Assessment of ECG Quality on an Android Platform

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Cardiovascular diseases are one of the major causes of death in the world. According to the WHO about 17 million deaths a year can be attributed to cardiovascular diseases. More than 80% of these deaths take place in low and middle-income countries lacking trained physicians. With the recent progress of mobile-platforms, and the increasing number of mobile phones, a solution to the problem is the recording of the surface electrocardiograms (ECGs) by untrained professionals, and subsequently transmitting them to a physician. However, this requires software to guide untrained professional in recording clinically valuable surface ECGs and means of transmitting them to a physician. We propose a simple set of ECG markers capable of quantifying the quality of the ECG looking at leads individually and combined, which can be implemented on a mobile-platform. ECGs with lead failure, QRS detection problems in one or more leads or having an average lead signal-to-noise ratio below a preset threshold are classified as being of low quality. To evaluate the method we acquired a training and test set from Physionet. Both datasets were recorded by untrained professionals at 500 Hz with a 16-bit amplitude resolution and contained metadata such as age and gender. The recordings were subsequently labeled as having adequate or inadequate quality by physicians. On the training dataset the proposed method resulted in 80% and 86% sensitivity and specificity respectively. The following evaluation on the test set resulted in a score of 0.8. We have shown that it is possible with simple measures to quantify the quality of the surface ECGs. We expect that methods like this, combined with the efforts of Sana to develop software for transmitting surface ECGs, can result in an earlier diagnosis of patients in low and middle-income countries possibly reducing the number of cardiovascular related deaths.