

A Novel DSP Algorithm for Diagnosis of Hypokinetic Speech  
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This paper describes a DSP algorithm named Guesstimate of Articulatory Performance (GAP) to assess hypokinetic speech disorders such as commonly observed among many patients of Parkinson's disease who do not articulate the orofacial musculature sufficiently during speech production. Basically, this algorithm determines an overall score of formant transitions in continuous speech signals. This approach is based on the rationale that articulatory movements directly affect the position of formant frequencies in speech spectrograms, and reduced articulatory movements are reflected in reduced shifts in the acoustic energy distribution across the frequency spectrum. Nevertheless, formant frequency tracking directly is often complicated in continuous speech and therefore, not easily affordable. This problem has been avoided in the GAP algorithm by computing an index of temporal variability of the instantaneous ratio of energy levels of two frequency bands. Being a ratiometric measure, the GAP score appears to be inherently immune to potentially confounding effects of fluctuations in absolute levels of speech signals. This paper also presents a set of experimental validations of sensitivity and specificity of the GAP algorithm, using digitally synthesized speech signals, which were designed to be similar to hypokinetic speech produced by patients of Parkinson's disease.