Effect of Deep Breath on the Correlation Between the Wrist and Finger Photoplethysmograms

Adib Keikhosravi [a], Edmond Zahedi [a]

[a] *Sharif University of Technology, Iran*

In this paper, a special probe is designed using an array of photodiodes and a 960 nm LED for recording the wrist photoplethysmogram (PPG). The design is based on Monte-Carlo simulation of light propagation in tissues. Two series of experiments were carried-out: normal breathing and deep breathing. In both experiments, finger and wrist PPG were simultaneously recorded from the index finger. In the first series of experiment, signals from 9 subjects were recorded and the correlation coefficient for the raw signals (AC+DC), the AC and DC components of wrist and finger PPG were (62.5% ± 12.1%), (91.2% ± 6.9%) and (61% ± 13.4%) respectively. In the second series of experiment (deep breathing), signals from 6 subjects were recorded and the correlation coefficient for the raw signals (AC+DC), the AC and DC components were (89.7% ± 5.9%), (93.7% ± 3.3%) and (89.9% ± 5.9%) respectively. These results show that under normal breathing conditions, only the AC components of the PPG signals are highly correlated. When respiration becomes the dominant effect, both AC and DC parts become highly correlated.

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