International Journal of IT & Knowledge Management (ISSN: 0973-4414)
Volume 11 • Issue 2 pp. 286-294 Jan 2018 - June 2018 www.csjournals.com

A Generalized Epileptic Seizure Detection Framework Independent of Defined Channels

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ABSTRACT

[608] Our Invention ageneralized epileptic seizure detection framework independent of channels is almost of the unique [610] solution provided are either having very less accuracy in detection, may be dependent on channel and may [612] be dependent on patients. The Invented method provides a generalized epileptic seizure final detection mapped framework for monitoring epileptic patients. [614] The input given to the seizure detection frame work are the EEG signals of patients collected from various channels. [616] The features are then extracted using feature extraction methods to accurately classify the epileptic and non-epileptic signals. [618] The Features are then given to the classifiers to defined detect epileptic and non-epileptic condition.

KEYWORD: Generalized, Epileptic, Seizure, Detection, Framework, Independent, Channels.

RESEARCH FIELD

[500] Our Invention is related to a generalized epileptic seizure detection framework independent of defined channels.

RESEARCH BACKGROUND

[502] The brain is that the most complicated organ of the physical body and additional understanding of it perform represents an excellent challenge within the areas of medication, medical specialty engineering and science.

[504] Brainwave's area unit generated by neural sources among the brain and propagate a measurable magnetic force field onto the scalp.

[506] The ensuing encephalogram (EEG) provides a non-invasive measuring of brain electrical activity, which might be measured victimization surface electrodes and a

recording device. as an example, the location of those conductors could also be ruled by the international 10-20 system of electrode placement. every channel of graphical record knowledge is formed up by combining the signals from 2 electrodes.

[508] The electrodes area unit typically paired in either a bipolar icon or a denotive icon.within the bipolar icon, a channel is formed by referencing every conductor with one different conductor, which can then be used because the reference conductor for consecutive channel then on till a sequence of conductor pairs is constructed up. within the denotive icon, every channel is constructed up by referencing every conductor to 1 common reference conductor.

[510] The reference conductor could also be placed on either a non-cerebral website, like coupled earlobes; a neighborhood of the pinnacle deemed to be comparatively electrically quiet; or created up from a mean of all the electrodes.

[512] The ensuing signals area unit born-again to digital values and so usually fed to the front-end of AN graphical record audio system and alos the graphical record shows ostensibly random activity within the μ-volt vary.

[514] The graphical record differs greatly for various age teams, with the graphical record of neonates especially being considerably completely different thereto of older youngsters and adults.

[516] The graphical record of the newborn is exclusive. Patterns of brain activity area unit seen during this amount that mirror the speedy biological process changes happening within the brain.

[518] Waveforms seem within the graphical record knowledge that aren't gift at the other time of life. Sleep states area unit varied, modification speedily and area unit terribly completely different from those seen in older youngsters and adults.

[520] Epilepsy, a disorder characterized by the incidence of seizures (specifically episodic impairment or loss of consciousness, abnormal motor phenomena, psychic or sensory disturbances, or the perturbation of the involuntary nervous system), is weakening to an excellent variety of individuals.

[522] The prevalence of brain disorder is zero.7% of the population with as several as 2 million Americans that suffer from numerous sorts of brain disorder and around fifty million worldwide. analysis has found that its prevalence could also be even larger worldwide, significantly in less economically developed nations, suggesting that the worldwide figure for brain disorder sufferers could also be in far more than 100 million.

[524] A typical brain disorder patient experiences episodic attacks or seizures, that area unit usually outlined as periods of abnormal medical specialty activity.

[526] As the proposed method is designed keeping in mind pediatric patients, therefore, non-invasive approach will be preferred as it does not involve any invasive procedure of implanting electrode as the patent application and side effects of scar tissue can be avoided.

[528] The proposed approach is not computationally exhaustive unlike deep learning models that requires large number of computational resources as mentioned in patent application.

[530] The patent application has neural network-based structure that require large number of internal connection and scaling of the network is difficult as synapses grow quadratic ally.

[532] Whereas, the proposed method is tree-based is less complex and less impacted by noise with a stable algorithm. The logic rules generated enhances the framework and provide good detection accuracy with minimum false detection rate.

[534] The characteristics of an epileptic seizure onset are different from patient to patient, but are frequently consistent from seizure to seizure within a single patient. Because epilepsy is characterized by seizures, its sufferers are frequently limited in the kinds of activities they may participate in.

[537] Epilepsy can prevent people from driving, working, or otherwise participating in much of what society has to offer. Some epilepsy sufferers have serious seizures so frequently that they are effectively incapacitated.

[538] Furthermore, epilepsy is often progressive and can be associated with degenerative disorders and conditions. Over time, epileptic seizures often become more frequent and more serious and may lead to deterioration of other brain functions (including cognitive function) as well as physical impairments.

[540] Timely detection of seizures allows a caregiver to monitor their severity and duration and to determine whether immediate treatment is necessary.

[542] Attempts have been made to create alarm systems based on motion systems, which alert a caregiver or call for emergency services in response to a repetitive rhythmic movement, which could indicate a seizure.

[545] However, these systems suffer from an abundance of false alarms, since rhythmic movement is also associated with many types of everyday activity, such as walking, hand gesturing, and even typing and alos Most known systems are placed under the mattress of a patient.

[546] EEG equipment, which is most readily available in hospitals. Nijsen performed visual analysis of the plotted signals (as presented on a chart recorder) but did not perform any numerical or statistical analysis on the accelerometer readings which would allow an accelerometer to be used as a stand-alone detection method.

[548] Use of an accelerometer alone, without statistical analysis, would result in a high degree of false positives due to rhythmic movement present in many everyday activities. As stated in Nijsen, "Visual analysis of ACM [accelerometer] readings are very labor intensive.

[550] It is more difficult to find suitable parameters that make computerized detection possible". Nijsen therefore recognized the need to develop a computerized system which would serve as an alert system allowing normal ambulation.

RESEARCH OBJECTIVES

1. The objective of the invention is to a EEG signals recorded from various channels placed at all different places in brain from the patient.
2. The other objective of the invention is to a a Feature extraction module process the EEG signals and extracts the appropriate features for detection of epileptic and non-epileptic condition. Wavelet packet transform is used as feature extractor in this work.
3. The other objective of the invention is to a Classifier module help in classifying the features as epileptic or non-epileptic using the parameters of the classifier.
4. The other objective of the invention is to a A tree based method has been used for classification of seizure and non-seizure.
5. The other objective of the invention is to a Alarm generation module give alarm in form of light according to the output of the classifier i.e. 'red' light for epileptic condition and 'green' light for non-epileptic condition.

RESEARCH SUMMARY

[552] Please elaborate the matter being resolved by your invention. Please specify the particular drawback within the existing product or method. encephalopathy may be a medical specialty condition that's exhibited by swift and continual seizure attack.

[554] Worldwide virtually fifty million folks may be affected that is an extended variety of world population.

[556] The uncontrolled movement of the body because of hypersynchronous activity of the neurons is often referred to as seizure.

[558] As epileptic attacks area unit abrupt, it causes spontaneous amendment within the behavior of a patient and might typically result in loss of consciousness for a quick amount.

[560] Generally, a seizure lasts between few seconds to couple of minutes and might occur while not previous aura. The widespread exhibition of abnormal brain activity is described by distinct changes within the usual electrical activity of the neurons.

[562] The betting on the symptoms and their manifestation, seizures area unit loosely classified as partial seizure and epilepsies major.

[564] When a part of the cerebral hemisphere experiences abnormal neuronal activity during an epileptic attack, such seizures are termed partial seizures. Further it can be subdivided into simple-partial and complex-partial.

[568] On the other hand, in generalized seizures the brain is affected as whole and all regions experience this irregular neuronal storm. Generalized seizures are again divided into the sub-categories of convulsive and non-convulsive seizures.

[570] To examine these noticeable changes, the most expansively accepted non-invasive technique used by physicians for studying brain activities is through electroencephalogram (EEG) that offers creditable temporal resolution.

[572] Other than routine EEG, sometimes prolonged EEGs are required when routine EEG is normal and diagnosis of epilepsy needs continuous EEG monitoring. Different radiologic tests are also present for studying brain conditions such as, magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), positron emission tomography (PET), single photon emission computed tomography (SPECT), and intracranial monitoring (invasive).

[574] As brain signals are complex, non-stationary, noisy, non-linear and generate high volume of data, therefore evaluating the recordings for detecting presence of seizure is a challenging task. Proficient intervention by neurologists is required for visual assessment of the EEG recording.

[576] Analyzing huge amount of EEG recordings is time consuming and also physically exhausting, hence, automatic diagnosis of seizure events is gaining interest. Automated seizure detection system would pave way for easier and faster diagnosis of seizure events with minimal misjudgment and error.

[578] Most of the analysis carried out follow patient-specific approach which may or may not be effective for another patient to detect epileptic conditions as neuronal activity varies greatly among patients.

[589] Also, a number of the previous works are administrated by considering specific channels out of all the recorded channels that once more may be unable to find all epileptic conditions as a result of manifestation of convulsion is exclusive for every patient and therefore involves totally different channels.

[582] Hence, it's necessary to develop an automatic generalized system that will adapt and find epileptic seizures specified it'll facilitate in providing higher treatment and care.

[584] examined twenty-one frequencies, time, modelling and entropy options and used normal statistics to see that feature had the foremost vital amendment from non-seizure to seizure. RMS amplitude, the quantity of soap and min and also the autoregressive model work were the highest activity options

[586] the utilization of mathematician method modelling with babe EEG. this system has antecedently been utilized au fait systems. 2 options of the mathematician model, particularly the Hyperparameters magnitude relation and also the prediction variance was developed to estimate the extent of structure within the EEG, indicative of seizure.

[588] The measures were compared with 10 different EEG measures and tested on a babe information. Mutual info and a neural network classifier were wont to live the performance of every live, with the prediction variance activity the most effective of all measures and also the Hyperparameters magnitude relation having the seventh best performance.

RESEARCH BRIEF DESCRIPTION OF THE DIAGRAM

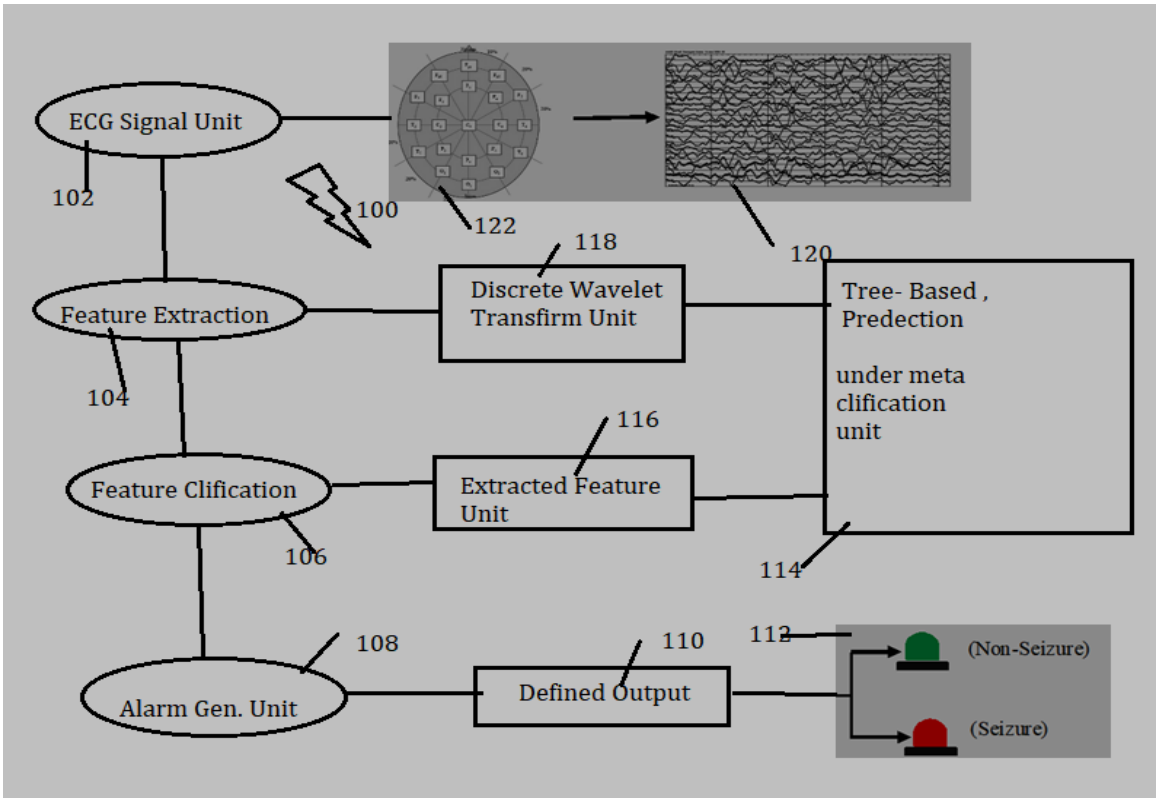

FIG.1: is a Schematic diagram of the framework.

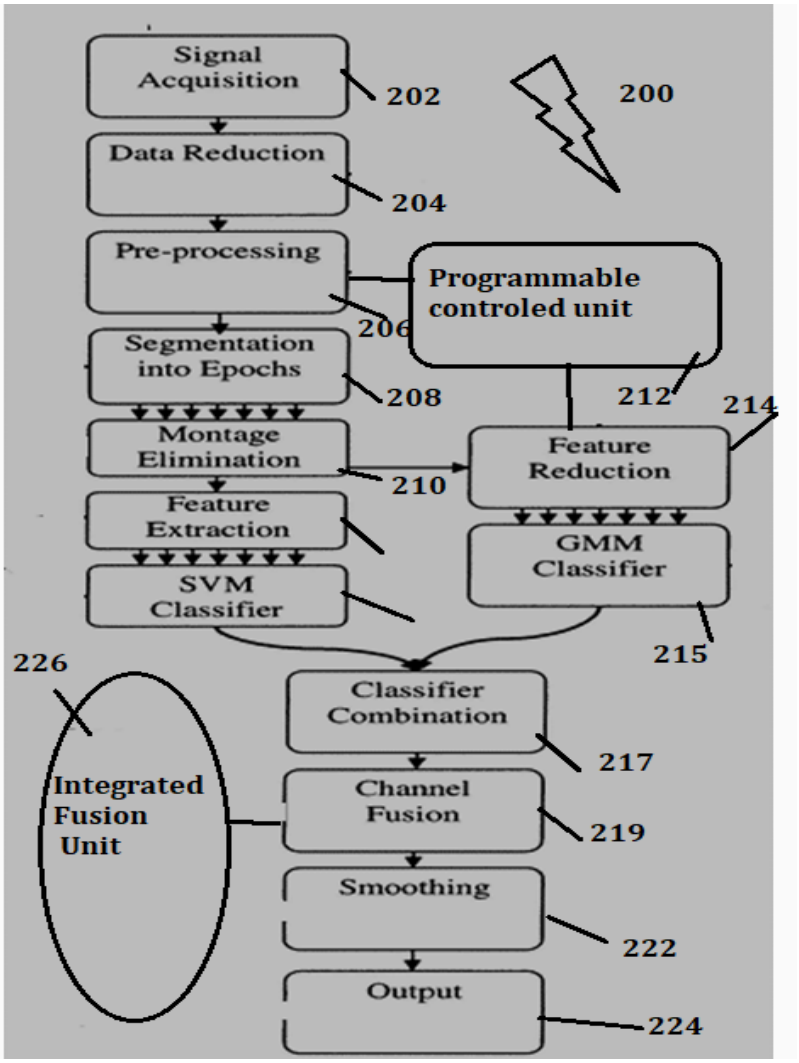

FIG. 2 is a flow chart of the system.

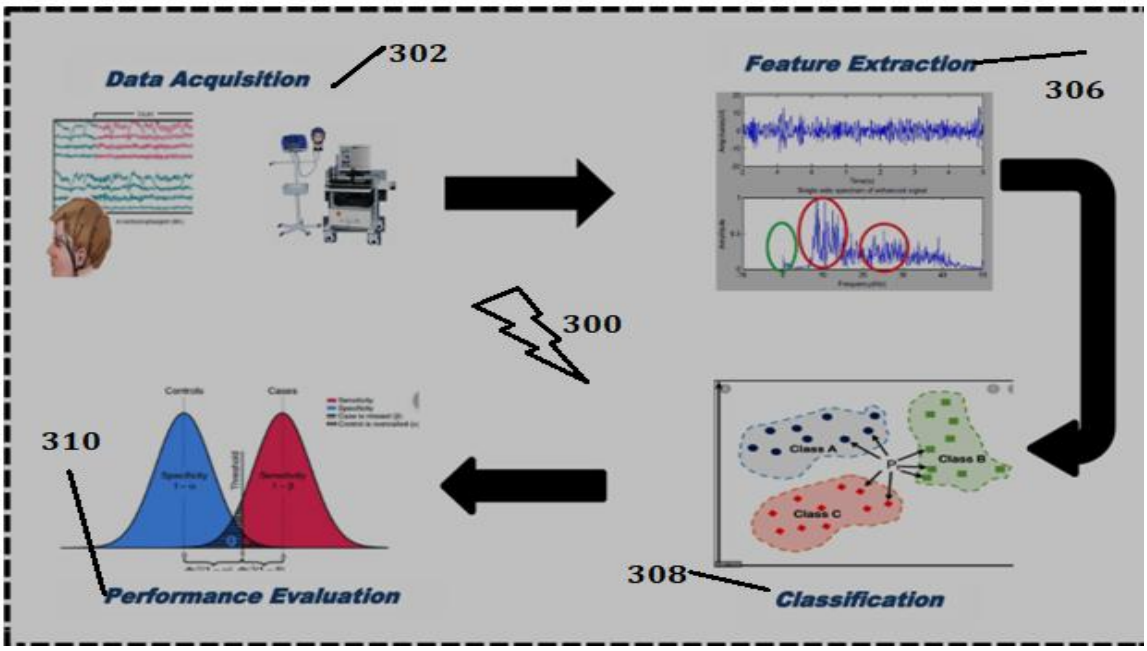

FIG. 3 is a flow chart of an alternative method.

RESEARCH DESCRIPTION OF THE INVENTION

[590] Prior to the utilization of the strategy of the invention for the period detection of seizures in AN EEG signal, it's necessary to coach the SVM classifier on sets of coaching EEG information.
[592] The coaching information includes adult and infant EEG signals. The coaching information used consists of EEG information from seventeen baby patients and fifteen adult patients.

[594] Patients weren't hand-picked on any criteria, all on the market patients having useable information were used therefore on maximize the on the market coaching information.

RESEARCH CLAIMS

1) [596] Our Invention ageneralized epileptic seizure detection framework independent of channels is almost of the unique solution provided are either having very less accuracy in detection [598] may be dependent on channel and may be dependent on patients. [600] The Invented method provides a generalized epileptic seizure final detection mapped framework for monitoring epileptic patients. [602] The input given to the seizure detection frame work are the EEG signals of patients collected from various channels. [604] The features are then extracted using feature extraction methods to accurately classify the epileptic and non-epileptic signals. [606] The Features

are then given to the classifiers to defined detect epileptic and non-epileptic condition.

2) According to claim1# the Invention is to a EEG signals recorded from various channels placed at all different places in brain from the patient and also a Feature extraction module process the EEG signals and extracts the appropriate features for detection of epileptic and non-epileptic condition. Wavelet packet transform is used as feature extractor in this work.
3) According to claim1# the Invention is to a Classifier module help in classifying the features as epileptic or non-epileptic using the parameters of the classifier. A tree based method has been used for classification of seizure and non-seizure.
4) According to claim1# the Invention is to a Alarm generation module give alarm in form of light according to the output of the classifier i.e. 'red' light for epileptic condition and 'green' light for non-epileptic condition.

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