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AN OVERVIEW AND ANALYSIS OF SILENT SOUND TECHNOLOGY

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ABSTRACT :
Nowadays whenever we are in a crowd or there was a to much background noise around us then it is very difficult to communicate or interact over the phone, but now we have an awesome solution on this problem that is ' silent sound technology ' it is a gift for those who lost their voice but wish to speak over the phone. this technology is produced by the Karlsruhe institute of technology, Germany and it will be available soon in the market. Silent sound technology is also known as ultrasonic sound or ultrasonic communication enables the transmission of data through inaudible sound waves. in this technology it detects every lip movement and convert it into the sound signal neglecting all background noise. without using real audio it is a visual interpretation of lip, mouth and face. So basically it reads our lip. This technology is available in English, German and French language, but not in language like Chinese because different tones hold different meanings in Chinese language. it use to allow silent calls and we can share our personal information like PIN , password or secret information to trusted one without knowing any other. it is also use in the Military for the secret missions. According to the researchers the technology have 99% efficiency only 1% possibility that it was produce a incorrect voice and upcoming 6-7 years the normal peoples are also use this technology because it launching very soon.
Keywords : silent sound technology, electromyography, image processing.

INTRODUCTION

Silent Sound Technology is the fabulous solution for those who unable to speak but want to communicate on the mobile phone. This technology helps you to transmit information without using vocal cords.[3] It detect yours every minor lip movement and convert it electrical pulse into sound signal. Hence the person on the other end of phone receive information in form of audio without hearing background noise. The technology has been developed by Karlsruhe institute of technology at Germany.[1] In a case if we are in public places like theater, concerts, marriage function or in a market we can't convey or send our message on the another side in that condition this technology is very useful because it neglect all background noise. [2] It's like sending a secret message that nobody else can hear so we can called it a secret messenger. [5]
The aim of silent sound technology is to give voice to those who unable to speak. The accuracy of this technology is very high so it is a perfect solution, only one percent it produce a bogus word, but the engineers try to solve the 1% fault to make this technology perfect.[1] This is neuromuscular activation associated with muscle contraction produce the electrical activity that manifest as a signal. It is useful for CID officers, military officers for the undercover operation. Ultrasonic sound technology, involves transmitting sound waves at frequencies higher than what humans can hear. These high-frequency sound waves can be used for various purposes without causing disturbance to people nearby. For instance, it can be used in wireless communication, medical imaging, and even controlling devices like smartphones through gestures.[3]

Figure1: common people speak on their cellphones without any disturbance

The key idea is that these sound waves are silent to human ears but can still carry information or perform tasks efficiently. Silent sound technology can be used to replace noisy communication methods with quieter alternatives. For example, instead of using loudspeakers or traditional microphones, silent sound technology employs ultrasonic waves to transmit and receive information without creating noise.[8] This can be especially useful in environments where noise pollution is a concern, such as crowded areas or sensitive locations like hospitals or libraries. Additionally, silent sound technology can enhance privacy by allowing for discreet communication without disturbing others nearby.[2]

Silent sound technology can be a game-changer for individuals who are unable to speak. By using ultrasonic waves to transmit and interpret subtle gestures or movements, this technology enables non-verbal communication. For example, someone who cannot speak due to a medical condition or disability can use silent sound technology to convey messages through gestures or movements, which are then translated into speech or text by a computer or device. This can significantly improve the quality of life for individuals who rely on alternative forms of communication.[3]

METHODS

There are two methods to processing silent sound technology

1. Electromyography
2. Image processing

ELECTROMYOGRAPHY

Electromyography is a test that measures the electrical activity in your muscles in silent sound technology. Involve using the electrical signals generated by muscles to control device or produce sound without any audible noise means it translates muscle activity to produce sound and enabling hand free control or communication through muscle movements. During the electromyography method the small needles or electrodes are place on the face or needles inserted into the face muscles to record the electrical signal When your muscles contract for producing Sound on another side of the phone. In that certain transducer is used like vibration sensor, pressure sensor, electromagnetic sensor and motion sensor. The electrical signals are generated by the facial muscle are recorded and this signal are compared with a recorded signal of the same spoken words as an input and then it convert this words into the sound.[1] The electrical source is the muscle membrane potential of about -90mv and its measured potential range between less than 50 μv and upto 20 to 30 mv depending on the muscle under observation. In the electromyography there is a one condition that is the electrodes are attached on proper place of the muscles because it needs proper muscle movements as an input to produce a accurate signal to the receiver. Using electromyography device can detect muscle movements like when you flex your fingers and translate that into actions like typing witπhout making any noise. Electromyography is a technique used to measure the electrical activity produced by muscles. In silent sound technology, EMG is employed to detect the tiny muscle movements that occur when a person silently mouths words or speaks very softly. [6]These muscle movements generate electrical signals, which can be picked up by sensors placed on the skin. By analyzing these signals, researchers can decode the words being silently spoken by the person. This technology has application in fields like communication aids for individuals with speech impairments and silent communication in noisy environments.

Figure2: Electromyography

IMAGE PROCESSING

The silent sound technology is the ultrasonic communication uses high frequency sound waves that are beyond the range of human hearing to transmit data. In image processing this technology can be used to encode and decode image using these ultrasonic signals allowing for covert or data transfer without audible noise but it is not exactly like regular image processing Instead, it's more about converting images or visual information into sound signals that are beyond human hearing range. These sound signals can then be transmitted and decoded back into images at the receiving end. It's like converting pictures into secret codes that only special devices can understand and convert back into pictures again basically it convert image into the sound signal. [3]

Image Conversion: First, the image is converted into a format that can be transmitted through sound waves. This involves breaking down the image into smaller pieces called pixels.

Pixel Mapping: Each pixel is assigned a specific frequency or combination of frequencies. Think of it like assigning a different pitch to each pixel.

Sound Encoding: These frequencies are then encoded into sound waves. This encoding process is like turning the image data into sound signals.

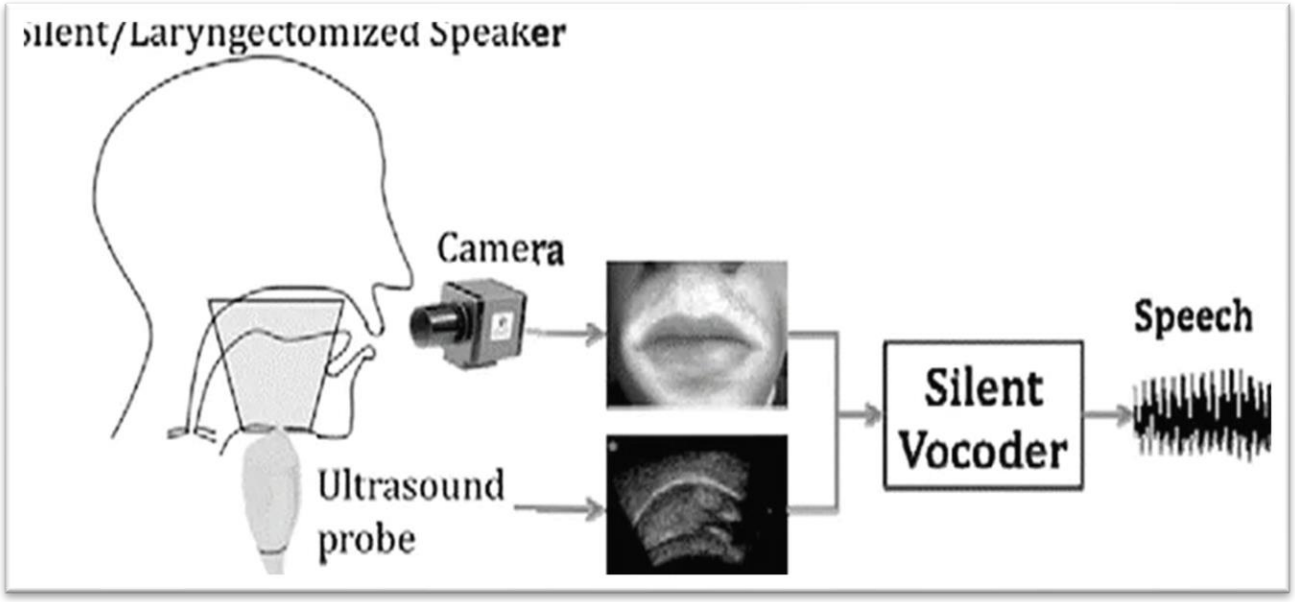

Figure3: Image processing

Conversion to Sound Waves: Each pixel's information is then converted into a corresponding ultrasonic sound wave. The intensity, frequency, or phase of the sound wave can represent different aspects of the pixel, such as its colour or brightness.

Transmission: These ultrasonic sound waves are then transmitted through the air to a receiver using a specialized transducer or speaker. Since these sound waves are beyond the range of human hearing (typically above 20 kHz), they are "silent" to us.

Reception: At the receiver's end, another specialized device, like a microphone or ultrasonic sensor, picks up the ultrasonic sound waves.

Decoding: The received sound waves are then decoded back into digital information, reconstructing the original image. This involves reverse-engineering the process used for encoding, extracting pixel information from the sound waves.

Displaying the Image: Finally, the reconstructed image is displayed on a screen or stored for further processing or analysis. The simplest type of image processing is the digital image processing it transforms digital data cassette into a film image where we give input is an image or a video and it will take an output as a sound signal because it compare our input with the are previous 'set of millions inputs' and give us accurate output. In this the digital or analog image are taking with the help of camera. In this they use photographic software to create an actual image and the image is the better option than electromyography because an image processing have a simplest way to use we only need a camera or device no more electrodes and wires are needed so image processing is the best option in the silent sound technology.[1]

APPLICATION

- As we know there is a no medium for travel to sound in the space therefore this technology can be best utilised by the astronauts.
- This technology used in military to transmit secret or private information about any missions or any undercover operation for the security purpose.
- Help the people who lose their voice its allow people to make silent calls.
- The normal peoples also can talk on the phone without disturbance of a background noise.
- We can share our password or PIN to our to our trusted friend or family member without taking any risk.

Figure 4: electrodes attached to the face and needles inserted in muscle

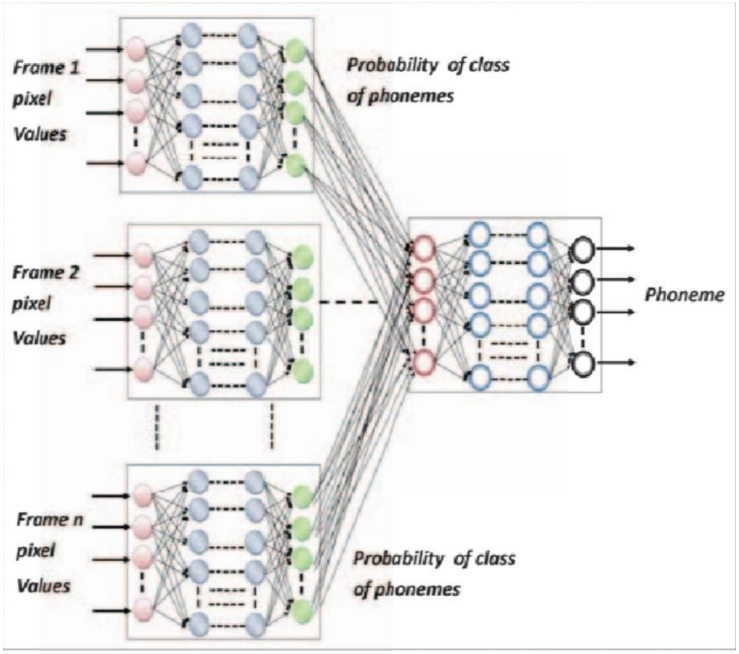

figure 5: Model representation of network for silent sound technology

LIMITATIONS

- The method of electromyography is quite impractical because it needs a nine leads to insert in your facial muscle .
- This technology is available in only three languages like German, English and French not like language Chinese because in Chinese language different tones hold different meanings.
- It's difficult to recognised who you are taking from the security point of view.
- It can't differentiating peoples and their emotions it just talking like a robot.
- Silent sound technology, which uses ultrasound to transmit information, has its limitations. One biggie is that ultrasound doesn't travel well through solid objects, like walls, which can mess up communication. Plus, it's not great for long-distance communication since it loses power over distance.

CONCLUSION

The silent sound technology, which detects mouth movements and direct electrical signals which are transformed into sound signals, will be suitable for people that they lost their vocals and yet still want to use mobile phones to communicate. It will provide a solution for their issue. It's like sending secret messages through sound that only machines can hear and decode. This tech is handy for secure communication and can be used for things like sending images without anyone hearing a thing. This technology has lots of cool uses. For example, it can help keep conversations private in public places because the sounds are silent to us. It is best option for us to end noisy communication and it is very useful to upcoming developed world.

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