

EPILEPSIAE

Evolving Platform for Improving Life Expectancy of Patients Suffering from IctAI Events



About one third of all epileptic patients cannot be treated by medication or by surgery; they suffer from refractory epilepsy. They live with the risk that a seizure can occur anywhere, at any time like a “bolt from the blue”. This can mean facing serious limitations in their daily lives, in particular when it comes to their safety, professional and social integration.

The EPILEPSIAE project started in January 2008, with the mission to use Information and Communication Technologies to **empower epileptic patients to monitor their own risks and improve their day to day safety**, strengthening their social integration.

The Epilepsiae project intends to develop a **wearable device to support people suffering from this kind of epilepsy**, allowing them to have a normal life. This device acquires EEG (Electroencephalogram)-ECG (Electrocardiogram) signals in real time, through electrodes in which are hidden in hair and clothes, and sends them to a tablet computer, held by the patient. The computer extracts and analyses a certain number of characteristics of these signals and runs a program that tries to predict if a seizure is likely to happen. In this case an alarm is given. The patient may then take action to prevent risks and protect his (her) privacy.

To reach this ambitious goal several activities have been launched and are being further developed.

Firstly, industrial partner, MICROMED, SpA, Italy, developed the hardware -the Brainatics. It is a

state of the art device which can acquire and transmit EEG-ECG data to a computer by cable or by Bluetooth. The device, shown in Fig.1, is small and lightweight.



Fig. 1. The Brainatics. The EU-LTM prototype

Secondly a large European Database on Epilepsy has been developed. The Oracle relational database, is currently filled with datasets from **over 200 patients** from the university hospitals of Freiburg and Coimbra and from the Hôpital la Pitié Salpêtrière in Paris. It is the **biggest epilepsy database in the world**. For each patient, 5 days continuous recordings of EEG-ECG are stored, as well as all the relevant clinical information about the patient, the registered seizures and other data such as MRI images. All of this anonymized data is used for research and training in seizure prediction. A seizure predictor is firstly projected in simulation mode using the patients' database. If it gives good results in simulation conditions, it can be tested in real clinical conditions, after customization to each new patient. Extensive facilities for searching and querying the database are available, as in Fig. 2 (below).

The following table contains a list of all patients currently contained in the EPILEPSIAE database. Click on the ID of a patient in the table to see respectively the patient details or use the button below the table to insert a new patient into the database.

id	patientcode	gender	onsetage	commentary	delete	details...
52303	52303	m	6	nocturnal partial complex seizure	delete	details...
1235103	1235103	m	14	bitemporal seizures	delete	details...
1235903	1235903	f	33	right hippocampus and right polar temporal lobe	delete	details...
1236703	1236703	m	14	left orbitofrontal epilepsy	delete	details...
1241003	1241003	m	18	sleep seizures	delete	details...
1242003	1242003	m	16	left amygdalohippocampal epilepsy	delete	details...
1242703	1242703	f	29	right tempora mesial seizureel	delete	details...
1243603	1243603	m	15	TEMPORAL LOBE EPILEPSY	delete	details...
1244803	1244803	f	10	temporal seizure	delete	details...
1245203	1245203	m	27	right temporal seizure	delete	details...
1256303	1256303	m	12	partial complex seizure	delete	details...
1259203	1259203	m	31	left insular epilepsy	delete	details...
1270403	1270403	m	12	left mesial temporal epilepsy	delete	details...
1272703	1272703	f	15	right temporal epilepsy	delete	details...
1319203	1319203	m	12	right neocortical centro-parieta epilepsy or right temporal epilepsyl	delete	details...
1324803	1324803	f	41	right sclerosis hippocampus	delete	details...
1324903	1324903	f	10	epileptic uncle	delete	details...

Fig.2. Database client for the database

Finally a **software laboratory**, the **EPILAB**, a computational platform is used for the development, training and testing of several kinds of seizure predictors. **EPILAB can be used in simulation** (batch mode) or **in real clinical experiments** (real-time mode). EPILAB allows all the stages of a study to be easily followed: data pre-processing, features extraction, predictor training, testing and implementation in real-time. It is developed in the Matlab programming environment, with extensive graphical and user interface facilities.

Presently several types of predictors are implemented: circadian thresholds, computational intelligence (neural networks, support vector machines, cellular neural networks), and high frequency features.

The first clinical experiments are expected to begin in March 2011 inside the clinics of the three participating hospitals, using a dedicated Bluetooth network that has already been installed.

Epilepsiae can be considered a high risk project in that efficient seizure predictors have not yet been discovered for all epilepsy patients. So far,

acceptable results have only been reached for some patients, in simulation conditions. Success means striking a delicate balance: on the one hand there is the need to correctly predict that a seizure will happen (and avoid that seizures happen without being predicted). On the other hand there is also the need to avoid the occurrence of false predictions (false seizures) resulting in false alarms that can disturb a patient's day to day life.

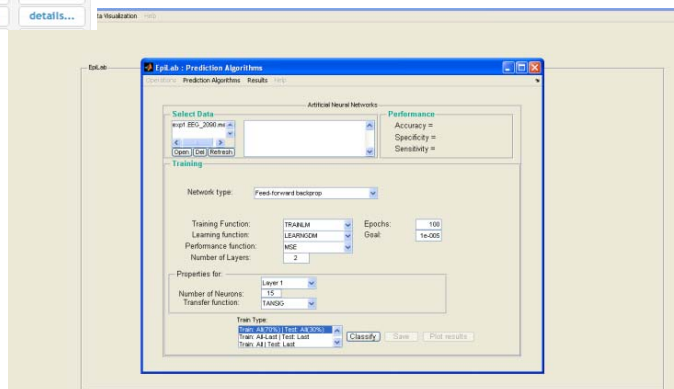


Fig. 3. The EpiLab: Seizure prediction algorithms with Artificial Neural Networks

In this context, the efforts of the **Epilepsiae consortium** are clearly leading to progress in this important area. Their **work is positioning the European Union as the leader in this field of research worldwide while contributing to significant improvements in the daily life of millions of people.**

Timetable: from 01/2008 – to 12/2010
Total cost: € 4.150.000
EC funding: € 2.920.000
Instrument: STREP
Project Identifier: FP7-2007-ICT-211713

Important Links:

Project website: www.epilepsiae.eu
 Project factsheet: http://ec.europa.eu/information_society/activities/health/docs/projects/fp7/epilepsiae-factsheet.pdf
 ICT for Health website: http://ec.europa.eu/information_society/ehealth

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