A new multi-level approach to EEG based human authentication using eye blinking

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Abstract:

This letter proposes a new multi-level approach for human biometric authentication using Electro-Encephalo-Gram (EEG) signals (brain waves) and eye blinking Electro-Oculo-Gram (EOG) signals. The main objective of this letter is to improve the performance of the EEG based biometric authentication using eye blinking EOG signals which are considered as source of artifacts for EEG. Feature and score level fusion approaches are tested for the proposed multi-level system. Density based and canonical correlation analysis strategies are applied for the score and feature level fusions, respectively. Autoregressive modeling of EEG signals (during relaxation or visual stimulation) and time delineation of the eye blinking waveform are adopted for the feature extraction stage. Finally, the classification stage is performed using linear discriminant analysis. For evaluation, a database of 31 subjects performing three different tasks of relaxation, visual stimulation, and eye blinking was collected using Neursky Mindwave headset. Using eye blinking features, a significant improvement is achieved, in terms of correct recognition and equal error rates, for the proposed multi-level EEG biometric system over single level system using EEG only.

Keywords:

Multi-level biometric authentication; Electro-encephalogram; Electro-oculogram; Eye blinking; Feature level fusion; Score level fusion.

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