

# Phonemes analysis for genealogical tree of world languages

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## ABSTRACT

We intend to verify the hypothesis of modern languages expansion from Africa, brought into attention by Atkinson, 2011. We use an online database designed for voice acquisition and storage of samples collected across the globe, and a software dedicated for automatic extraction and analysis of phonemes. This tool can be used for world languages classification, also. The models used to trace the human genetic origins could be applied to investigate the evolution of modern human languages.

Every language uses only a small part of the inborn human possibilities. Young, unformed children have the ability to train a spectrum of sounds broader than those existing in any particular language. Their individual articulation abilities are shaped by the culture and motivates them to master some phonemes and at the same time losing the ability to produce other.

The archeological clues help to deduce when the human kind developed the ability of articulation. However, the existence of anatomical potential of uttering of speech sounds does not simply imply the fact of speech production. The significant question is when the phonemes started to convey information.

Evolving, languages fluently gain, lose and change phonemes. The precise acoustic analysis of multi-linguistic speech gives answers to questions which phonemes are used in different parts of the world and what are their individual features. The conclusions seem to be unsurprisingly convergent to the hypothesis of universal phonetics, being a root of all world languages.

Human genetic and phenotypic diversity declines during expansion progressively with distance from origin of modern humans. A founder effect may operate on human language as well. Expansion should progressively reduce phonemic diversity with increasing distance from the point of origin, paralleling the serial founder effect observed in evolutionary genetics.

The frequency analysis of short time fragments of speech is a well established part of numerous applications of speech technology. The task of phoneme recognition from acoustic features is a central issue in speech recognition or vocal tract modeling.

The collected recordings are segmented into phoneme units using the spectral methods based on the discrete wavelet transform. The methodology developed during past years for speech recognition provides accurate segmentation and its usable implementations. Each fraction of the speech signal is split by digital low-pass and high-pass filters. The low frequencies have narrow bandwidths and are investigated with finer resolution, while the high frequencies have wide bandwidths and result in a poor resolution.

The phoneme segmentation and analysis algorithm is based on analysis of fractions of speech energy in each frequency band. Phonemes can be described as quasi-stationary processes. The role of the segmentation algorithm is to detect the significant transitions of the energy among the frequency subbands. Then, the qualitative and quantitative analysis of the extracted phonemes features is performed.

Our research involves both experimental and theoretical works that aim in gaining knowledge about phonetic diversity of languages across the world. The cognitive research will allow the analysis of appearing and development of cultures in human kind history, especially development of speech communication.

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