

Abstract:

Photoplethysmography (PPG) sensors are widely used in medical applications due to their attractive properties such as non-invasiveness, inexpensive, and easy setup. However, they are still inefficient in non-stationary states of important measurements related to cardiovascular assessment. Adaptive noise cancellation (ANC) has existed as a kind of technique to address this issue. Unfortunately, the traditional 3-Axis Accelerometer (ACC) in ANC implementation has failed to provide the real motion artifact (MA) as the main factor for efficient adaptive filtering. In this work, the performance of ACC will be investigated and compared with a new twin photodiodes PPG probe design (TPs-PPD) that has been proven in previous work. The TPs-PPD contained an added covered photodiode (CPD) customized to obtain the MA instead of classic use of ACC. During different motions, PPG data were recorded and processed at the same time by the same two units of adaptive filters using ACC and CPD as noise references. The results indicated a clear failure of the ACC compared to the CPD in determining important features of PPG signal, in addition to the accuracy of signal to noise ratio (SNR) and mean square error (MSE). The CPD was better than ACC as it reduced the MSE by 14 times while the SNR was multiplied 10 times. Without any doubt, it has been proven with evidence that the ACC is not suitable for the processing of human health-related signals while PPG can be used for such purposes.