(Article: 20)

FRACTAL ANALYSIS OF EEG SIGNAL

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ABSTRACTt

In this literature EEG signal is filtered and smoothed using Exponential Smoothing technique to denoise the signal from noise and probable measurement error and analyzed to understand the degree of randomness by introducing Fractal Geometry Analysis. Using modified Higuchi method, Fractal Dimension is computed on the EEG data which is *obtained from Henri Begleiter at the Neurodynamics Laboratory at the State University of New York Health Center at Brooklyn. EEG data* arise from a large study to examine EEG correlates of genetic predisposition to alcoholism. There were two groups of subjects: alcoholic and control. Here, Fractal Dimensions of controlled patients and alcoholic patients enlighten the randomness of the human brain's functionality.

INTRODUCTION

One of the major challenges to design an electroencephalograph is to decode the noisy signals in order to diagnose specific mental states. EEG signal is modeled as functions consisting of both a deterministic and a stochastic component. A common model of such signal consists of a deterministic part $x(t)$ and noise. The compressive sampled data then is segmented as pieces for further processing like feature detection and classification, signal modeling and data compression.

INTRODUCTION

EEG signals acquired from rodent brain during injury and recovery from global cerebral ischemia are commonly considered by the scientists and researchers in this field [1]. So such analyses are a very important task since EEGs are the source of information. It provides the validation of theories and models as well as their improvements. . Normally, Its amplitude lies in the range microvolt level and the frequency < 100 Hz. Such week signal is susceptible to noise [2]. Analysis of such signal in presence of noise often renders a wrong interpretation of the data. So we need to develop an initial platform by denoising it from which we can begin the extensive study on it. Denoising of a EEG signal can be performed with a satisfactory level of accuracy if the following two matters are obeyed [3] :

(i) Certain cases may arise in which the error generated in a certain position propagates to the next stages. In those cases while trying to develop a smoothing model we must consider this propagation of error and must try to fight against it.

(ii) While extracting the new EEG signal s data by filtering the old one we must keep in mind the positional importance of data i.e. if $\{y_i\}$ be the newly developed signal by filtering the old one $\{x_i\}$; $i=1, 2, \ldots, n$ the y_i's must be generated mostly from the corresponding x_i's.

There are so many important signal processing techniques to reduce the noise and increase the probability of finding the disorders even at minute level. In those cases while trying to develop a denoising model we must consider this propagation of error and must try to fight against it and secondly,while extracting signal by filtering method we must keep in mind the positional importance of instantaneous sample signal i.e. if {yi} be the newly developed EEG time series data by filtering the old one {xi}; i=1, 2, …., n the yi's must be generated mostly from the corresponding xi's.

INTRODUCTION

As if produced filtered signal shows very handful optimization of error. In this literature EEG signal is smoothed using exponential smoothing [4,5,6,7] and to interpret on the degree of randomness , modified Higuchi method[8,9] is applied to determine fractality of the time series .This data arises from a large study to examine EEG correlates of genetic predisposition to alcoholism. It contains measurements from 64 electrodes placed on subject's scalps which were sampled at 256 Hz (3.9-msec epoch) for 1 second. There were two groups of subjects: alcoholic and control. Here, an effort is executed to smooth one of the 64 EEG signals obtained in both condition and monitor the chaotic nature of into two different situations of the brainwave.

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