

SENSE-PARK

FP7-INFSo-ICT-288557

Name of deliverable: D1.6.2 Public report for year 2

Due date: month 24

Start date of the project : 1.10.2011

Duration: 36 months

Responsible of the deliverable: Partner 1 (EKUT)

Target Dissemination Level: PP

Status of the Document: final

Project web site : www.sense-park.eu

Public report for year 2

Project context

At the current time, measurements of PD symptoms that are used for disease management and also for therapeutic trials are almost all performed in a clinical setting which only provides a subjective snapshot of the disease and does not reflect the daily life situation of people with Parkinson's disease (PwP) on an objective basis. Compared to the daily life the clinical setting is artificial and one can hardly draw reliable conclusions for daily living situations from results obtained in this artificial environment. Moreover, the clinical scales used for measurement have a strong subjective component. (see figure 1) This leads to misinterpretation of symptoms' occurrence and severity, and consequently to problems with regard to self-awareness of disease state, patient-doctor and patient-caregiver interaction, definition of disease progression, and in choosing the best therapeutic intervention. Moreover, therapeutic trials for disease modifying treatment have to do with semi-subjective clinical rating scales which might not be able to detect subtle changes associated with such treatment.



Figure 1: Results of the rating exercise on the SENSE-PARK web site showing the high bandwidth of scoring a symptom of Parkinson's disease. Persons that do this exercise are first shown videos of patients with the respective symptom that show the correct rating of 0-4 and then asked to rate two videos on their own.

Objectives

A sensor information and data capture system (SENSE-PARK system) of disease-relevant parameters of PwP's' daily life, including routine activities (first level) and leisure activities (second level) will be developed, and validated by implementation of scientifically established tasks (third level) in the home environment of the user. Feasibility (primary outcome) and usability (secondary outcome) of the system will be tested. Target parameters will be isolated to cover not only motor but also non-motor aspects of the disease.

Taking the different perspectives SENSE-PARK addresses, the objectives of the project are

1. ICT-perspective: to develop, validate and implement a novel multimodal sensor information system which is modular, extendible, adaptive and minimally obtrusive, and which is based on the patients' needs and requirements.
2. PwP's' perspective: to provide disease-relevant information to the user about daily activity performance. This should increase self-awareness and activity, and stimulate the user to overcome frustration and apathy associated with the disease.
3. Clinical and scientific perspective: to provide individual, unbiased, disease-relevant information (a) to the doctor, as a basis for a better medical and occupational therapy as well as to collect data about patterns in the progression of PD, and (b) to the scientist, as the basis for designing disease-relevant progression markers for future therapeutic trials.

Description of work performed and main results

SENSE-PARK consists of eight work packages of which the work packages 1 (project management), 2, 3, 4, 5, 6, 7 and 8 have been active in the second year of the project. According to the initial plan work package 7 should commence at month 25, however, has already started in year two to draft the protocol for the clinical study (see below).

The list of the SENSE-PARK is as follows:

- **WP 1** Project Management
- **WP 2** Define needs and requirements
- **WP 3** Designing friendly and useful interfaces for PwP's and the doctors
- **WP 4** Define clinically/scientifically relevant parameters to measure PD, and monitor disease progression
- **WP 5** Sensor system development and data interpretation
- **WP 6** Integration, IT infrastructure and telemedicine
- **WP 7** Scenario-based multicentre study
- **WP 8** Coordination/Networking/Training Activities and Facilitating the "Voice" of PwP's

Main project milestones reached

Results / milestones	Subsequent action
Wearable system fully functional for measurement of gait, sleep, bradykinesia and tremor as well as first usability tests done	User testing including clinical study and implementation of respective improvements Validation of measurement of relevant symptomatic domains
Hardware component (wii balance board) for gaming and virtual reality-linked test environment functional; gaming environment used for measurement of cognitive function; validation of test games for measurement of cognitive function	Further user testing Validation of sway measurement Clinical study
Interface/navigation solutions which can be used for the scenario-based study	Further user testing with real data and implementation of respective improvements

Summary of work performed in the work packages in the second year of SENSE-PARK*Summary of starting point at begin of project year 2:*

- **WP2** (Define needs and requirements): Identification of symptoms to monitor based on needs and requirements analysis, approach for communication between PwP's and technologists developed
- **WP3** (Interface design for PwP's and doctors): Relevant problems and requirements of People with Parkinson's in regards to the user interface determined
- **WP4** (Define clinically/scientifically relevant parameters): List of measurable symptoms / signs of Parkinson's disease in the home environment defined, proposal how relevant parameters can be extracted out of the obtained raw data and be validated, determination of the most useful hardware solutions to detect those six Parkinson's disease symptoms that have been defined as the most important to be assessed by the SENSE-PARK system
- **WP5:** (Sensor system development and data interpretation): Concept for the Hardware implementation developed
- **WP6** (Integration, IT infrastructure and telemedicine): Software requirements specification developed
- **WP8** (Coordination/Networking/Training Activities and Facilitating the "Voice" of PwP's): survey that obtained quantitative data about the priorities of symptoms, recruitment and first meetings of Focus groups, second survey that collected information about PwP's use of, access to and attitude towards current technologies and their attitude to new technologies as well as to investigate issues of access and practicalities of use in the home.

Work package No	Work package title	Summary of work performed and results achieved
1	Project management	<ul style="list-style-type: none"> • Coordination, administration, communication and monitoring according to projects needs • Reporting according to EC requirements • Relaunch of web site • Organisation of "Marketing and Commercialisation" workshop
2	Define needs and requirements	<ul style="list-style-type: none"> • Refine and finalise need and requirements for the system based on the project prototypes of the SENSE-PARK system • Testing prototypes (sensors, the docking station, interface programme, instruction leaflet) for non-functional aspects (look and feel, usability and human personal requirements) in real life conditions (24 h) • Determination of use case scenarios that exemplified the possibilities and limits to the use of the system.
3	Interface design for PwP's and doctors	<ul style="list-style-type: none"> • Iterative development and testing a prototype of the user interface software • Prototype of user interface software with most of the required functionality and fir for clinical study

4	Define clinically/scientifically relevant parameters	<ul style="list-style-type: none"> • Development and partly implementation of validation strategy • Cognitive function domain validated • Development for Protocol for level 3 testing in the scenario-based approach
5	Sensor system development and data interpretation	<ul style="list-style-type: none"> • Hardware and firmware prototype • Set up of components for gaming and (link) to VR environment for measurement of “cognitive function” and “sway” • Validation of “cognitive function” testing • Development and implementation of “tremor” algorithm, “sleep” algorithm, “sway” algorithms • Development of “gait” algorithm and “Bradikinesia/Akinesia” algorithm
6	Integration, IT infrastructure and telemedicine	<ul style="list-style-type: none"> • Development of a home-based PC software application (Central Administration Tool, ‘PDCAT’) for management, storage, analysis and visualization of data, parameters as information relevant for daily life of PwP such as medication, diary and survey • Development of SENSE-PARK App for medication reminder and event registration
7	Scenario-based multicentre study	<ul style="list-style-type: none"> • Drafting and discussion of the clinical study design for year 3 of the project
8	Coordination/Net working/Training Activities and Facilitating the “Voice” of PwP’s	<ul style="list-style-type: none"> • Planning and implementation of the first two testing phases ((i) usability of the hardware, (ii) first testing of functional systems) • Focus group meeting on hardware usability, cognitive testing and interface design • Preparation of draft instructions for use of the system • Dissemination and awareness measures for SENSE-PARK



Four sensors: three worn during days and one during nights



Wii balance board, interface and data analysis, SENSE-PARK App
Figure 2: SENSE-PARK hardware and software

Expected final results and their potential impact and use

SENSE-PARK aims to develop a novel multimodal sensor information system which is modular, extendible, adaptive and minimally obtrusive, and which is based on the patients' needs and requirements. Its effectiveness will be proven by implementing the pressing and unsolved issues of self-dependent management of Parkinson's as well as provision of accurate parameters for disease modifying therapeutic studies. SENSE-PARK aims to achieve a significant research, economical and medical impact through a fast use of the developed system either through the commercialisation of the system for PwP's, in a continuation research project or in therapeutic trials. In order to put SENSE-PARK into an optimal position for this SENSE-PARK will – in addition to usability and feasibility - lay particular emphasis on the validation of the systems and on the publication of the validation in peer review scientific journals.

Project web site

www.sense-park.eu

SENSE-PARK
 Supporting and Empowering Parkinson patients in their home environment using a novel sensory information system that monitors daily-life-relevant parameters of Parkinson disease and their change

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Personal Accounts

WP 1 WP 2 WP 3 WP 4 **WP 5** WP 6 WP 7 WP 8

HOME:
 The future treatment of Parkinson's relies on the accurate assessment of how it affects people with Parkinson's as individuals. SENSE-PARK is a pioneering project which combines expertise from technology with the experiences of those who live with Parkinson's and the scientific know-how of those who treat it. Current measurement of Parkinson's relies on clinical appointments which does not provide a continuous objective picture over 24 hours – a picture that becomes essential when considering disease patterns, trends and modification. To map these characteristics, it is essential that continuous objective measurement be implemented. Measuring Parkinson's by means of clinical scales provides only a subjective snapshot of the disease. SENSE-PARK provides an alternative way of measuring Parkinson's.

SENSE-PARK is funded from the European Community's Seventh Framework Programme under grant agreement No. INFOS-ICT-2011-288557

Scoring Parkinson's - Test yourself

COOPERATION