EEG Based Biometric Identification with Reduced Number of Channels

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***Abstract*—EEG based biometric system can be used for authentication, with advantages like confidentiality retention and forgery prevention. Signals taken from maximum brain regions show some sort of unique information, which can be used for extracting the subject dependent pattern. This paper presents an approach to find the relationships among signals generated in different brain regions which give birth to unique patterns. A bivariate measure, Magnitude Squared Coherence (MSC) is selected as a feature which is insensitive to the random changes in the amplitude of the signals (because of circadian rhythm).We are trying to optimize the number of EEG channels to be considered for the identification without compromising the accuracy. An experiment is performed on all the possible combinations of channels and on accomplishment of 100% accuracy channels are reduced one by one. This incremental approach is followed till we get accuracy less than 95%. K-nearest neighbor (K=1), a distance based classifier, which worked well with very high dimensional data with limited number of samples per class is used here. 100% accuracy on 108 subjects with eye open resting state was previously claimed using 64 channels, whereas the same accuracy is obtained here on 109 subjects by selecting only 10 channels. Obtained result lead us to conclude that 10 channels can be used conveniently in confidential environment for biometric identification.**

***Keyword*—EEG, Magnitude squared coherence, authentication, distance based classifier, 10 channel EEG, k-nearest neighbor.**

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