

Title of the work: Real-time Implementation of Systolic Peak Detection for PRV Parameter Extraction Using Raspberry Pi Computing Platform

Summary of the work: Pulse rate variability (PRV) parameters are used to understand and assess parasympathetic as well as sympathetic nervous system activity. The PRV measures the beat-to-beat pulse rate variation (peak-to-peak interval variation) of the photoplethysmogram (PPG) signal. For accurate measurement of PRV parameters, real-time accurate systolic peak detection is essential to automatically find time instants of systolic peaks of the PPG signal for PRV analysis on portable or wearable health monitoring devices. In this paper, we study the real-time implementation of a lightweight systolic peak detection method by using the Raspberry-Pi computing platform. The peak detection method's performance is evaluated using 40 signals from the CapnoBase database. The method achieved a sensitivity of 100% for 38 records and positive predictivity of 100% for 38 records. When the results were evaluated, it was revealed that the method had 109 false positive as well as false negative detections out of 26216 peaks. Real-time implementation results showed that the method proposed here requires a processing time of 63.2 ± 1.37 ms on the 1000 iterations.

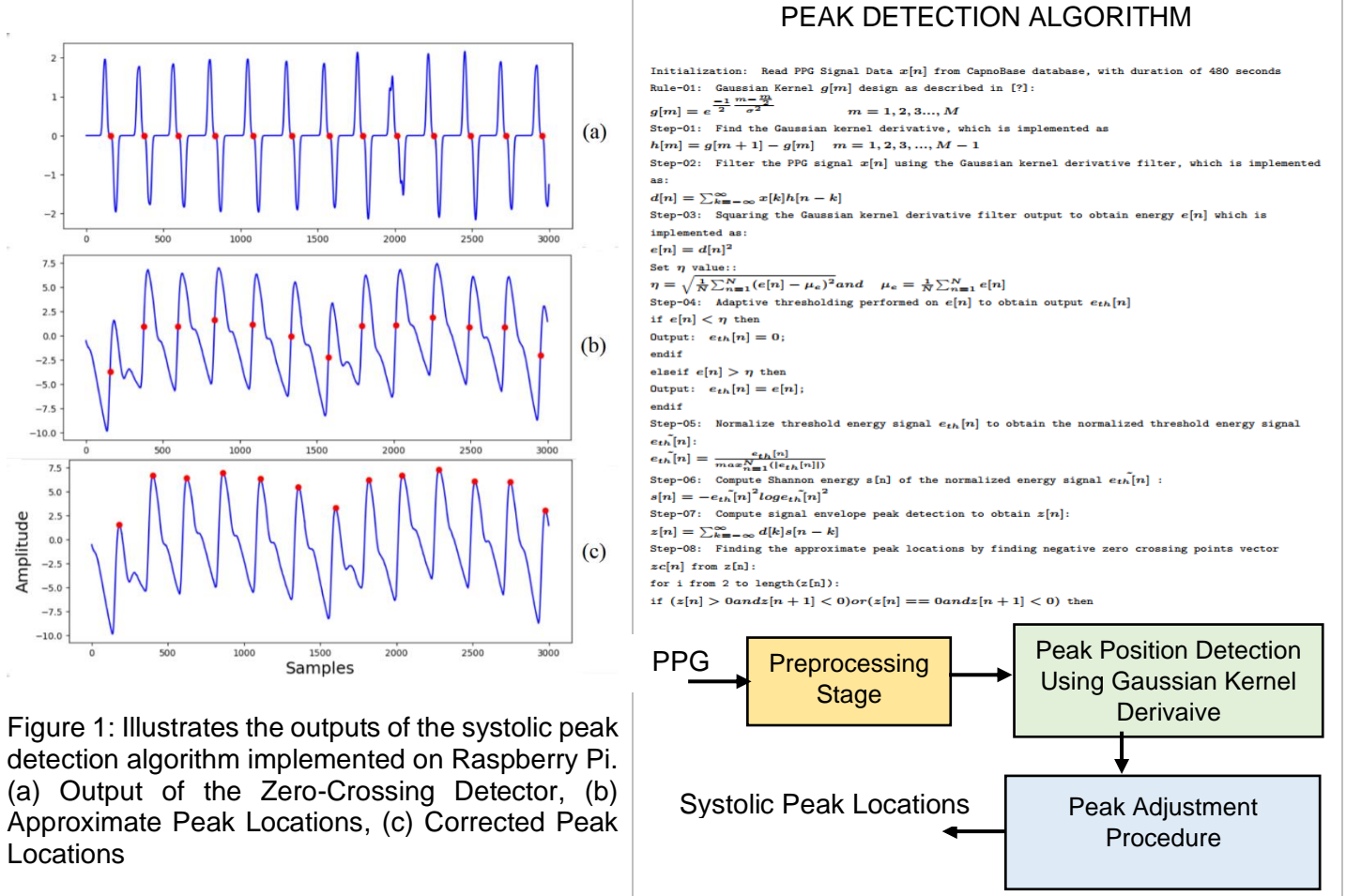


TABLE II: Performance of Systolic Peak Detection Algorithm Implemented on Raspberry-Pi

| PPG RECORD RECORD | TP | FP | FN | DER (%) | SE (%) | PP (%) | ACCURACY (%) |
|-------------------|------|----|----|---------|--------|--------|--------------|
| Sig16 PPG.mat | 1000 | 0 | 2 | 0.002 | 100 | 100 | 99.80 |
| Sig18 PPG.mat | 1113 | 0 | 13 | 0.01 | 100 | 100 | 98.85 |
| Sig23 PPG.mat | 817 | 0 | 0 | 0 | 100 | 100 | 100 |
| Sig28 PPG.mat | 588 | 0 | 0 | 0 | 100 | 100 | 100 |
| Sig29 PPG.mat | 545 | 0 | 0 | 0 | 100 | 100 | 100 |
| Sig30 PPG.mat | 910 | 0 | 17 | 0.02 | 100 | 100 | 98.17 |