Myocardial Infarction Localization using Combined Heart Vector Analysis and Neural Network Localizer

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The development of accurate methods for characterization of Myocardial Infarction (MI) is of major importance, especially for diagnosis purposes. To assess the recent developments and to encourage the scientists to much more focus on this issue, the CinC/Physionet Challenge 2007 was held on the same topic. Since, the data-sets of the challenge were limited to four subjects; the proposed methods were not evaluated very well. Therefore, in this paper, we reconsider the VCG-based method proposed by Ghasemi et al. in the CinC/Physionet Challenge 2007 and develop a multi-layer perceptron (MLP) neural network (NN) to automatically perform MI localization at its decision-making stage. To perform this task, we first implement the VCG-based method to generate a part of the activation front's surface which is induced by MI. Then, the resulting vector is fed into the neural network MI localizer consisting of one hidden layer. The output of the neural network will be the segment(s) in which MI has occurred. In order to evaluate the method, we use the PTB diagnostic database. The selected MI subjects were divided into two sets; the training set and the test set. Note that the subjects with bundle branch block and hypertrophy were excluded from our data-sets. Finally, we examined the neural network MI localizer with the test set and the method approached the accuracy of about 67.5%. Since, the performance of the neural network is connected to its input vector i.e. MI-induced activation front; the generating mathematical model should be more investigated in future works.