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Tone and quantity: the psychoacoustic trade-offs in prosodic signaling

Many languages exploit suprasegmental devices in signaling word meaning. Tone languages exploit fundamental frequency whereas quantity languages rely on segmental durations to distinguish otherwise similar words. Traditionally, duration and tone have been taken as mutually exclusive. However, some evidence suggests that, in addition to durational cues, phonological quantity is associated with and co-signaled by changes in fundamental frequency in quantity languages such as Finnish, Estonian, and Serbo-Croatian. It is also known that the fundamental frequency of a complex sound modulates the perceived duration of a sound. Higher pitch sounds are perceived longer compared to lower pitch sounds as shown by several independent studies since 1973. In my talk I will present a series of experiments that explore the interactions between tonal features of speech and both temporal and energy based features, and the ways these trade-offs are used to signal both phonological and functional aspects of language. Our research ranges from production studies to measuring complex auditory brainstem responses using participants from several different language groups.

Professor Martti Vainio is the head of the Phonetics and Speech Synthesis Research Group and the Department of Digital Humanities at the University of Helsinki. Before his professorship prof. Vainio worked as a university lecturer in the discipline of language technology at the Department of Linguistics at the University of Helsinki. After that he held a Finnish Academy Fellowship and worked on emotional speech synthesis. He has also worked at the Aalto University and is currently collaborating with Academy Professor Paavo Alku on statistical speech synthesis.

In addition to basic scientific research on speech he has been working on speech synthesis actively for more than twenty years. His doctoral dissertation examined the use of artificial neural networks in controlling prosody in text-to-speech synthesis. He has published more than a hundred papers on phonetics and speech synthesis research and is a former board-member of the board of the ISCA special interest group on speech synthesis (SynSIG). Prof. Vainio has been a principal investigator in several Finnish Academy and privately funded projects and has taken part in international projects with the Simple4All synthesis project coordinated by the University of Edinburgh being the latest. His most important research links are with Aalto University and the Center of Speech Technology Research at the University of Edinburgh.