ID PROJECT
LONG DESCRIPTIONS
2014-2015 - Q1 & Q2

SMART HEALTH
Smart Moves

Abstract
Wearable technology and interactive games offer an untapped potential for rehabilitation technology. They can register human motion more accurately than human observers, they provide feedback, or even guide movement and correct it. They can motivate people to train movements or to keep correct posture in a fun way and over sustained periods of time. Good design in this domain requires thinking out of the box to provide a fresh approach that uses the new interactive materials we have out our disposal nowadays like smartphones, and textile electronics. It requires attention to context and sensitivity to different stakeholders, and good skills to interact with medical domain experts.

Main competency development targeted in:
IT; UFP; FS; SCA

Targeted blocks
B1-bc; B2-bc; B2; B3.2; M1.1; M1.2

Design challenges or research questions
We seek innovative design students that will break new ground in rehabilitation technology, and do so with attention to aesthetics, comfort/wearability and giving rise to pleasurable and fun experiences. Design projects are planned that can deliver integrated prototypes, that demonstrate a coherent and validated design concept. Overall we look to advance the state of the art with a prime attention to the comfort and well-being of patients. We focus on training the body, e.g., arm and hand skills, posture maintenance.

Wearable proprioception
We know and we sense our movements and we can know how we move thanks to our proprioception. For people trying to keep a particular posture or to carry out a particular movement, this proprioception can be compromised by fatigue, inability to monitor it for a long time, or a damaged nervous system. In the case of physiotherapy exercises damaged ‘intrinsic’ feedback compromises the ability of patients to check if they carry out exercises correctly. We look for applications of wearable rehabilitation technology to provide personalized feedback to patients that will provide to them feedback regarding their movement and posture. For example, a garment can be extended with sensors and actuators to remind you to stay upright, or that help you keep your balance.

Figure 1: Wearable sensors
Gamification of training

Training for sports or for physiotherapy can be tedious. One’s internal drive diminishes with time and may not be sufficient to sustain training. Games promise to increase enjoyment and perhaps let players engage in a game. This project can be approached at several levels:

a - proposing novel game concepts to support training of patients in physiotherapy
b - investigate the psychological mechanisms by which patients get in the flow and persevere with training
c - see how gaming can be used to profile and log patient progress
d - seeing how gamification can be applied as a concept in standard rehabilitation training or in daily life independent of a specific game.

Squeeze to fit

The specialized hand-physiotherapists of the ‘hand centre’ in Eindhoven diagnose and treat patients with all kinds of hand injuries. Injuries range from tendon and nerve damage to amputated fingers. The physiotherapists’ goal is to get as much as (painless) movement back into the hands of their patients. There is a need for tools that help them achieve their goal. This project will require a hands-on iterative approach in which you will develop several prototypes. You will be able to talk to a team of experts, test your prototypes with them, observe live treatment sessions and in this way develop your concept and product. Your assignment can be one of the following:

a - design and make an ergonomic tool that can measure grip strength of all individual fingers.
b - design and make an ergonomic tool that can measure the amount of stretch strength for each finger.
c - design and make an ergonomic tool that can measure the rotation of the wrist in several angles.

References

Abstract
This project aims at designing intelligent products, systems and/or related services for enhancing comfort and bonding of newborn children at home or in hospital environments. In case of a hospital the aim is to create a home-like, natural environment which supports a healthy development of the baby and its parents.

Main competency development targeted in:
IC; IT; UFP; FS

Targeted blocks
B3.2; M1.1; M1.2.

Introduction
Home is where the heart is. This saying is more than true for a mother who just gave birth to her child. Home is valued the best place to build a strong bond between parents and their baby.

Figure 1: Looking for comfort (koleksifoto.com)

In this project, you will design with a new and out of the box approach to enhance comfort and bonding of newborn children. In a hospital environment, the aim is to create a home-like, natural environment which supports a healthy development of the baby and its parents. You will investigate and combine the latest insights in baby monitoring and parent-baby bonding mechanisms and technology. Think for example of a monitoring system without obtrusion or physical intrusion, or other specific applications in a smart home.

It is well known that mammals get acquainted with their newborns through their senses, i.e. smelling, tasting, feeling, seeing and hearing. These senses also play a very important role for creating comfort and bonding for the human species, especially in the period right after birth. Of course, it is up to you to focus on a particular sense or combination of senses.

Previous projects
In our Theme several designs for babies at hospitals have been created, such as the much praised Smart Jacket for babies, used for monitoring its health and well-being.

Figure 2: Smart jacket design by former ID student Sibrecht Bouwstra

We discovered that, by analyzing baby movements with a clever industrial design, we were able to see the world through the eyes of a baby and break the boundaries between parents and medical technology.

It was fascinating to see that by giving feedback with colorful wings of a butterfly, the baby’s emotion is
communicated to the parents which result in rich interactions.

**Figure 3:** Design by ID student Kyra Frederiks

**Support and cooperation**
You will have the opportunity to work closely together with medical experts of Máxima Medisch Centrum (MMC). MMC Experts and Theme experts will support you in a user study, provide feedback on your concept and prototype and/or facilitate the performing of tests. The project should provide sufficient possibilities for individual competency development in a team or as an individual. In principle you are allowed to choose a direction which meets your study goals best. For example you may want to focus on social interaction, technology (such as non-obtrusive monitoring), user centered design or business modeling.

**Design challenges or research questions**
Starting from researching scientific findings and new monitoring, analyzing and feedback technology on the one hand, and demands for more comfortable solutions for bonding parents and their newborn on the other, you will design a meaningful concept. Mammal biology, as well as the minds and senses of the newborn will be explored. The concept you create has to be relevant for the users and have value for its stakeholders. Your concept needs to be followed by a functional prototype which proofs the principles behind your design.

**Development theme**
This project supports and develops the vision of the theme as a whole in the specific application area of the health. By making sure students develop a personal vision on the future of the baby care and parent-child bonding and then realizing this vision in working prototype, we believe a strong development can be guaranteed. The ultimate goal of these prototypes is that we can collect them in a new neonatology experience lab. Where we can invite possible clients and other interested parties and show our developments, vision, and mission of not only the theme but of the whole department.

**References and citations**
[1] [http://www.smartjacket.id.tue.nl/](http://www.smartjacket.id.tue.nl/)
[2] [http://www.idemployee.id.tue.nl/w.chen](http://www.idemployee.id.tue.nl/w.chen)
Health Coaching

Abstract
This project is about supporting this self-discovery, and supporting coaching to help people improve upon specific behaviours and address different health conditions. We look both at healthy people with some slight complaints that motivate them to a healthier lifestyle and to people with chronic conditions (like diabetes, or recovering an operation) who need to adjust their diet or activity patterns [4].

Main competency development targeted in:
IC; IT; UFP; DMM.

Targeted blocks
B3.2; M1.1; M1.2.

Introduction
Monitoring your own behaviour is one of the most reliable ways to achieve behaviour change and a cornerstone for many health regimes like; diet programs, fitness programs, or approaches to reducing tobacco consumption.

More subtle than setting quantifiable behavioural objectives and monitoring progress is the possibility to increase self-awareness, to look at relations between behaviours, habits, contexts, and let people increase their awareness and learn from reflecting on their own behaviour [6]. For example: is it the stress at work or the late evening facebook interactions that keep someone awake in the night? What makes one person feel refreshed after a few hours of sleep and the other one not?

Figure 1: Sleeping problems? (www.cbsnews.com)

Staying healthy or managing chronic conditions successfully depends on our own behaviour. How we eat [3], how we sleep[1,2], how actively we live, etc. But how do we make people aware of this behaviour? Wearable sensor applications and smartphone applications offer new possibilities for people to take control of their health. The question is hoe do we create new products, systems and services that take advantage of these new possibilities and help people becoming aware of their behaviour in such a way that they live more healthy.
Design challenges or research questions
We need to create products that, by using objective measures, can say something about the quality of our sleep. Devices that monitor objectively the duration of sleep, the number of times you wake up, your breathing.. but also applications that enable people to easily describe and log how well they sleep from night to night.

How did you sleep last night?
In order to support coaching of sleep quality, for anybody with a slight sleeping problem or a more serious sleep disorder, we need ways to let people describe easily how they sleep from night to night. We seek an app that will let them do it, with as little hassle as possible and without making them focus excessively on sleep problems – which would create a vicious circle. This project will approach this problem by focusing on differences from night to night; the project will develop an electronic diary app with the aim to support physicians understand the effect of their treatment.

MyBigSleepData
There are several devices on the market that use simple measurements (e.g. sensing movement) to describe sleep quality to provide coaching information, trying to get people to follow life patterns that should lead to better sleeping. However, what works for one person does not work for the other. Or particular habits and feelings that influence one’s sleep may be unknown to health professionals advising people with sleep problems. It appears that self-awareness and self-reflection are useful avenues to explore: this project aims to design and prototype a system that supports life logging and exploring patterns of daily life and how they could perhaps influence sleep quality. Such devices can allow self-management of sleep problems, or approaches such as cognitive behavioural therapy.

References