

Recognition and Evaluation by Video Synthesis Methods and Symmetry Features

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Abstract

Biometrics is being increasingly utilized for person authentication. It requires little or no efforts from the user as compared to traditional non-biometric systems where the user has to memorize PIN codes and passwords or carry pass cards and keys that can be easily forgotten or lost. Biometric systems use the subjects' unique traits such as fingerprint, DNA, face, voice, palm etc for enrollment and authentication. Their development require extensive testing on datasets that are representative samples of what the systems might face when implemented in the real world.

A novel method is proposed to build face video databases from existing ones by a damascening procedure. The term "damascening" refers to merging images extracted from two videos. The procedure is implemented on all image sequences of XM2VTS database to create the DXM2VTS (Damascened XM2VTS) database. A novel set of video is captured in realistic environments for use as a background for existing databases. An evaluation protocol is proposed for the damascened database to establish a common ground for comparing performance of face detection and tracking systems such that it extends the hitherto used protocol rather than replacing it. Moreover, a text driven video synthesis method is suggested to test the attack resilience of audio-video based authentication systems.

Feature extraction/matching are core aspects of pattern recognition including biometrics. Testing the discrimination versus generalization abilities of a feature family is a significant task of the feature design. A new set of features are suggested that use symmetric patterns and their corresponding symmetry filters primarily for pattern recognition tasks of trust management. The second order complex moments of the local power spectrum in harmonic coordinates represented by the generalized structure tensor (GST) enables the detection of the position and orientation of these patterns simultaneously. This special property is exploited to detect and describe the identities of symmetric patterns in natural environments as well as when used as artificial markers. Applications such as eye detection, camera calibration, and symmetry codes are presented indicating their usefulness.

Keywords: Biometrics, liveness detection, damascening, video synthesis, symmetry codes, Generalized Structure Tensor, eye detection, camera calibration