



Closed-loop system for personalized and at-home rehabilitation of people with Parkinson's disease

Issue 03

Page 1

Welcome to the third of the six monthly newsletters for the CuPiD project.

Plenary Meeting

The CuPiD Winter Plenary took place in late February in the historic city of Bologna and was hosted by CuPiD's lead partner Università di Bologna (UNIBO). Spread over three days, the CuPiD consortium gathered for workshops on Exergaming, Freezing of Gait and Biofeedback scenarios. These include demonstrations and planning of the pilot trials for each scenario. CuPiD member UNIBO presented the GUI for the biofeedback training of the gait prototype and answered questions concerning the scenario of use, the kind and frequency of feedback and proposed exercises tailored by clinicians.

Eidgenössische Technische Hochschule Zürich (ETHZ) presented their current development including algorithms for freezing detection, data acquisition for freezing prediction and development of algorithms on smartphones. Fundació Illes Balears Innovació Tecnològica (IBIT) presented two games for the Exergaming platform and the server to manage rehabilitation therapies and patients.



CuPiD Consortium at Work!

CuPiD Passes its First Review

The CuPiD project has passed its first European Commission Technical Review Report with good progress made towards achieving its objectives and technical goals. The Review Report highlights the good quality documents and reports that CuPiD has produced. The Report also states that the project management is efficient and has produced correct documentation.

Partners:

Università di Bologna (Italy)
Tel-Aviv Sourasky Medical Center (Israel)
Eidgenössische Technische Hochschule Zürich (Switzerland)
KU Leuven (Belgium)
Oxford Computer Consultants (UK)
ST Microelectronics (Italy)
EXEL (Italy)
Fundació Illes Balears Innovació Tecnològica (Spain)

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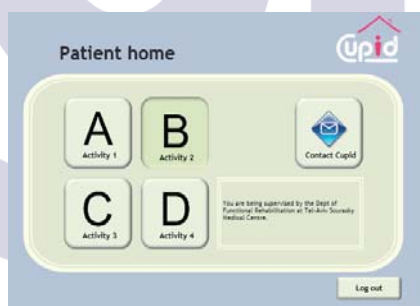


The review board believes that the project's early results indicate successful detection of gait-related events and FOG and states that our involvement of patients and other potential users is well balanced. It recognised the participation of the consortium in events on behalf of CuPiD and their approaches to potential partners. Resources have been utilised by the consortium and individual partners to achieve the goals set by the European Commission. Progress has been made to solve particular tasks in an effective and transparent manner, whilst the consortium's approach continues to be relevant to PD.

CuPiD User Interface (UI)

The CuPiD Telemedicine system is a new infrastructure component built for the CuPiD project. It is agnostic about the implementation of the services it supports in that it provides generic functions to the main CuPiD users: the patient at home, the clinician supervising them and an administrator.

The Patient UI has been developed to be operated via a touchscreen. The main page shows a list of activities (services).



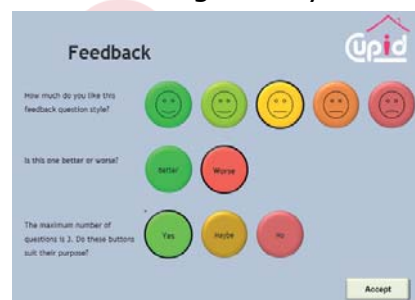
Main CuPiD User Interface (UI)

To select a service, the user touches one of the buttons on the screen which launches the service.

When a service is launched, what the user sees lies outside of the main CuPiD UI. In the case of Exergaming it is likely to be an exercise menu or start page. For audio biofeedback the user could have the option of starting with an instructional video showing how to attach sensors correctly.

When the user wishes to return to the Main Page, they select the « Finish » button and are returned to the main CuPiD UI.

There is an opportunity to provide feedback (optional). The questions and number of responses are configured by the clinician.



Feedback page

Sensors Product Specification

CuPiD consortium member EXEL have produced the EXLs1, wireless Inertial Measurement Unit (IMU). EXLs1 is an inertial sensor based on MEMS technology and wireless communication (Bluetooth TM) made for motion measurement, acquisition and transmission. It features a complete IMU sensor set with full axis gyroscope, magnetometer, accelerometer, vibration

sensor and temperature sensor. It is a wearable device for body movement analysis including: posture assessment, rehabilitation, gait monitoring, joint biomechanics analysis and activity monitoring. The built in Flash memory allows data logging over long periods of activity. Data can then be retrieved by using a Bluetooth™ connection or USB interface.

The EXLs1 was on display at EXEL's stand at MEDICA 2012 in Dusseldorf from 14th to 17th November 2012. MEDICA is the world's largest medical marketplace organized annually and consists of lectures, seminars and workshops and includes presentations by experts in patient care.



Data retrieval for body movement analysis

International Conference on Neurorehabilitation

Laura Rocchi (Università di Bologna) attended the 2012 International Conference on Neurorehabilitation in Toledo, Spain, last November. Laura co-presented a session entitled Moving rehabilitation at home:

how technology can answer to the clinical needs. The aim of the session was to provide an overview of the emerging technology that could make Neurorehabilitation feasible at the patient's home in the future. The session showed that when rehabilitation is undertaken at home this can increase both access to training and its effectiveness whilst maintaining the overall cost therefore making it sustainable.

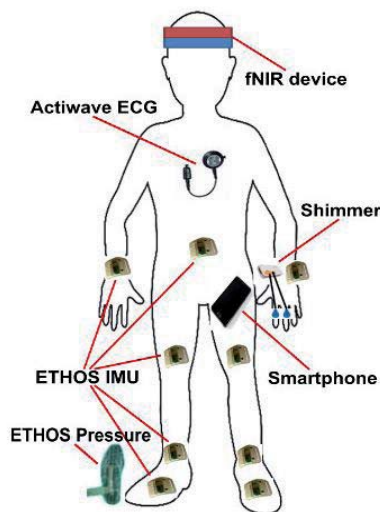
SLAM Conference

The 4th Augmented Human International Conference took place in Stuttgart, Germany, 7th and 8th March 2013. Sinziana Mazilu presented the paper Engineers Meet Clinicians: Augmented Parkinson's Disease Patients to Gather Information for Gait Rehabilitation by Sinziana Mazulu, Eran Gazit, Ulf Blanke, Daniel Roggen, Jeffrey Hausdorff and Gerhard Troester.

Many people with Parkinson's disease suffer from freezing of gait, a debilitating temporary inability which makes walking difficult. Rehabilitation with wearable technology is promising. State-of-the-art approaches face difficulties in providing the necessary biofeedback with sufficient low latency and high accuracy, as they rely solely on the crude analysis of movement patterns allowed by commercial motion sensors. Yet the medical literature hints at more sophisticated approaches.

The paper contains the first steps to address this with a rich multimodal approach combining physical and physiological sensors. It describes the

experimental recordings conducted on 18 patients with 35 motion and 3 physiological sensors, collecting over 23 hours of data. Best practices are used to ensure robust data collection which allows real requirements for real world patients to be considered, together with evidence from a user questionnaire that the system is non-invasive and that a multimodal view can leverage across modal correlations for detection or even prediction of freeze of gait episodes.



5 sensor system and on body locations

Image taken from Engineers Meet Clinicians: Augmented Parkinson's Disease Patients to Gather Information for Gait Rehabilitation by Sinziana Mazilu, Eran Gazit, Ulf Blanke, Daniel Roggen, Jeffrey Hausdorff and Gerhard Troester.

Upcoming Events

Annual Body Sensor Network Conference

Filippo Casamassima (UNIBO) will be participating in the 10th Annual Body Sensor Network Conference 2013, in Cambridge, USA, 6th to 9th May 2013. The conference will be focusing on Wearable and Implantable Body Sensor Networks,

providing attendees with a unique forum to discuss key issues and innovative solutions involving sensors for measuring tremors. Filippo Casamassima will be presenting work based on EXLs1 nodes on the synchronization of the Body Area Networks.

IV Conference RDI on ICT and Health

Xisco Tous (IBIT) will be attending the IV Conference RDI on ICT and Health, in Girona, Spain, 22nd and 23rd of May, to present a paper on CuPiD Exergaming platform. The conference is organized by the Eurorégion Pyrénées Méditerranée with the objective of bringing improved supply and demand in ICT and Health projects, presenting the most innovating projects and promoting them to reach the market.

King's Fund Third Annual International Congress on Telehealth and Telecare

Reynold Greenlaw and Andrew Muddiman will be attending the King's Fund Third Annual International Congress on Telehealth and Telecare in London on Wednesday 3rd July to present a poster on CuPiD to the congress audience. The poster will be on display throughout the 3 day conference. The congress enables people to come together to showcase new ideas, new research and new innovations in telehealth and telecare that have been shown to support improvements in the care of people with long-term conditions and other health social care needs.

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