STATISTICAL CLASSIFICATION OF POLISH FRICATIVE CONSONANTS BASED ON THEIR SPECTRAL FEATURES

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Spectra of a total of 1035 fricatives spoken in nonsense-words by 3 voices were specified in three different ways and the following quantitative features were used for their classification: coefficients of the terms in polynomials describing the spectral envelope, partial areas under the envelope and centres of gravity. According to the kind of feature, between 1 and 12 variables were used in a statistical model which divided the feature space into classification regions - either one for each phoneme or one for each variant. With a maximum of 12 variables a 100% correct classification could be obtained by applying quadratic statistical discriminant functions. Under specific conditions, with no more than 4 variables, 99% correct classification could be achieved.

The analysis was performed by connecting the Sona-Graph via an A/D converter to a minicomputer and the mathematical operations, including the decision-taking were carried out in a larger general-purpose computer. Under less-than-optimum conditions, /s,z,x/ gave slightly better results than the other phonemes.

The methods using centres of gravity and those using partial areas under the spectral envelope appear more satisfactory than those employing polynomials.

As speech sounds can be correctly classified by using instrumental (acoustical) analysis and mathematical data processing, it is suggested that phonemes and their variants may be regarded as objective, physically distinct entities.