Technology Transfer in Computing Systems

D3.6: Individual TTP6 abstract

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TETRACOM D3.6: TagTrainer Transfer Project: TaTra

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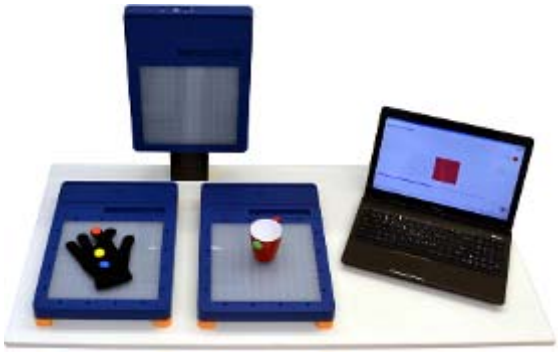
Worldwide stroke is the first cause of problems with fine motor skills and thus of problems with common activities of daily life. Every year, 15 million people worldwide suffer a stroke meaning that 1 in 6 people will have a stroke in their lifetime. And this is increasing due to aging, obesity and higher survival rates of patients. Impaired arm-hand performance is a serious and underestimated problem that is associated with poor quality of life after stroke. 4 years after stroke, 67% of Dutch stroke patients still report non-use or disuse of the affected arm as a major problem. Next to stroke, many other indications result in impaired arm-hand performance, such as: cerebral palsy, multiple sclerosis, spinal cord injury, ...

Improving rehabilitation therapy to reduce non-use or disuse of the affected arm is not straightforward. In part due to the substantial costs involved. In part because there are no effective technological aids on the market to support such efforts. Within the WikiTherapist project, TU/e, together with Adelante Rehab Centre and other partners, has developed a unique computer-aided therapy device for sensor motor arm-hand skills training, TagTrainer. Research has shown that the system can significantly improve arm-hand skill performance in patients with stroke or cerebral palsy. Next to improving the therapy outcome, therapy costs are reduced because with the TagTrainer, patients can train without constant supervision by a therapist. Also patients' comfort is improved, they can exercise when it fits them, in their own time and even in their own home.

The training is also very cost-effective: the potential reduction in annual healthcare costs exceeds 250 M€ in the EU alone, next to an estimated 250 M€ in societal benefits.



The aim of this TTP project is to ready the prototype software of the TagTrainer for commercial use and transfer it to Symbio Therapy.

The TagTrainer software is a Java based set of applications to generate and execute rehabilitation exercises that run on the proprietary hardware (connected via USB) of Symbio Therapy: the TagTiles boards (see picture). To that end the TagTrainer software offers an easy to use user interface to enable therapists to create exercises of their own design by dragging en dropping exercise components to a timeline. The program subsequently generates ESPranto code. ESPranto is the proprietary high level language used by Symbio Therapy to program its hardware. To execute exercises an easy to use shell is used. Therapists can schedule any of the created exercises in a customized sequence for each individual patient. The patient can then perform the exercises without further assistance from the therapist.

In the project first a development environment was set up, incorporating the TagTrainer codebase and the Symbio Therapy development kit, which were previously separated. This enabled to henceforth develop all parts of the code in an integrated manner.

Second, the prototype code exhibited major stability and performance issues. Some were related to the communication with the TagTiles boards. These were resolved by monitoring and identifying all communication

from and to the boards, pruning the superfluous exchanges and optimizing the other. A way to re-calibrate the hardware from inside the TagTrainer software was added. Other issues were due to the evolutionary manner the prototype code was developed. A code review was done and subsequently, an iterative, systematic and system wide rigorous testing and bug fixing program was executed. Several internal processes were redesigned and many bugs and application errors were fixed. This took care of the critical usability improvements.

An intermediate version of the TagTrainer was released to partners for trials in a clinical setting. Based on the test results and a previous requirements analysis a 2nd round of usability improvements was executed. This included general optimizations to the user interface, for instance, making the user interface multilingual, English and Dutch are supported but now other languages can be easily added. This also included the addition of a performance feedback module, critical to the clinical use of TagTrainer as it bolsters the motivation of the patient and enables the therapist to follow the progress of each patient. Also the communication with the database was optimized. This included the testing and fixing of import/export issues critical to enable application updates in the field during use. The work was finalized by writing the user manual and creating an installer.

The TTP project has successfully delivered a first version of the TagTrainer software that can be used in a therapeutic setting in clinics. This provides a solid basis to produce a full commercial product, the development of which will continue within Symbio Therapy.