



ABSTRACT

Licentiate thesis

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"LIP-MOTION AND SPEECH BIOMETRICS IN PERSON RECOGNITION"

Abstract:

Biometric identification techniques are being frequently used to guarantee security, e.g. in financial transactions, computer networks and security locations. The purpose of biometric authentication systems is to verify a individual by his biological characteristics including those generating characteristically behaviour. Not only fingerprints are used for authentication, now, our lips, eyes, speech, signatures and even facial temperature are used to identify us. This increases the security since it is harder to copy, steal or lose a characteristic of an individual.

This thesis presents an effective scheme to extract discriminative features based on a novel motion estimation algorithm for lip-movement. Motion is defined as the distribution of apparent velocities in the changes of brightness patterns in an image. The velocity components of a lip sequence are computed by the well-known structure tensor using 1D processing, in 2D manifolds. Since the velocities are computed without extracting the speaker's lip contours, more robust visual features can be obtained. The velocity estimation is performed in rectangular lip-regions, which affords increased computational efficiency.

To investigate the proposed motion estimation technique we implement a person authentication system based on lip-movements information with(and without) speech information. It yields a speaker verification rate of 98% with lip and speech information. Comparisons between an alternative motion estimation technique is presented along with our proposed feature fusion technique. Beside its value in authentication, the technique can be used naturally to evaluate the liveness of a speaking person as it can be used in a text-prompted dialog.

Keywords: Audio-visual recognition, Biometrics, Biometric recognition, Speaker verification, Speaker authentication, Person identification, Lip movements, Motion, Structure tensor, Orientation, Optical flow, Hidden Markov Model, Gaussian Markov Model, Motion, Lip-motion