REKNEW-DYSARTHRIA
Abstracts from research conducted in collaboration with the OHSU Department of Engineering & Science, Division of Biomedical Computer Science and BioSpeech, Inc.

VOICE TRANSFORMATION FOR DYSARTHRIA - PHASE I SBIR

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Software will be developed that transforms speech compromised by dysarthria into easier-to-understand and more natural-sounding speech. The software will reside on laptop computers, with microphone input and amplified speaker or line output.
Such software and hardware solutions will assist individuals with dysarthria to better communicate by voice, whether face-to-face or by telephone; it will also help these individuals when interacting with voice controlled services and devices, which are increasingly more popular. The system operates in "Interpreter Mode", meaning that output will take place after a brief processing delay once the speaker has completed an utterance. The software is based on a multi-step formant re-synthesis process: (i) Robust extraction of formant, energy, spectral balance, and pitch trajectories from input speech; (ii) Modification of extracted trajectories by imposition of smoothness and shape based constraints, and by bringing these trajectories in closer proximity to trajectories of normal speech; (iii) Conversion of the trajectories into a speech signal by formant synthesis. Results obtained with a prototype, personal computer based system show that this process is robust, enhances intelligibility, and completely eliminates "vocal fry", i.e., distortions caused by irregularities in the temporal pattern of the vocal folds. In Phase I, the core algorithms performing these steps will be improved and extended, and the software will be ported to a pocketable computer; the resulting system will be evaluated on multiple speakers and listeners; and feedback will be obtained from potential users and their partners about desired features, usability, and functionality. In Phase II, acceptable processing delays will be achieved using known methods for optimizing memory and processing speed; further enhancement capabilities will be added, and the system will be evaluated. The currently targeted product will be the first in a family of speech enhancement products with continually expanding functionality, by capitalizing on ongoing algorithmic and hardware improvements. Usage of standard hardware and software platforms, that in turn are compatible with a wide range of headsets and wearable amplified speakers or telephones, puts this software in a strong competitive position. A large percentage of the more than 2.5 million adult Americans with significant disability due to chronic neurological impairment in the United States present with dysarthria or speech impairment as 1 of their disabling conditions. There are no cures for speech impairments. Dysarthric individuals report losses to employment, educational opportunities,

social integration, and quality of life. Individuals are taught strategies that compensate for their impairments, but the isolation caused by communication impairment is pervasive. The project goal is to develop a system that uses a wearable computer to transform speech compromised by dysarthria into easier-to-understand and more natural-sounding speech, and will thereby enable dysarthric individuals to communicate more effectively by telephone or in face-to-face contexts.