CHAPTER 6

CONCLUSION AND FUTURE AVENUES

6.1 CONCLUSION

The complexity of the brain activity can be analyzed with the help of different nonlinear techniques for cognitive functions for healthy persons and diseased persons. The Research work embodies with Statistical parameters methods, Pattern recognition techniques and graph theory approach for analyzing the activity patterns found in the EEG data of the human brain. This helps in understanding of the normal subject brain and also to evaluate the extent of abnormality in the patient data as compared to the normal data. The limitations faced by the radiologist/neurologist in automatically classifying and understanding various activity patterns is simplified through various signal processing and decision making algorithms.

We have considered the sLoreta tool and matlab for finding out the end results. The needs and the basic necessities of paradigm designing are emphasized. Detailed study about the preprocessing techniques applied to the signals incorporated through matlab and sLoreta tool is made. The knowledge about the preprocessing is a must because the research proposal depends on the signal obtained through different softwares were used. Three case studies are made to validate the procedures involved in data acquisition procedures. The different activity task datas are data obtained and processed using Matlab, sLoreta and EEG lab with reference to the paradigm design and obtained the results.
The EEG pattern analysis, Linear and Nonlinear parameter analysis specifically deals with the preprocessing techniques used primarily for extraction of features that represent the signals effectively....

The classification procedures are verified by an application which considers both the cognitive data and normal subject data for classification. The pattern classification techniques and the preprocessing techniques are considered for estimation of deviation of the cognitive data as compared with different activities. The features representing the signals are compared. The results are validated through statistical methods to estimate the extent of deviation.

The visualization of the EEG data in 3D gives an insight into the functional representation of the brain in the third dimension. The technique allows visualization of the multiple dimensions of the EEG brain data. It also helps in localization of the activity pattern and viewing the data in three orthogonal directions of imaging. The graph theory approach paved a new way of analyzing the activities of brain with the help of connectivity toolbox. So that visualization of EEG data much clearly with all the nonlinear functions used to arrive into conclusion.

Overall the work encompasses different techniques that will aid the radiologist/ neurologist in understanding the brain functionality through automated pattern classification methods. It also helps in automated assessment of the extent of neurological disorders found in patients. It can be concluded that the nonlinear analysis may be a useful and discriminative tool in investigating the neuro-dynamic properties of the brain in patients with different cognitive behaviors and brain disorders.
6.2 FUTURE AVENUES

The EEG activity pattern classification and analysis techniques that are evolved through this research give an insight into brain functionality and also aid the radiologist/neurologist in the process of diagnosis of any neurological disorder.

The application of the same would therefore be proposed in the area of prognosis aid for the radiologist/neurologist. The estimation of deviation of the patient data as compared to the normal data can be extended to the problem of prognosis prediction for the patient. The deviation extent was measured in our proposal with reference to the normal data whereas for prognosis we consider the same patient data for comparison over a period of time. The analysis of the patient data over a period of time will give an insight into the modification in the activity patterns that have happened during that period. The prognosis can then be proposed based on the variations found in the activity patterns this in turn helps for people who have ADHD and dementia and alzheimiers diseases for knowing their cognitive disability much effectively.

Although patients with Major Depressive Disorder (MDD) have dysfunctions in cognitive behaviors and the regulation of emotions, the underlying brain dynamics of the pathophysiology are unclear. Therefore, nonlinear techniques can be used to understand the dynamic behavior of the EEG signals of MDD patients.

Another booming area of applying this graph-theory approach is in the study of meditation and yoga for observing the conditions of human brain before mediation and after mediation. The further study could be helpful for the Sleep-study analysis of data to find out the condition of the cognitive state of mind during sleep.
The deviations in the activity patterns of a patient with neurological disorder with reference to the normal data are not precisely visible to the naked eye. Statistical methods would render a detailed report on the several features of the activity pattern. This would help the neurosurgeon in decisions on prognosis. The proposal on 3D visualization of EEG data at interactive depths and overlapping of healthy and patient data in 3D view to visualize the deviation extent helps in pre-surgical preparations.

The research proposal was made taking into consideration the limitation of the traditional method of analysis of EEG data. A detailed discussion of the existing methodologies which paved path for the realization of the proposal is done in chapter two and three. This chapter consists of an exhaustive analysis of each of the methods considered in the research project.