PIRE 2009 Project Proposal

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Project Title: Extraction of key parameters towards seizure detection and prediction

Problem Statement: Subdural and scalp Electroencephalogram (EEG) data will be analyzed in order to evaluate the sensitivity, specificity and accuracy of seizure detection using key parameters. In this study, the role of these parameters in developing a reliable seizure detection algorithm for EEG recording intra-cranially (IEEG) will be explored in order to confront the complex nature of EEG data and the inherent heavy computational requirements.

Motivation and Impact: Seizures occur intermittently and unpredictably. Hence, whether the planned treatment option is focal brain resection or chronic stimulation implants, massive amounts of EEG or iEEG data needs to be analyzed offline to detect seizures; a challenge that can only be met through reliable and computationally efficient seizure detection paradigms.

Current Status: EEG and iEEG data files are currently being analyzed by students at the Center for Advanced Technology and Education at FIU. The extraction of parameters and the analysis implemented using this data is done in a single computer and therefore used only for offline applications. The next step will be to develop a computationally efficient platform to seek the desired results but in real or near real-time. Since the structure of EEG data is based on the temporal measurement of a several channels of recorded electrodes, and data collected from each electrode is independent from the other electrodes, the parameters per electrodes can be processed separately. By using a cluster, each node can handle a single electrode, thus decreasing the compilation time. This type of implementation will allow for larger amounts of data to be analyzed.

Research Roadmap:

- EEG Data will be extracted and cleaned, artifacts will be removed
- Fourier transform of each electrode will be performed in order to extract frequency components of the data
- The data will be partitioned in several windows with variable sizes in order to extract reliable parameters. Time and frequency domain parameters will be extracted from these windows

- Explore the possibility to develop parallel processing paradigm on the data with real-time and with high accuracy.

Relation to PIRE Core Research Projects:

The proposed project combines the fields of health care and parallel processing computing. Our research will fit into the Healthcare Comm. Apps box in figure at *http://pire.fiu.edu/research.php* because it will propose an algorithm which allows parallel processing of data. This creates a level of abstraction which can be used at a higher level with minimal knowledge about the underlying functioning. We will also make emphasis in creating a reusable layer which can be used by other applications.