Performance Analysis of T-wave-offset Detection Algorithms on Patients with Cardiac Diseases

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**Aim:** Automatic processing algorithms detecting the T-wave-offset contribute to providing important information about heart rhythm abnormalities and heart diseases. Many algorithms for T-wave-offset detection have been developed, however there is a lack of validation of these algorithms for patients suffering from cardiac diseases. This study proposes a comparison of several T-wave-offset detection algorithms on healthy subjects, and patients suffering from myocardial infarction and other cardiac diseases.

**Methods:** Seven state of the art T-wave-offset detection algorithms were selected for implementation based on the type of method being used and the clarity of the techniques presented in the paper to ensure reconstruction of the algorithms was possible. They were then all evaluated using the same dataset and benchmark to provide a fair comparison. The PhysioNet’s PTB Database was used, from which 268 patients with a range of different diseases were selected, based on the accuracy of T-wave-offset annotations. To further validate each algorithm the QT database was also used, along with simulated ECGs. Performance was assessed in terms of time mismatch between detections and annotations. A detection was considered correct if it fell in a window of 100ms centered around the annotation.

**Results:** Most algorithms performed better on healthy subjects than diseased. On average 79 ± 26 percent of all T-wave-offsets were correctly annotated for healthy patients, 63 ± 28 for MI patients and 71 ± 21 for patients with other cardiac diseases. Further evaluation has shown that a more accurate morphology detector could improve the overall results, as slight changes of the T-wave can cause the algorithm to detect the fiducial point based on the incorrect morphology.

**Conclusion:** Although no algorithm performs with 100% accuracy for all patients, most can perform well with regards to the healthy patients, with two algorithms having a high performance, above 75% accuracy, on all patients.

![Graph showing the percentage of patients correctly annotating every beat for different T-wave offset detection algorithms, categorized by health status and disease type.](image-url)