

# Optimizing Performance of a Speech Analysis System for Orofacial Muscle Activity Data

Shonda Bernadin  
Florida A&M University-Florida State University  
College of Engineering  
bernadin@eng.fsu.edu

Tejal Udhan  
Florida State University  
tu13b@my.fsu.edu

Megan MacPherson  
Florida State University  
megan.macpherson@cci.fsu.edu

## Abstract

In this paper an investigation of a speech analysis system for orofacial muscle activity data is presented. Specifically, studies are conducted on compatibility, optimization and performance of the system. The speech analysis system determines the variability index of kinematic and electromyographic (EMG) data collected from nonpathological subjects. Previous studies showed that lip aperture variability index, which represents the difference in upper lip displacement and lower lip displacement, can be used as a reliable variability measure for EMG data to determine the effects of multiple repetitions of the same utterance on speech motor production. This study is an extension of previous work and examines the orofacial muscle activity patterns (i.e. EMG data) during speech production in efforts to quantify EMG variability. During system portability, however, there were several technical issues that minimized system performance. These challenges manifested primarily in *compatibility* issues, *optimization* issues and *performance* issues. This paper presents the main issues that impeded system performance and discusses optimal solutions. Once optimized the system can be used to obtain insight into how well the speech motor system is functioning in different groups of speakers (e.g., healthy young adults vs. healthy older adults). The analysis provides the platform for studying the quantification of variability in EMG data.

## Biographies

SHONDA L. BERNADIN is an Associate Professor in the Electrical and Computer Engineering Department the Florida A&M University-Florida State University College of Engineering. Dr. Bernadin received her B.S. degree in Electrical Engineering from Florida

A&M University in 1997, her M.S. degree in Electrical and Computer Engineering from University of Florida in 1999, and her Ph.D. degree in Electrical Engineering from Florida State University in 2003. She is currently the founding director of the Speech Processing and Data Analysis Laboratory (SPADAL). Her research interests include speech analysis and pattern recognition, feature extraction, data mining, instructional design and engineering education. Dr. Bernadin may be reached at [bernadin@eng.fsu.edu](mailto:bernadin@eng.fsu.edu).

TEJAL UDHAN graduated from Marathawada Institute of Technology (Aurangabad, India) with a B.E. in Electronics and Communication. Ms. Udhan is currently pursuing a doctoral degree in Electrical Engineering at Florida State University (FSU) and is a research assistant in the Speech Processing and Data Analysis Laboratory. Her research interests include speech processing systems, data mining and pattern recognition techniques. Ms. Udhan may be reached at [tu13b@my.fsu.edu](mailto:tu13b@my.fsu.edu).

MEGAN MACPHERSON is an Assistant Professor of Speech Communication and Disorders at the Florida State University. Dr. MacPherson received her B.S. degree in Communication Disorders and her M.A. degree in Speech-Language Pathology from Central Michigan University. She received her Ph.D. in Speech Science and Gerontology from Purdue University. Her main research interests include Speech Motor Control, Aging, and Neurologic Disorders: Neuromotor Processes Involved in Speech Production; and Physiologic Measures (e.g., Kinematic, Electromyographic, and Psychophysiological) of Speech Function. Dr. MacPherson may be reached at [megan.macpherson@cci.fsu.edu](mailto:megan.macpherson@cci.fsu.edu)