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Differential diagnosis of QRS complex Tachycardia and Tachyarrhythmia in Noisy ECG Signals through Fuzzy Neural Signal Processing Embedded System

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The current work reports of a Field Programmable Gate Array (FPGA) based embedded system for detection of QRS complex and differential diagnosis of tachycardia and tachyarrhythmia in a noisy ECG signal. The QRS complex is the most striking waveform, caused by ventricular depolarization of the human heart. Once the positions of the QRS complexes are found, the locations of other components of ECG like P, T-waves and ST segment etc. are found relative to the position of QRS, in order to analyze the complete cardiac period. In this sense, QRS detection is prerogative to almost all automated ECG analysis algorithms. The QRS complex has been detected after application of entropy measure of fuzziness to build a detection function of ECG signal, which has been previously filtered to remove power line interference and base line wander. Using the detected QRS complexes, differential diagnosis of tachycardia and tachyarrhythmia has been performed. The entire algorithm has been realized in hardware on an FPGA. Using the standard CSE ECG database, the algorithm performed highly effectively. The performance of the algorithm in respect of QRS detection with sensitivity (*Se*) of 99.74% and accuracy of 99.5% is achieved when tested using single channel ECG with entropy criteria. Using the system, 200 patients have been diagnosed with an accuracy of 98.5%.