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

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

Preliminary findings from validation stage

The first 14 patients (mean age: 64.5 years; 3 women, mean disease duration: 10.8 years) who completed training using the system were able to successfully use the technology and reported high satisfaction with its use. Usual walking speed, step length and a 2 minute walk test were all improved. These Initial findings suggest that patients with Parkinson's can use the CuPiD system in the home and community setting, without professional supervision, and that it may be an effective tool for home-based rehabilitation.

Patient during training

CuPiD meeting in Palma

The latest consortium meeting was held in Palma, Majorca on 11th and 12th November which was arranged by CuPiD member IBIT. All the members were there; they discussed and assessed the success of the CuPiD project as it draws to a close.

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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eHealth
European Commission
Information Society and Media
SEVENTH FRAMEWORK PROGRAMME

Changes / enhancements to the sensors' hardware and firmware

The team at Exel have been working on CuPiD's sensors to enhance the features of the hardware and firmware.

The main improvements to the sensors are:

- Tuning of hardware and firmware to improve the quality of the data collected and its reliability, which will give more accurate measurements. It is possible to use the sensors as a standalone wearable inertial datalogger which means that the data collected is stored on the internal drive, instead of being sent to a Smartphone or PC. This is useful when no real-time data processes are required, as in the case of activity monitoring. A data file can be retrieved later using a memory stick or via a sensor's dedicated docking station.
- In the Status Bar, a notification message now appears listing the beginning and end of the synch activity, together with telemedicine information such as the number of files sent, sessions synchronised, etc.
- Trunk and clearance are the only two parameters that depend to a certain extent on the sensors' placement to particular parts of the body. In order to allow for patients not always wearing the sensors in the same place on the feet and trunk, they are referenced during the first steps taken and not during calibration. Feedback is given by requesting that the user keep the same clearance and trunk posture.
- Development of a new PC application for configuring and controlling the sensors means that pairing of sensors is automatic and are now managed and executed directly from the ABF app. The app pairs the sensors before connecting the EXLs3 to the Smartphone which means that the patient is not required to give permission for the CuPiD sensors to pair.

The production and testing processes have been fine tuned prior to manufacture of the new sensors (CuPiD V3 - alias EXLs3) and the much-improved product is being presented at Medica Trade Fair which is held in Düsseldorf in November.

Advances in Wireless Body Area Networks, European Conference euCNC 2014

The 2014 European Conference on Networks and Communications (EuCNC) was held in Bologna on 23rd June. Co-hosts and project lead, Università di Bologna (UNIBO), presented a live demonstration of the Audio Biofeedback app for CuPiD during the workshop on Wearable Body Sensor Networks for Motor and Cognitive Rehabilitation.

Ambulatory sensing in balance control and fall prevention; Application in Parkinson's Disease

Montecatini in Italy saw the CIMTEC 6th Forum on New Materials in June. In a special session on Wearable and Implantable Sensor Systems, Lorenzo Chiari (UNIBO) was invited to present the project with a talk entitled "Ambulatory

sensing in balance control and fall prevention; Application in Parkinson's Disease".

2014 ISPGR World Congress

The 2014 International Society for Posture and Gait Research (ISPGR) was held from 29th June to 3rd July in Vancouver, Canada. CuPiD presented posters on:

- Inertial measurement units for monitoring spatio-temporal gait parameters in Parkinson's disease: Validation in a clinical setting
- Wearable auditory biofeedback of gait for persons with Parkinson's Disease
- New Smartphone system for personalized and at-home rehabilitation of people with Parkinson's disease: Preliminary Clinical Experience
- Detection of freezing of gait in Parkinson's disease patients during daily living activities

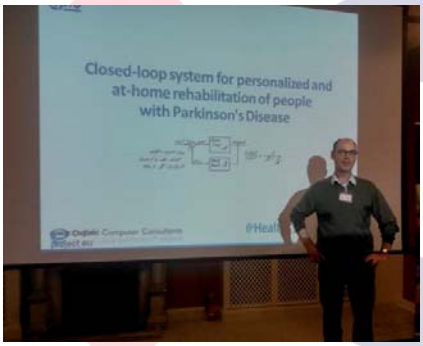
The posters all received great interest from participants.

Digital Health Oxford

Reynold Greenlaw from OCC presented the CuPiD project at Digital Health Oxford's 5th meeting on 7th July. Reynold was one of three speakers and he presented "Wearable technology for cueing Parkinson's gait".

Audience at Digital Health Oxford

Digital Health Oxford is a cross-disciplinary and cross-sector group that aims to promote all things related to digital health within Oxford. It brings together researchers, developers, clinicians, entrepreneurs, patients, engineers, designers and others interested in Digital Health, by providing friendly and informal meetups, with accessible talks and an opportunity for networking and idea-forming.



Reynold presenting at Digital Health Oxford

Demo day at OCC

The Cure Parkinson's Trust visited OCC's office in Oxford on 17th June. Reynold Greenlaw and Andrew Muddiman from OCC demonstrated Audio Feedback and the Exergaming from the CuPiD project. The Cure Parkinson's Trust are partners on an EU funded project called Sense-Park.

The Cure Parkinson's Trust trying the telemedicine system

Telemedicine system with sensors

In the Sense-Park project people with Parkinson's disease are encouraged to wear small motion sensors during daily life in order to objectively record and measure the symptoms of this complicated movement disorder. With CuPiD, similar wearable motion sensors are used to provide exercises. The photographs opposite show an example where the arm gestures and sit-to-stand movements of the user move an avatar on the screen.

Medica International Trade Fair 2014

Medica International Trade Fair took place in Düsseldorf from 12th to 15th November. Medica is the world's largest trade fair for medicine and medical technology. CuPiD partner Exel exhibited wearable technology including the CuPiD sensors.

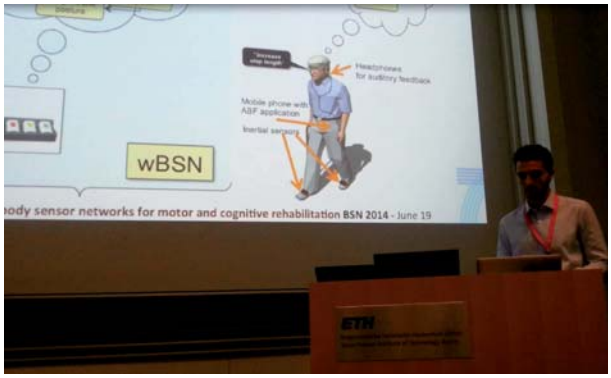
Article in Berner Zeitung

ETH Wearable Computing Lab was mentioned in an article in Berner Zeitung, which includes ETHZ's work on Parkinson's for CuPiD FoG GaitAssist.

International Conference on Wearable and Implantable Body Sensor Networks

ETHZ hosted the 11th International Conference on Wearable and Implantable Body Sensor Networks (BSN2014) in Zurich in June. With 9 exciting workshops, 21 talks and 22 posters, BSN2014 offered a wide variety of events and topics for the body sensor network field. BSN2014 provided researchers and industry practitioners with a unique forum to discuss the latest work utilising body sensor networks.

Sinziana and Alberto demonstrating biofeedback



Alberto presenting CuPiD at BSN2014

Matrix Reloaded Event

ETHZ were invited to present its CuPiD GaitAssist system to the 'Matrix Reloaded' event for Vontobel Investment Bank.

The Gait-Assist banner at Matrix Reloaded

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