A Multistage Computer Test Algorithm for Improving the Quality of ECGs

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Electrocardiograph (ECG) is a body-surface measurement of the dynamic propagation of electrical waves generated in the heart. ECG is the gold standard for diagnosis of various cardiovascular diseases. The 2011 Physionet challenge visions mobile phones that can be used to collect and deliver ECG records. Such devices are particularly useful in underdeveloped regions such as some rural areas in India and China, which have a large population size but lack adequate primary care capacity. The goal of the challenge is to develop an efficient computer algorithm to evaluate the quality of ECGs collected using mobile phones. The algorithm can be used to provide guidance to acquire diagnostically useful ECG recordings. In response to this challenge, we develop a computer-based multistage test algorithm. The algorithm utilizes various ECG analysis methods, including time domain analysis, frequency domain analysis, joint time-frequency analysis, and entropy analysis. The algorithm collects outputs from multiple analyses to collectively make decision about the quality of an ECG recording. A final score will be computed based on these analysis to indicate whether the recording is acceptable, indeterminable, or unacceptable. The algorithm will be tested using training data from the Physionet website.