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III. LINGUISTIC THEORY

A. NUMERICAL SIMULATION OF VOWEL QUALITY SYSTEMS:
THE ROLE OF PERCEPTUAL CONTRAST*

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Abstract

A numerical model is developed in order to establish the extent to which the principle of maximal perceptual contrast can be used in phonological theory to explain the phonetic structure of vowel systems. Preliminary results obtained with the model indicate that perceptual contrast appears to play an important role as a determinant of such systems. Therefore, it is likely that this principle (along with other factors) should be included among the variables in an explanatory phonological theory. However, the incorporation of numerically stated conditions on phonological structure appears to presuppose a formalism different from that which has developed within current descriptions of phonology. Some refinements and extensions of the present framework are suggested. It is proposed that predictions of phonological facts be derived as consequences of the structure of the mechanisms available for human speech communication and the optimization of their use. Such an extension would constitute a theory that would be different from traditional "Saussurean" linguistics in several respects, e. g., it would be quantitative and it would be deliberately substance-based. The research reported represents a preliminary attempt to apply such a research program.

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