A Method for Atoms Selection applied to Screening for Sleep Disorders

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ABSTRACT

The Obstructive Sleep Apnea-Hypopnea Syndrome (OSAHS) is a sleep disorder which consists in repetitive events of partial or total airflow decrease during sleep. This pathology has a 4% prevalence in the population around the world and, without appropriate treatment, it increases with age [1]. Actually the gold standard for detecting OSAHS is a polysomnography (PSG) in a sleep laboratory, which consists in the simultaneous measurement of different physiological signals at the same time. In the last years several research studies have shown that the pulse oximetry is a very attractive option of screening for OSAHS, since changes in the dynamics of oxygen in the blood stream (*SaO2*) can be related with respiratory problems [2].

In the last fifteen years, many different signal processing techniques were used for building appropriate representations of a certain types of signals. One of these techniques is known as “sparse representation” [3]. The idea behind the method is to represent the involved signal using only a few coefficients in a certain dictionary, previously constructed. In this work the *SaO2* signal is used in order to predict the occurrence of Apnea-Hypopnea (AH) events. First a dictionary is learned by using a statistical method (NOCICA) [4], then a greedy pursuit algorithm is used in order to obtain the activation coefficients [5]. A subset of the most discriminative coefficients is then selected and used as input of a pattern recognition neural network (NN) in order to classify AH events [6]. The problem for finding the optimal dictionary and activation coefficients gives rise to an inverse problem with sparse constraints. A multilayer perceptron with different number of inputs and neurons in its hidden layer is then tested and the optimal configuration is derived.

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