

A phonetic grammar of the Polish language

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A phonetic grammar of an ethnic language is understood as a set of relations between articulatory features and dimensions of speech sounds (phones). The concept of the phonetic grammar is based on the original axiomatic theory of language by J. Bańcerowski.

The aim of the present paper is to give an overview of the investigation of the phonic articulatory systems of the Polish language (in the future also other languages) on the basis of the detailed articulatory descriptions existent in phonetic literature and by means of computational tools.

The created application enables us to collect a given phonetic inventory, taking into consideration the division into particular languages and the database generated here makes further computer analysis possible. Owing to the introduction of numeric interpretation of the articulatory features and dimensions, the phones can be treated as vectors in N dimensional metric space. Then the measures of distances can be employed as measures of similarity between respective phones. By means of applying the Data Mining algorithms, the interdependencies in the set of phones can be automatically shown.

The computer application will automatically generate:

- the articulatory distance of two random phones in a given language
- the articulatory similarity of two random phones in a given language
- the articulatory features of a given phone
- the articulatory category of a given articulatory feature
- the dimensions in which given phones differ
- the dimensions in which given phones are identical
- the set of phones which have a specified articulatory distance
- the set of phones which have specified articulatory features
- the combination of a given set of articulatory features
- the average articulatory distance between phones
- the most numerous articulatory category specified by a given number of features
- the least numerous articulatory category specified by a given number of features
- the set of relevant features discerning at least one pair of sounds
- the number of pairs of phones being discerned by particular features
- the number of pairs of phones being discerned by particular sets of features
- the most frequently combined articulatory features in a given articulatory distance

The results can be further used in different linguistic disciplines (also applied linguistics), especially in speech analysis and synthesis and in constructing transcriptional algorithms which are employed in basic research on natural and artificial languages (in theory of linguistics and literary phonostylistics, comparative linguistics, typology, a posteriori systems of artificial languages) and in solving technical problems of man-computer communication, controlling robot's voice etc.

The present paper is a first attempt to apply the axiomatic theory of language at the phonetic level to the analysis and synthesis of the phonetic system of Polish.