Electro-optical stomatography and electromagnetic sensing of the vocal tract state for silent speech interfaces

Besides the recognition of audible speech, there is an increasing interest in the recognition of silent speech, i.e., speech movements that are performed without making audible sound. Silent-speech recognition is still at an experimental stage, but has the potential for a range of new applications. For example, it could enable silent telephone conversations or silent queries to spoken dialog systems, which would provide privacy and prevent the disturbance of nearby people in public places, and work also in the presence of strong acoustic background noise. However, a major obstacle for a wide spread of silent-speech technology is the lack of measurement methods for speech movements that are convenient, non-invasive, portable, and robust at the same time.

In this talk I present our progress in the development of two rather new approaches to capture (silent) speech movements. The first method is optical stomatography, where the speaker wears a pseudopalate in the mouth that measures the palate-tongue distances at multiple points along the palatal midline, along with the tongue-palate contact pattern and the protrusion of the lips. The second method is based on the measurement of the electromagnetic (EM) transmission and reflection properties of the vocal tract for EM waves with a power band from 2-12 GHz using two antennas attached to the face, one below the chin and one on the cheek. According to our preliminary results, both techniques are highly promising with regard to both silent speech recognition and the direct synthesis of speech.