Licensing and Technology Transfer Opportunity: Manipal University

Title of Technology Available: Automatically Controlled Hands Free Electrolarynx System and Method

Brief Description of Invention:
The present invention provides an automatically controlled electrolarynx wearable device with hands-free operation. The device is a voice prosthesis with a transducer for generating signal to be modulated into speech and an interface for receiving signal indicative of mouth movement activity. The mouth movement activity interface is non-invasive and responds to mouth opening and closing activity. This interface detects jaw bone movement activity in association with movement of mandible bones. The device includes an electronic circuit for detecting a change in resistance due to mouth movement activity and converts the same as change of voltage. The change of voltage is amplified and sent to a processor. Depending on voltage value, processor decides to send or not to send activation signal to transducer. Along with activation signal, an excitation pattern corresponding to mandible movement is sent and converted into speech using transducer.

Brief Background of Invention:
The electrolarynx is an electro-mechanical voice prosthesis that produces a vibration that are used to acoustically excite the vocal tract. The device acts as a substitute for larynx. The most commonly used electrolarynx is a battery powered neck-placed electrolarynx. This type of electrolarynx devices are hand held devices which produce vibrations and need to be turned on manually and pressed against the neck surface throughout the speech. The vibrations pass through the pharyngeal muscles inside the vocal tract and get modulated by articulators such as tongue, teeth, nose and lips to produce meaningful speech.

Describe the final product:
The device comprises a neck brace configured for fitting around the neck of a patient. The device will comprise a sensor module configured for fitting onto a mandible of the patient. The product will have a processor coupled to the sensor and affixed onto the neck brace. The device comprises a transducer coupled to the processor and affixed to the neck brace so as to deliver the excitation signal to the neck of a patient.

Technological Domain (Keywords):
Electrolarynx, Artificial Larynx, Voice Box, Automatic, Wearable device, Low Noise, Glottal Wave, Perceptual, Hands free, Low battery consumption

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Proof of Concept:
Figure 1 shows the block diagram of the electrolarynx. A processor will receive the signal from the amplifier circuit. Depending on the value of voltage the processor decides to send or not to send activation signal to the transducer interface circuit. Along with activation signal to enable the transducer it also sends the excitation pattern. No excitation pattern is sent to the transducer if the processor decides not to send the activation signal.

In normal human beings the larynx produces a repeated vibration known as glottal wave pattern. But the Electrolarynx being a replacement of the larynx cannot produce the glottal wave since there is a loss of signals due to the nature of its placement on the neck surface. This loss is due to the neck transfer function. So a pattern for exciting the electrolarynx is derived by inverting the neck transfer function on the mathematical model of the human glottal wave. The digital values corresponding to the pattern are stored in the processor as a look up table.

An electrical circuit convert the digital values into analog values to form the excitation wave pattern. An electronic circuit will increase the magnitude of power of the excitation pattern and apply to the transducer.

When the processor decides not to send excitation pattern to the transducer, the transducer will go to the power gating mode in which power supply is cut off through the power gating circuit to reduce the power dissipation of the circuit. Additional power saving is done through the enabling of sleep mode of the processor.

A circular shaped neodymium magnet acts as the base of the transducer. Another cylindrical magnet of size is placed at the center of the circular magnet. An air core piston wound with a coil acts as the electromagnet. A circular shaped flexible card of is the coupler to be placed on the neck region. The entire transducer is placed on a thick metal plate which enables the device to be worn as a neck brace.

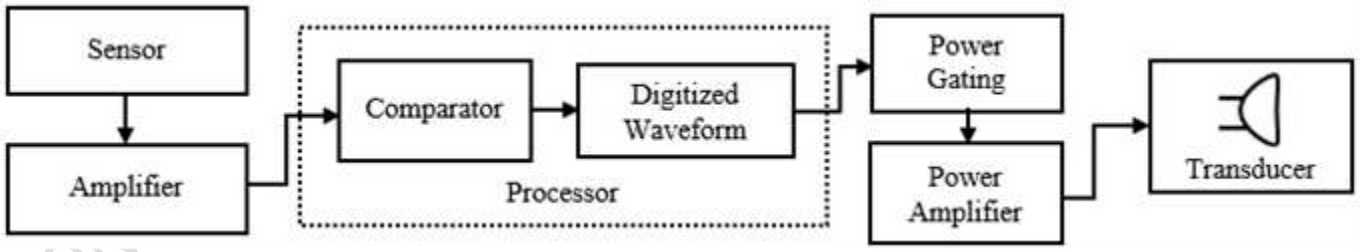

Figure 1. Block diagram of the electrolarynx

Stage of Development:
Prototype

Provide Information on Competitors who manufacture and/or sell similar products: NA

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What are the unique advantages your innovation has compared to the competition:
The proposed device will avoid the manual turn-on and turn-off and have features with automatic control of the device as per the need. The device will also work extends the battery life by reducing the power consumption through the alternative excitation wave, power gating and sleep mode mechanisms. The device will also reduce the self-produced noise due to the alternative excitation wave which increases the listening perception.

A few potential companies who might be interested in this technology:
Blackfrog Technologies

Intellectual Property Status: Indian Patent application with number 201941019052 filed in 2019

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