

**The Coarticulation/Invariance Scale: Mutual Information as a measure of
coarticulation resistance, motor synergy, and articulatory invariance in speech**

Khalil Iskarous

*Department of Linguistics,
University of Southern California and Haskins Laboratories*

Christine Mooshammer

University of Southern California and Haskins Laboratories

Phil Hoole

*Institut für Phonetik und Sprachverarbeitung,
LMU München,
Germany*

Daniel Recasens

*Departament de Filologia Catalana,
Universitat Autònoma de Barcelona,
Spain*

Christine Shadle

Haskins Laboratories

Elliot Saltzman

Boston University and Haskins Laboratories

D.H. Whalen

CUNY Graduate Center and Haskins Laboratories

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Abstract

Coarticulation and invariance are two topics at the center of theorizing about speech production and speech perception. In this paper, a new quantitative scale is proposed that places coarticulation and invariance at the two ends of the scale. This scale is based on physical information flow in the articulatory signal, and uses Information Theory, especially the concept of mutual information, to quantify these central concepts of speech research. Mutual Information measures the amount of physical information shared across phonological units. In the proposed quantitative scale, coarticulation corresponds to greater and invariance to lesser information sharing. The measurement scale is tested by data from three languages: German, Catalan, and English. The relation between the new scale and several existing theories of coarticulation is discussed, and implications for existing theories of speech production and perception are presented.

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