Development of premature ventricular contraction (PVC) detection system from the paper Electrocardiograph (ECG) records

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Introduction: Background: Electrocardiographs (ECG) are obtained by a digital signal. However, they are still printed out of paper to read by physicians. Digitizing the analog ECG from the paper to digital signal make us much easier to access of bid data pool form the daily clinical practice and previous resources. Objective: The goal of this study is to digitize paper ECG to detect premature ventricular contraction (PVC).

Methods: Method: This system consists of 2 steps; digitization and PVC detection.

Result: Result: First, for digitization, ECG are filtered by the specific cut-off value of red, green and blue, then the filtered ECG image is changed into gray scale. In order to extract ECG signal, the algorithm find the only one of the biggest white body throughout the X-axis. The X and Y axis is matched with distance and amplitude, depending on dots per inch (DPI). Second, to detect PVC, ECG signal is filtered to eliminate baseline wandering. The characteristics of PVC is higher amplitude and longer duration than normal sinus rhythm, we set two criteria to detect the PVC: 1.5 times the duration, 1.2 points out of the amplitude. For the synchronization of timing, lead II rhythm strip was used by PVC detection and then the rest of 12-lead ECG is matched based on lead II synchronization (Figure 1). We applied this algorithm to the three real patient's ECGs. Two of three ECGs are successfully digitalized signal and PVC detection. However, the other subject failed to detect PVC from because the algorithm confused ECG signal from the lead marking, such as V1 (Figure 2).

Conclusion: Conclusion: We successfully developed the algorithm analog ECG signal into digital signal to detect PVC. In the future, this method helps to gather big data from ECG papers to develop a new algorithm to localization of PVC.