BRAINABLE & BACKHOME

Brain-neural computer interfaces on track to home

REACTION, Hellas September 26-27 2013

BrainAble

BackHome

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Brainable

Backhome

Motivation

Socio-economic problem

Neurological disorders are primary causes of disabilities in modern societies.

Expected that by 2020 TBI will be among the five causes of disease with the most significant economical repercussion.

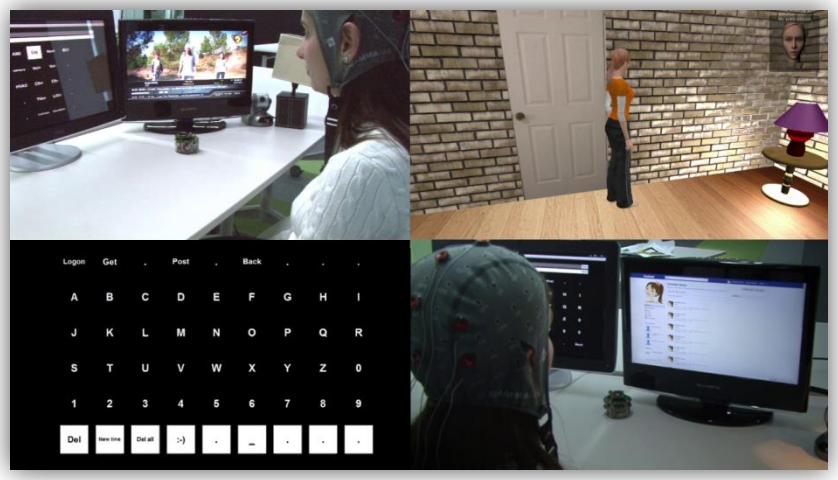
The main goal

Brainable - Improve the living conditions overcoming two of the main shortcomings – exclusion from home and social activities – using BNCI combined with Ambient Intelligence, Social Networking and Virtual Reality.

Backhome - To assist people with disabilities back home after a discharge.

Brainable vs Backhome - Differences

Brainable



Focused in Laboratory prototyping

Virtual environment for social activities.

Ambient Intelligence

Backhome

Focused in adapting the technology to be usable at user's home. Redesigned BNCI cap to be portable and wireless

Web browsing, e-mail, media player, brain painting and gaming

Quality of Life (QoL), Telemonitoring and Home support - Through assessment of user's QoL, the therapists prescribe specific cognitive rehabilitation exercises and receive feedback from both the user and the sensors at home.

Applied Technologies - BNCI

Integration detection of multiple physiological signals (EEG, EMG y EOG, Heart Rate) and different techniques (P300, SSVEP, ERS)

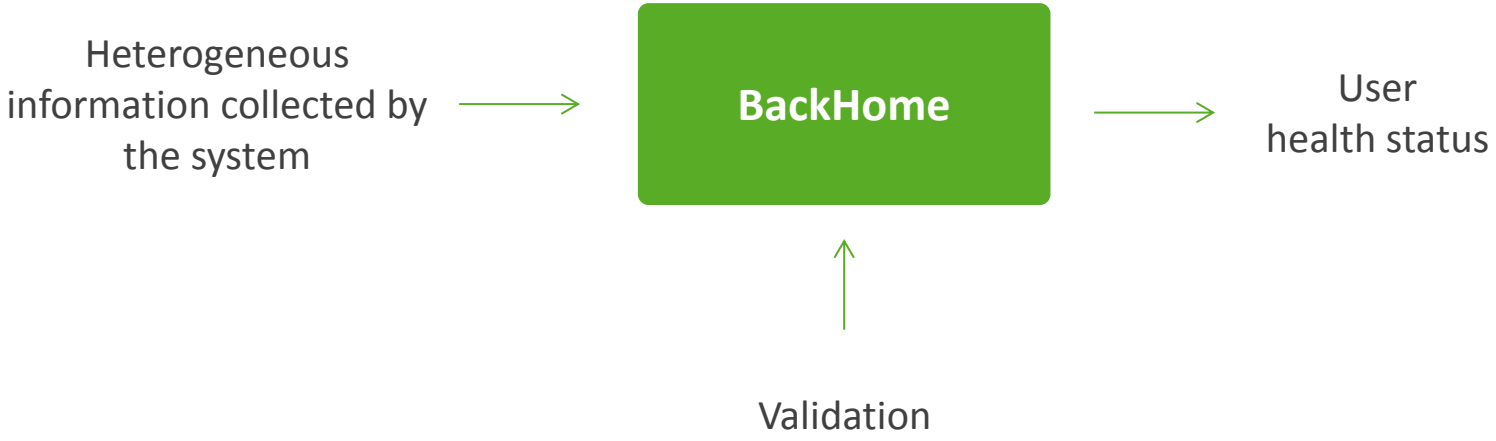
Hybrid BCI Software to identify the optimal signal, method or their combination. Adaptive personal training.

User state Monitoring software to determine the state of the user - tired, alerted, etc.

Applied Technologies
– Quality of Life –

To help in answering basic questions about the state of the user, such as “is she depressed?” or “is she more engaged in social interactions?”

Monitoring and inferring data from selected questionnaires completed by the user and automatically by relying on a context-aware approach



Applied Technologies
– Home Telemonitoring –

To recognize user's activities, Quality of Life and physiological state. More specifically, to detect mood, health status, mobility, usual activities and pain/discomfort.

Gathering and analyzing data from

The BNCI system - monitoring EEG, EOG, and EMG

Wearable physiological, and biometric sensors - ECG, heart-rate, GSR, and EMG

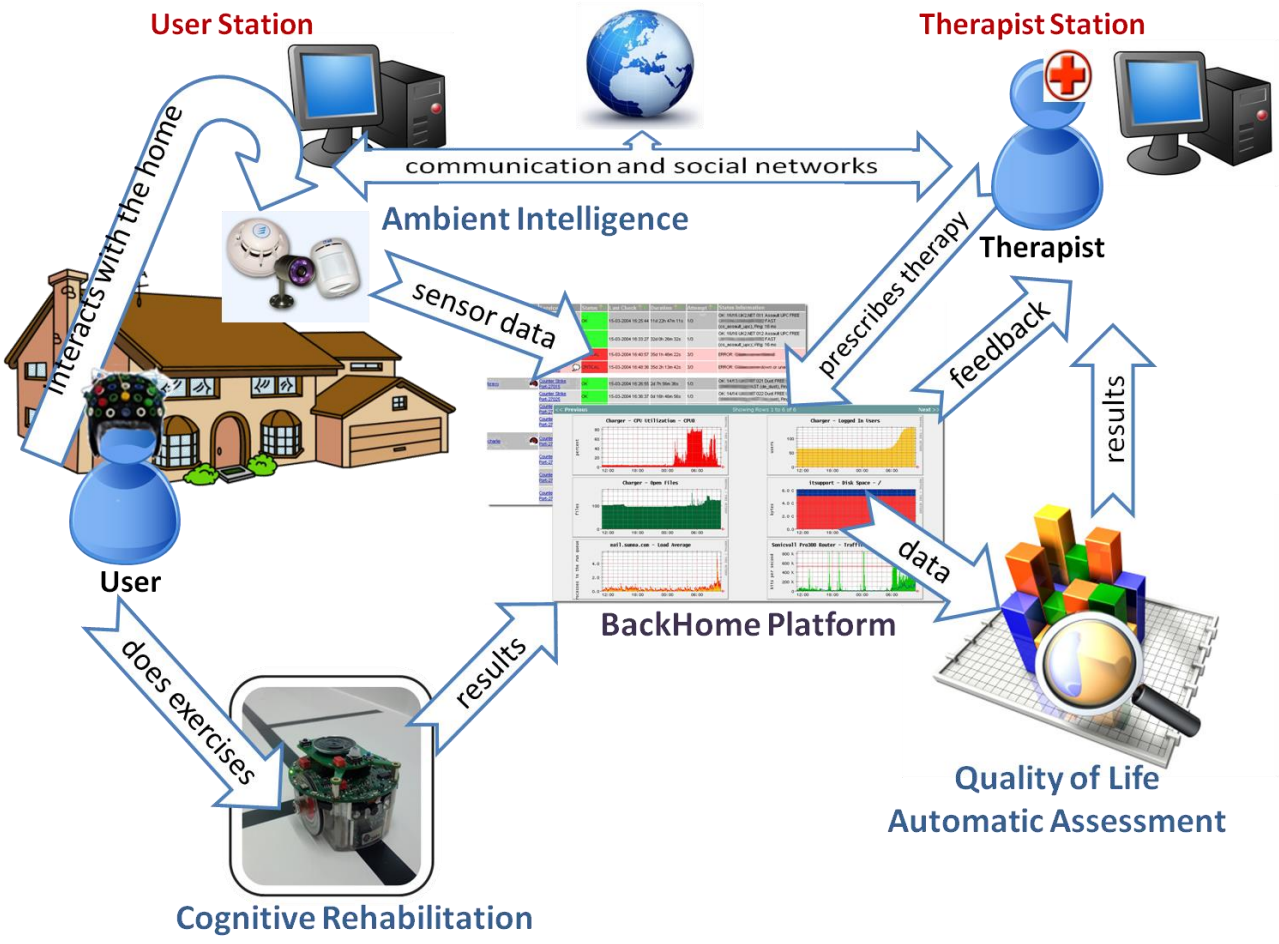
Environmental sensors - Temperature and gas sensors

Smart home devices - lights, TVs, and doors

Devices that allow interaction activities - a desktop PC

Devices to perform rehabilitation tasks - a robot

Applied Technologies
– Home Telemonitoring –



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Applied Technologies
– Ambient Intelligence –

Ubiquitous computing to access home devices and integrate services such as ambient sensors – temperature, luminosity, presence – , Television, Lights and PC combined with time and localization.

Context-aware system capable of perceiving and reacting to different situations in the environment. Several approaches implemented:

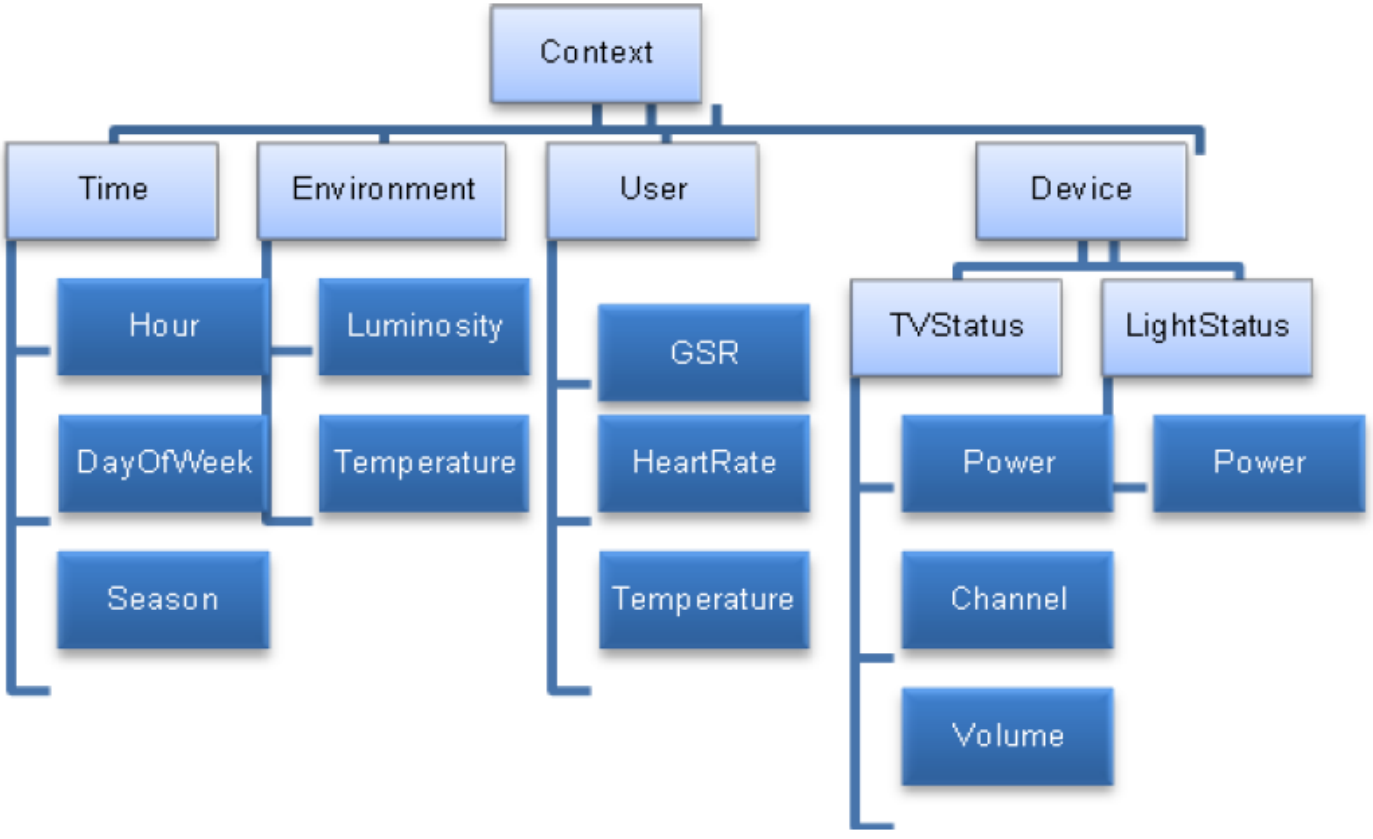
Rule based Engine for simple and known situations – alarms, concatenation of events, time events.

Trained system with Decision Trees to adapt to more complex environment

Proactive approach and adaptation to user needs by means of anticipation - Real time shortcuts recommending the user most probable need or desire at a certain time.

Use of a standards to implement a simple architecture for device interoperability **URC/UCH** (ISO/IEC 24752).

Applied Technologies
– Ambient Intelligence–



Applied Technologies
– Virtual environment –

Design and development of a multisensory virtual environment to be used with the BNCI - Training scenarios

Simulation of real environments to interface and control ambient devices, imaginary environments and interaction with the virtual world.

Communication and social interaction with networked virtual environments, character customization and emotions mapping.

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Brainable current status

Finished in 2013

Review from European Comission

"*The project has been successfully completed with a **high level of scientific achievement**. All objectives and milestones were achieved*"

Dissemination through national and regional TV channels and Youtube Videos. The commission has called us to participate in the Governmental conference in Denmark, the conference to brain research in Europe and the innovation convention in 2011.

Scientific Achievement with 40 publications, five among them with high level index such as Neuroscience. Two patents from Gtec.

Backhome is the natural continuation of Brainable.

Backhome current status

First year Prototype installed in Belfast and Würsburg at end users facilities

Services Smart Home Control, Web Browser, E-mailing, Multimedia Player, Brain Painting and memory-card game implemented and integrated.

Quality of life visual analogic scale questionnaire defined and first definition of the automatic assessment system

Future

Year two prototype will be installed on December in Belfast at **users' home**

Ambient Intelligence adaptation at user's home, localization of user at home and adaptive recommendations according to preferences and context.

Activity recognition such as sleep activity, mobility and leisure activities

User interface with hybrid BNCIs – p300 + ERS + SSVEP

Dry wireless Electrode cap from Gtec - Nautilus

ICT Day 2013 in Vilnius. Please visit us! **Stand 5B1**

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