotely sensed data is done using various image processing techniques and methods that includes

1) *Analog Image processing*: - Analog processing technique is applied to hard copy data such as photographs or printouts. It adopts certain elements of interpretation, such as primary element, spatial arrangement etc. With the combination of multi-concept of examining remotely sensed data it allows us to make a verdict not only as to what an object is but also its importance. Apart from these it also includes optical photogrammetric techniques allowing for precise measurement of the height, width, location, etc. of an object

2) *Digital Image Processing*: - Digital Image Processing involves a collection of techniques for the manipulation of digital images by computers. It contain some flaws. To overcome the flaws and deficiencies in order to get the originality of the data, it needs to undergo several steps of processing. Digital Image Processing undergoes three general steps: 1) Pre-processing Display 2) Enhancement 3) Information extraction

IV. ADVANTAGES OF SILENT SOUND TECHNOLOGY

Very useful for those people who lost their voice and has been rendered mute due to accident.

At public crowded places like in market, bus, train, malls, theater etc.

Very good technology for noise cancellation technique.

Helps in making phone calls in noisy environment.

Very useful for sharing confidential information like secret PIN number on phone at public place.

Very useful for astronaut.

V. RESTRICTIONS

This technology works in many languages of user's choice like English, French & German, etc. But, for the languages like Chinese is difficult because different tones can hold many different meanings.

VI. FUTURE SCOPE

Silent sound technology gives way to a bright future to speech recognition technology from simple voice commands to memorandum dictated over the phone all this is fairly possible in noisy public places. Without having electrodes hanging all around your face, these electrodes will be incorporated into cell phones. Nano technology will be a mentionable step towards making the device handy.

VII. CONCLUSIONS

Engineers claim that the device is working with 99 percent efficiency. Silent Sound Technology, one of the recent trends in the field of information technology implements 'Talking Without Talking'. It will be one of the innovation and useful technology and in mere future this technology will be use in our day to day life

REFERENCES

- [1] Hueber T, Benaroya E-L, Chollet G, Denby B, Dreyfus G, Stone M. (2010). Development of a silent speech interface driven by ultrasound and optical images of the tongue and lips. *Speech Communication*.
- [2] Denby B, Schultz T, Honda K, Hueber T, Gilbert J.M., Brumberg J.S. (2010). *Silent speech interfaces. Speech Communication*
- [3] <http://www.telecomspace.com/content/cebit-2010-silent-sound-technology-endless-possibilities>
- [4] <http://www.techpark.net/2010/03/04/silent-soundtechnology-an-end-to-noisy-communications/>
- [5] Shehjar Safaya , Kameshwar Sharma , Silent Sound Technology- An End to Noisy Communication, *Speech Communication* , Vol. 1, Issue 9, November 2013
- [6] www.dellchallenge.org.