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Biometric analysis using fused feature set from side face texture and electrocardiogram

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Abstract: Multimodal biometric authentication requires fusion of information extracted from different biometric modalities. Face recognition is the most common and versatile biometric parameter used for years. Recently, biosignals such as electrocardiogram (ECG), photoplathysmogram etc. are under study for probable use in authentication work. It is also established that multi-parameter approach in biometric analysis plays a vital role in increasing accuracy and robustness and preventing spoofing in spite of more computational demand. In the present study, information fusion based authentication system is proposed using face and ECG. Instead of conventional face image, a unique frontal face textural signal is proposed. This leads to simpler data processing similar to that of ECG signal. Finally, information from both the signals is fused at mother template generation level. A good accuracy is achieved using mean square deviation method as presented in the result section. A stability study is also made with five volunteers to check the long term variability of the features.

1 Introduction

Security and authentication is a very serious issue in the present days. Conventional biometric analysis is a technique to capture a physical (e.g. thumb impression, face, iris etc.) or behavioural (e.g. signature pattern, key stroke pressure, gait etc.) parameter and perform the authentication job with the features derived from the parameter. Multimodal biometric fusion combines measurements from different biometric traits to enhance the performance. The results also clarify the use of multimodal biometric approaches [1]. Fusion at matching score, rank and decision level has been extensively studied in the literature. Different levels of fusion are: sensor level, feature level, matching score level and decision level [2]. In feature extraction level fusion, a new feature vector is formed by concatenation of two feature vectors. The new feature vectors can handle a large number of inputs. In matching score level fusion, scores provides by the system to indicate the proximity of the feature vector with the template vector, is combined to identify. In decision level fusion, the outputs from the individual classifiers are combined using various weighting parameters. Decision fusion is ideal for cases when sensor data are of different types or formats. A typical multi-parameter biometric fusion at different level is shown in Fig. 1. In this present work, feature extraction level fusion is performed.

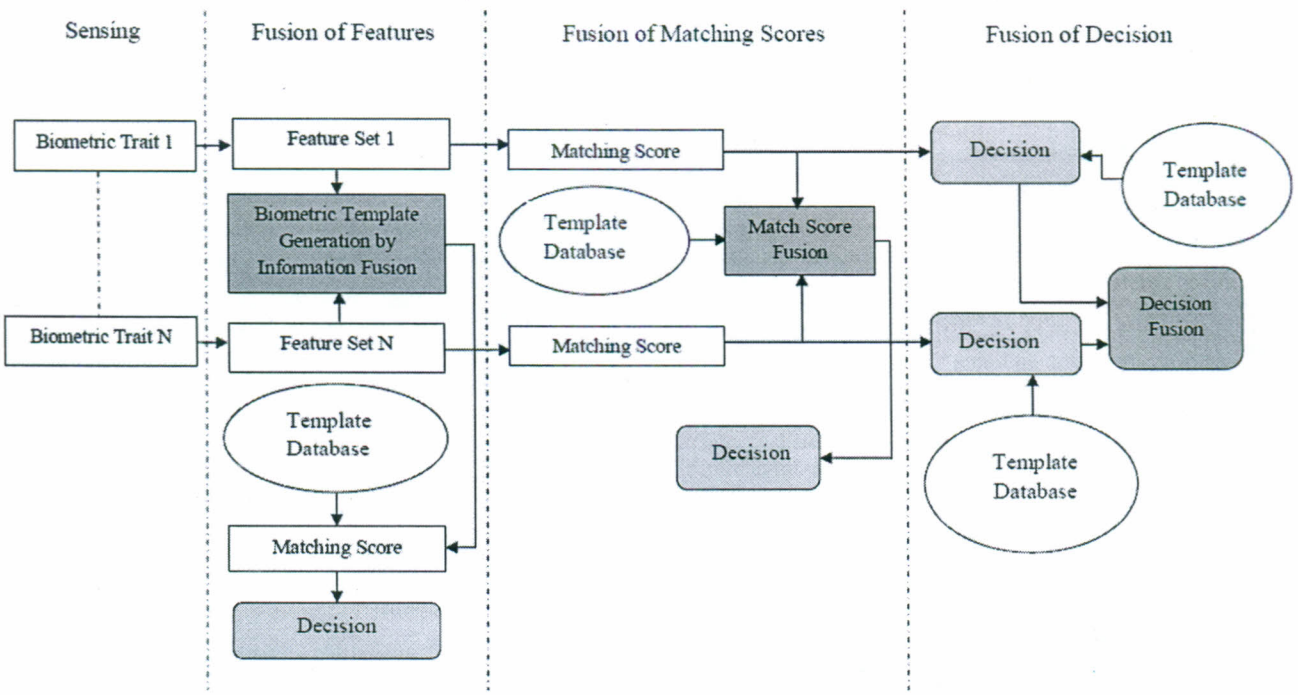

Fig. 1 *Multi-parameter biometric different fusion based system*