High-Resolution ECG Automated Analysis and Diagnosis

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Abstract : Electrocardiogram (ECG) recording is prone to complications, on analysis by physicians, due to noise and artifacts, thus creating ambiguity leading to possible error of diagnosis. Such drawbacks may be overcome with the advent of high resolution Methods, such as Discrete Wavelet Analysis and Digital Signal Processing (DSP) techniques. This ECG signal analysis is implemented in three stages: ECG preprocessing, features extraction and classification with the aim of realizing high resolution ECG diagnosis and improved detection of abnormal conditions in the heart. The preprocessing stage involves removing spurious artifacts (noise), due to such factors as muscle contraction, motion, respiration, etc. ECG features are extracted by applying DSP and suggested sloping method techniques. These measured features represent peak amplitude values and intervals of P, Q, R, S, R', and T waves on ECG, and other features such as ST elevation, QRS width, heart rate, electrical axis, QR and QT intervals. The classification is preformed using these extracted features and the criteria for cardiovascular diseases. The ECG diagnostic system is successfully applied to 12-lead ECG recordings for 12 cases. The system is provided with information to enable it diagnoses 15 different diseases. Physician's and computer's diagnoses are compared with 90% agreement, with respect to physician diagnosis, and the time taken for diagnosis is 2 seconds. All of these operations are programmed in Matlab environment.