Feature extraction for biometric recognition with photoplethysmography signals

Abstract

Photoplethysmography (PPG) signals stand out due to features such as readily accessible, high reliability and confidentiality, the ease of use etc. among bio-signals. The feasibility studies carried out on the PPG signals demonstrated that PPG signals contained important features for human recognition and were the availability of biometric identification systems. In this study, twenty new features were extracted from PPG signal as a preliminary study intended to biometric recognition. PPG signals with 10 seconds were recorded from five healthy people using SDPPG (second derivative PPG) data acquisition card. To remove the noise from received raw PPG signals, a FIR low pass filtering with 200 points and 10 Hz cut-off frequency was designed. These twenty new features were obtained from filtered PPG signal and its second derivative. PPG signal with 10 seconds contains eight periods and twenty characteristic features in each person must not change within an individual over a period. This feature symbolizes the consistency in the identification of a person. To test the performance of biometric recognition system, the k-NN (k-nearest neighbor) classifier was used and achieved 95% of recognition success rate using 10-fold cross validation with twenty new features. The obtained results showed that the developed biometric recognition system based on PPG signal were very promising.