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## System for Assessing Speech Feedback Processing in Alzheimer's Disease

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Alzheimer's disease is associated with a breakdown of frontal cognitive systems related to memory, speech, and language. Quantifying and tracking this breakdown is important for monitoring the disease progression and assessing the success of rehabilitation treatments, especially in speech and language function.

John Houde, Ph.D. and colleagues propose to develop and test a system for the automatic assessment of frontal function in speech based on measuring responses to altered auditory feedback during speaking. A key job of the speech production system is the processing of sensory feedback, where frontal motor regions generate predictions of what a speaker expects to hear and feel as he speaks. These predictions are sent back to sensory cortex regions and compared with incoming feedback, where any deviations from predicted feedback are detected and sent back to frontal motor regions to correct ongoing speaking. The speaker's response is an objective quantification of their speech feedback sensitivity. Therefore, a system that allows real-time alterations of auditory feedback (pitch, loudness, formants) during speaking is potentially a quick, objective clinical measure of frontal cortical function during speaking in Alzheimer's disease.

Current experimental paradigms that examine a speaker's responses to real-time audio feedback are based on professional audio processing and data acquisition systems that would be too expensive for individuals or small medical clinics to acquire. The researchers believe that an inexpensive PC system of signal processing software could be created that would accomplish the necessary real-time audio feedback alterations. Such a system could track compensation as it relates to cortical function over extended periods of time, and automatically communicate results to physicians via the Internet.

Offering a quick automated tool for objectively measuring cortical functioning in speech increases the chances of detecting early, subclinical signs of Alzheimer's disease, and measuring the effectiveness of treatments targeted at maintaining and improving speech and language function in Alzheimer's disease.