BackHome

Assisting and Telemonitoring People with Disabilities

A joint work with:
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Outline of the talk

- Aim & Motivation
- An Overview of BackHome
- The Proposed Telemonitoring and Home Support System
- Conclusions
Aim & Motivation

- The long term rehabilitation goal for individuals with an acquired brain injury is resettlement back in the community away from institutional care.
- The ideal scenario is that the person will return to her/his previous home and life roles.
Aim & Motivation

- In the early post-discharge phase, additional home care is provided to support the individual and their family.
- Unfortunately, the provided support is often not long enough to achieve the maximum possible independence.
- The transition to the home is often very difficult and traumatic for the individual and the carers.
Aim & Motivation

Telemonitoring and Home Support Systems (TMHSSs) provide a range of services which enable patients to transition more smoothly into the home environment and be maintained for longer at home.

TMHSSs

- Facilitate services which are convenient for patients, avoiding travel whilst supporting participation in basic healthcare.
- Can be a cost effective intervention which promotes personal empowerment.
...an Overview of BackHome
BackHome Main Goal

- To assist people with disabilities back home after a discharge

- BackHome comes from the BrainAble (http://www.brainable.org/en/Pages/Home.aspx)
  - Don’t miss the BrainAble workshop this afternoon at 14.30!
BackHome Objectives

- To study the transition from the hospital to the home
- To learn how different BNCIs and other assistive technologies work together
- To learn how different BNCIs and other assistive technologies can help in the transition from the hospital to the home
- To reduce the cost and hassle of the transition from the hospital to the home
A Reference Scenario

- Paul is a 60 years old man depressed about his recent stroke
- Dr. Jones suggests him to try to use a BNCI system at home
  - At home, a nurse shows to Paul how to use the BackHome system and how it is easy to perform different tasks
  - At the hospital, Dr. Jones is able to continuously verify the status of Paul and to suggest him new and personalized exercises to his rehabilitation therapy
A Reference Scenario

- In few weeks, Paul
  - becomes more motivated
  - performs the rehabilitation exercises daily
  - joins a chess club
  - starts to talk online to friends

- Through BackHome system, Dr. Jones notes the progresses in Paul’s daily activities and in his mood, and the corresponding general improved quality of life
...the proposed telemonitoring and home support system
The Approach

User

Home

TMHSS

Social Environment

Care Center

Contexts
The Approach

- User
- Functionalities
- Home: Personal Autonomy, Cognitive Rehabilitation
- Social Autonomy
- Social Environment: QoL Assessment, Remote monitoring
- Care Center

TMHSS
The Approach

TMHSS

User

Brain Neural Computer Interface

Complementary Interfaces

Technologies

Home

Personal Autonomy

Ambient Intelligence

Cognitive Rehabilitation

Remote Cognitive Rehabilitation

Social Environment

Social Autonomy

Quality of Life Assessment System

Care Center

Remote Monitoring
The System

User Station

Therapist Station

Ambient Intelligence

User

Cognitive Rehabilitation

BackHome Platform

Quality of Life
Automatic Assessment

Interacts with the Home

communication and social networks

sensor data

prescribes therapy

feedback

results

does exercises

results
The System

From: Augusto & McCullagh – Ambient Intelligence: Concepts and Applications
The System

Aml is the “glue” technology providing the intelligent baseline framework
The System

- **Physical autonomy** (smart home control)
  - To turn on/off a TV
  - To open/close a curtain
  - To set the room temperature

- **Social autonomy** (social networking)
  - To communicate with the therapists
  - To communicate with relatives
  - To communicate with friends
The System

- **Telerehabilitation technologies**
  - image-based
  - sensor-based
  - virtual environments and virtual reality

- **Cognitive rehabilitation** addresses how to
  - improve cognitive performance by practicing on certain tasks, implemented in computer applications (cognitive training)
  - integrate brain measurements into computer applications enabling user to consciously control the corresponding application (BCI)
The System

Performing cognitive activities through:

- a communication system
  - to plan future patient activities
  - to personalize exercises and activities
- sensors-based technologies
  - to monitor exercise execution and performance
  - to perform cognitive activities (e.g., Brain Painting)
- smart objects
  - to perform cognitive rehabilitation task (e.g., with a robot)
The System

User does exercises at home interacting with smart objects

The user station stores all the gathered information and sends it to the therapist station

Therapist assigns personalized exercises tasks

Closed loop treatment

Therapist reviews data of previous exercises
The System

- QoL is the subjective experiences or preferences expressed by an individual in relation to specified aspects of her/his life, with a particular reference to the health status.
The System

- The QoL assessment system will help answer basic questions about the state of the user, such as
  - “is she depressed?”
  - “has she decreased her activity level?”
  - “is she more engaged in social interactions?”
The System

- **BackHome challenge**
  - Automatic assessment of QoL

- **BackHome approach**
  - To adopt a standard questionnaire
  - To gathered data from sensors
  - To infer data by relying on data mining algorithms
Work in Progress…

- Wearable and environmental sensors selection
- Information gathering and fusion of all the provided data
- Cognitive rehabilitation tasks definition
- Machine learning approaches selection and/or definition
Conclusions

➢ Telemonitoring and home support of people with disabilities
➢ A sensor-based system that relies on
  ▪ Ambient Intelligence
  ▪ Cognitive Rehabilitation
  ▪ Quality of Life Assessment
Conclusions

- BackHome
  - Website: www.Backhome-FP7.eu
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  - Consortium
Thanks for your attention!

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