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Early Detection of Epileptic Seizures Using DWT Features and SVM Classification

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ABSTRACT

Epilepsy is a chronic neurological disorder caused by irregular nerve cell movement in the cerebrum and is described by continuous unforeseen seizures. Correctly identifying and counting the patients with epilepsy experience seizures in is fundamental for conclusion, choosing treatment and evaluating the impacts of the treatment. Epilepsy recognition done just by physically dissecting a man's body is an extremely exhausting activity. The cerebrum includes exceptional nerve cell movement which can be broke down with the assistance of an EEG sensor to identify epileptic seizure in a subject as it gauges the voltage variances coming about because of ionic current inside the neurons of the mind. This paper displays a way to deal with dissect the cerebrum flag utilizing an EEG sensor and perform different flag preparing systems on MATLAB, recognize its high recurrence parts by wavelet examination and contrast it with the database motion with identify and arrange the seizure with the assistance of SVM.

Keyword: - DWT, Seizure, Epilepsy, SVM, EEG.

1. INTRODUCTION

Epilepsy is a neurological issue with commonness of around 1-2% of the world's population. Epilepsy is a general term for various conditions where at least two unjustifiable seizures are watched. A seizure happens because of sudden electrical aggravation in the cerebrum. Seizure is viewed as the second most capable neurological issue after stroke. Until the nineteenth century, epilepsy was not recognized as a mind issue. The primary driver of epileptic seizure is hereditary disarranges, strokes and cerebrum tumors however the reasons for seizures are some of the times non-deterministic in nature. A seizure happens when the cerebrum cells convey wrong flags. The distinction between seizure and epilepsy must be obvious to all. We can characterize epilepsy as a progression of tedious seizures. Seizures may harm cerebrum however the majority of them don't affect the mind. Seizures may happen at any age with length going from a couple of moments.

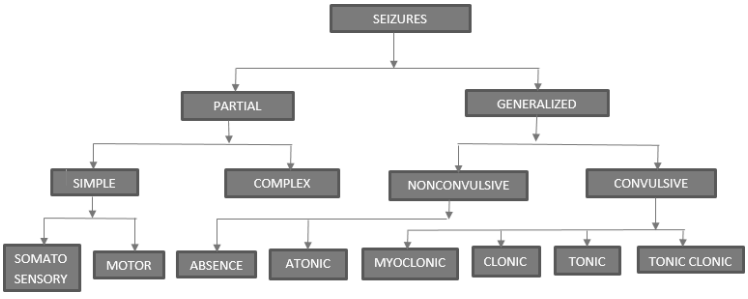

Fig.1: Types of Seizure

Seizures can be separated into various classifications. This division depends on the mind region which is influenced because of seizure. Seizures are comprehensively delegated generalized seizures and focal seizures. Partial seizures or Focal seizures happen in a specific piece of mind not the total brain. Simple seizures and complex seizures are the kinds of focal seizures. Seizures happening on the two sides of the cerebrum are named as generalized seizures. Absence seizure, tonic seizure, clonic seizures and atonic seizures are few sorts of generalized seizures. Some

individuals may have the two kinds of seizures however with no reasonable example between them. Insights show that 60% of the epileptic patients have seizures in which body muscles contract and grow quickly without the mediation of human cerebrum. Such seizures are called convulsive seizures

1.1 EEG (Electroencephalogram):

Electrical action of human cerebrum is recorded and monitored by using electrophysiological called Electroencephalography (EEG). It is generally non-invasive technique with the anodes placed on the patient scalp of the patient. EEG measures voltage fluctuations coming about because of ionic current within the neurons of cerebrum. Electrical action of brain over a period of time is gathered by placing terminals at various brain areas of the scalp. For all demonstrative purposes, there is a primary spotlight on the spectral content of EEG signals. EEG signals are regularly utilized in analysis of epilepsy, as it causes anomalies in EEG signal patterns [3]. EEG keeps on being an important apparatus for research and conclusion. EEG has a few advantages over alternate techniques:

1) EEG signals provide higher temporal resolution.

2) Cerebrum activity is measured directly using electrical activity. EEG signal has turned into an extremely helpful and prominent clinical instrument, particularly in the field of epileptology, yet in addition to different zones of neurology.

1.2 Objective of project:

Primary target of this undertaking is to manufacture a cost effective and customer friendly framework that helps specialists, patients, and guardians in regulating and manage epileptic seizures. This system can identify epilepsy notwithstanding even when the patient isn't having a seizure at that example yet have in the past history [4].

Input signal or EEG signal is first applied to an FIR filter and the smoothened output is provided to input to next stage i.e. DWT (discrete wavelet transform). As EEG signals are time dependent, the DWT is used to provide useful representation of a function in time-frequency domain. Wavelet analysis is used to decompose signals into several frequency bands. SVM (support vector machines) is in the third stage. An automated machine learning algorithm based on concept of decision plans to determine decision boundaries. Features of EEG signals are extracted, and boundaries of all features are determined using SVM [5].

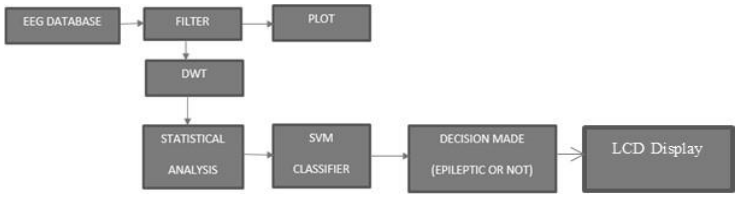

Fig. 2: Block Diagram

1.3 DWT

Wavelet transform is one of the most promising methods for feature extraction from EEG signals. It is linear time-frequency transform that represents efficient analytical tool for signal processing, pattern recognition and classification. Wavelet transform widely used in biomedical signal processing because it can localize information in both frequency and time domains [6]. EEG signal is decomposed into several sub-bands using Discrete Wavelet Transform to decompose allows the extraction from the alpha, beta, and theta frequency bands. And signal is divided into five different frequency groups. Different features, such as Zero Crossing Rate (ZCR), Energy, Fractal measurements and Variance can be extracted from these sub-bands. The estimated value of these features is provided to Support Vector Machine classifier. After performing statistical analysis, the SVM isolates the classify into epileptic and non-epileptic seizures classes.

2.2 SVM CLASSIFIERS

Support Vector Machine is utilized for Characterization of EEG signals; and it should have capacity to distinguish between the electrical activity of a healthy subject and that of an epileptic subject. In SVM, each data point is represented as n-dimensional space, where the estimation value of each includes being the estimation of particular facilitate, and after that arrangement is done [7]. For epileptic seizure detection, the SVM classifier must be trained, cross validated, and tested using extracted features obtained through DWT of the EEG signals got from healthy

(non-epileptic) and epileptic subjects included in our database.

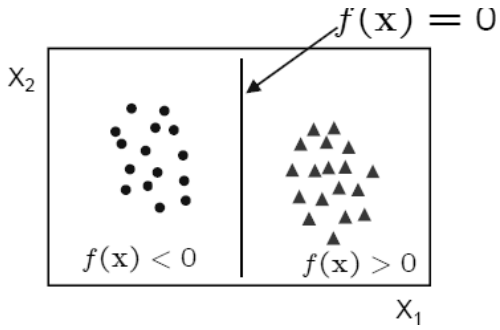

Fig. 3: SVM classifier

2. FLOWCHART

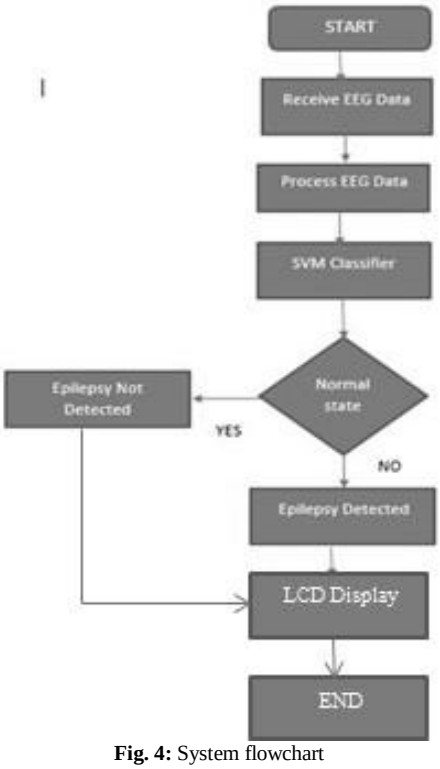

Fig. 4: System flowchart

3. RESULT

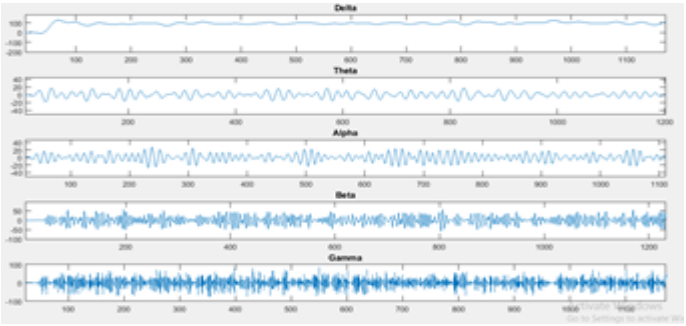

Fig.5: Healthy plot

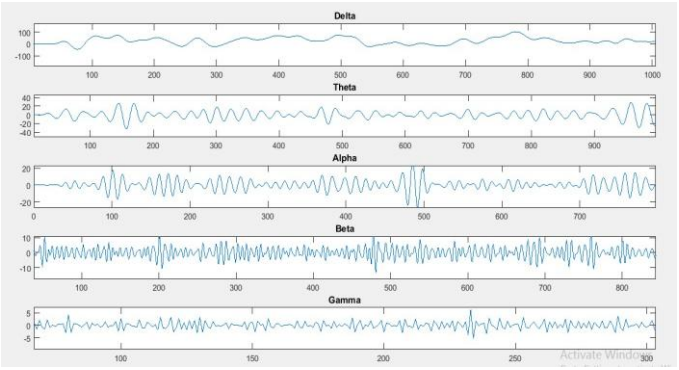

Fig.6: Healthy plot

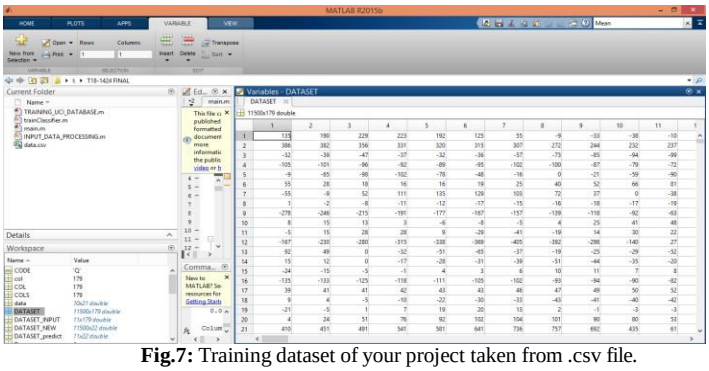

Fig.7: Training dataset of your project taken from .csv file.

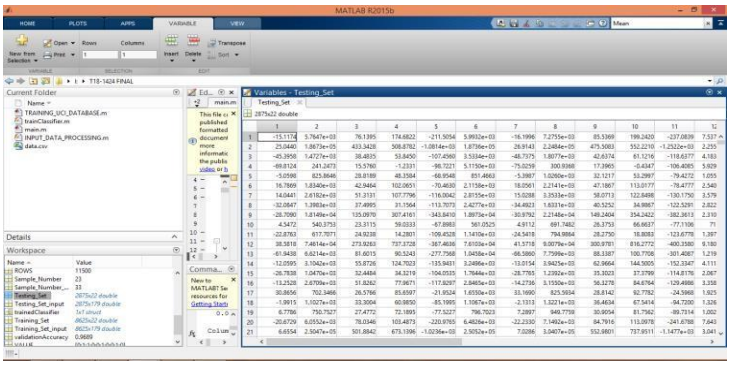

Fig.8: Dataset values after feature extraction

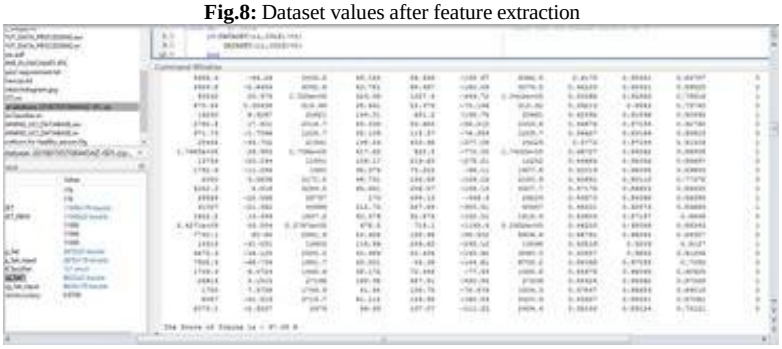

Fig.9: This is the values after applying for SVM classifier.

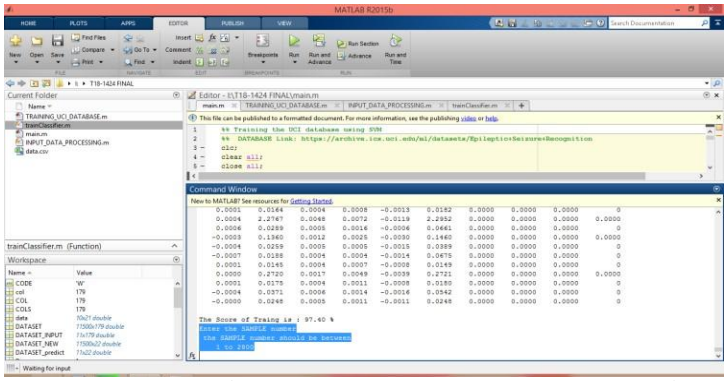

Fig.10: Enter sample no of individual to know the output i.e. he has seizure in future or not.

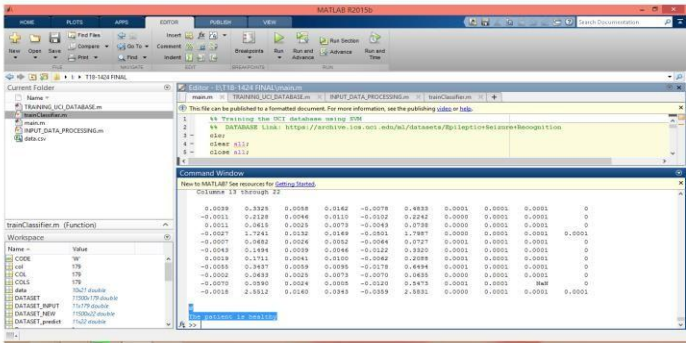

Fig.11: Output of the sample

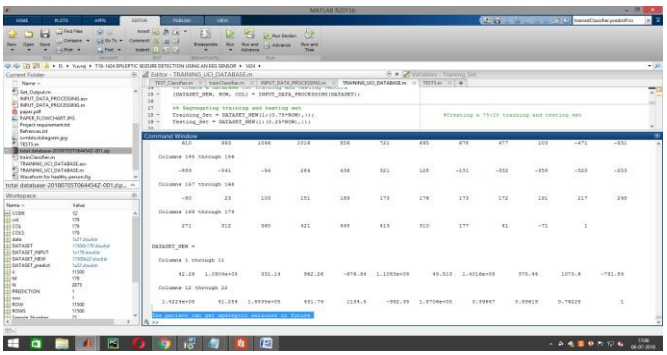

Fig.12: Output of the sample

4. CONCLUSION

This paper presents a framework which separates expansive number of features from EEG signals information after applying wavelet transform then performs measurable examination before they provided to the SVM classifier to settle on a target choice about the EEG information handled. This framework will have the capacity to effectively separate epileptic highlights from ordinary EEG signals with high precision and minimum false rate will impact its capacity to accurately anticipate beginning of the seizure.

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