



Pre-estimation of Sleep Apnea Using Sleep ECG Signals

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Sleep apnea is one of the most important diseases caused by snoring and can be expressed as a respiratory arrest in sleep [1]. This disturbance can be repeated many times during the night. People with symptoms of sleep apnea can experience many serious problems during the day. Sudden death in sleep, stroke, heart attack and heart failure, respiratory failure in lung patients, and uncontrolled diabetes are examples of these adverse events [2, 3]. For these reasons, diagnosis and treatment of sleep apnea is very important.

In this study, Variational Mode Decomposition (VMD) method [4] was applied to raw electrocardiography (ECG) signals. Using the obtained intrinsic mode functions (IMF) components, it is estimated that sleep apnea may occur in the patient before apnea occurs. Data of three patients from the PhysioNet ECG database [5] were used for this. Using the records of the patients, the VMD method was applied on the 4 epochs (each epoch is 30-seconds-length) before the apnea epoch and the first 4 IMF components were obtained. From the 4 IMF components obtained, 5 different features were extracted in the time domain and given to the Random Forest (RF) classifier.

As a result, apnea was estimated with a 73.86% success rate before this apnea occurred by using 3rd IMF component. The results have shown that apnea can be predicted before apnea occurred in the person by using the VMD method, successfully.

Keywords: ECG, Random Forest, sleep apnea, VMD

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