

Proposal for a bachelor or master thesis project in
Informatics, Computer Science or comparable subjects with the title

Increasing Peoples' Physical Activity by Monitoring and Feedback using a Sensor Floor

The continuous increase of life expectancy when accompanied by a decrease of the birthrate leads to what is called the demographic change in developed countries. Consequently, more and more elderly people live alone in their homes without caring relatives. An increase of frailty often caused by a sedentary lifestyle finally makes it impossible for many elderly people to lead a self-sufficient life. Recently, so-called Ambient Assistive Living systems (AAL) have appeared on the market which monitor and assist such persons, so that in dangerous situations (e.g. falls) family members, neighbors or professional care services are informed. However, mostly these systems come often into play only shortly before moving into a nursing home is the only option left.

A real prolongation of the independent time at home could be achieved, however, if the data acquired by a monitoring system would be used to assess the general health status of a person and to give feedback in case the status changes significantly. In the example of a sedentary lifestyle, for instance, the person and/or a relative could be informed about his or her current overall physical activity level and its trend over a longer period. This feedback can help the person increase agility and remain in good physical condition for a longer time.

This principle is already being applied by health insurance companies which provide benefits when their customers achieve certain physical goals proved by means of a fitness tracker. However, for elderly people wearables have not turned out to be the right choice as they often forget to wear it, to charge it or to download the data.

Therefore, we propose to use data from the AAL system SensFloor® which is used in nursing homes for fall and inactivity detection. This system consists of a sensor underlay which is integrated invisibly under the floor covering and which provides precise data about a person's location, direction and walking velocity (Fig. 1). Whereas in current care-applications event-data from the SensFloor is transmitted to a fixed touch screen in the nurse-station, we propose the development of an application that can display the activity status and -goals clearly visible on a tablet that can be placed in the apartment of an elderly person. Simultaneously, the data should be transmitted to an app on the smartphone of a caring relative (e.g. family member). This app should be equipped with a simple indicator (e.g. traffic-light) that warns the family member in case the activity decreased, and which provides feedback to the person in order to increase the level of general movement. It is important, that the system does not act like a training-aid but displays the overall activity during normal daily living in order to motivate the person without enforcing unnatural behavior.

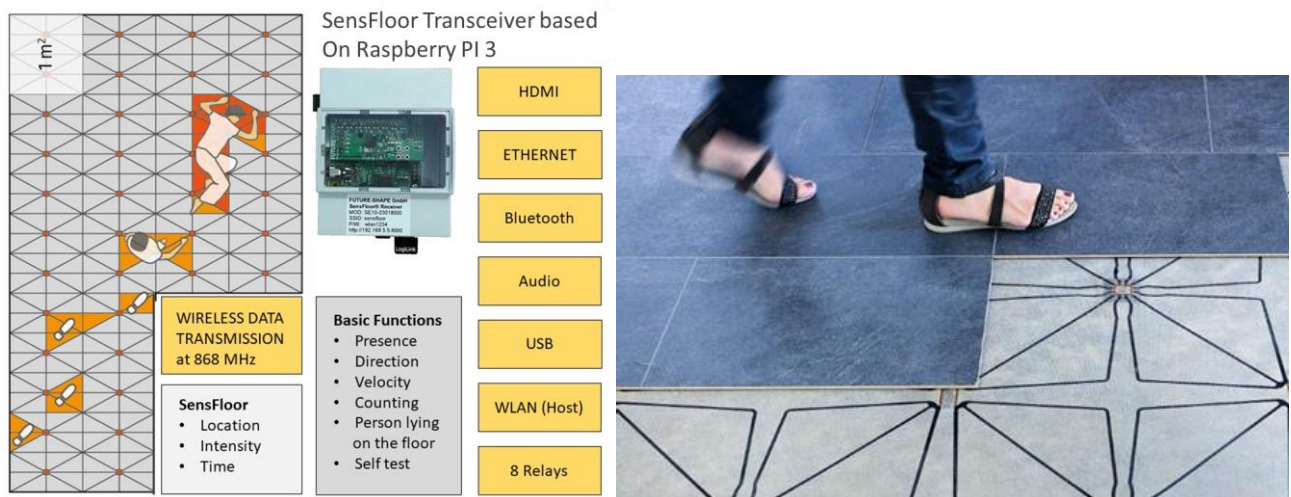


Fig. 1: SensFloor schematics (left) and invisible placement underneath the floor covering (right)

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The project comprises the following tasks:

- Obtaining and summarizing knowledge about the current state of the art in the domains of AAL, serious games, fitness tracking and user interfaces tailored to elderly people
 - Understanding the working principle and data format of SensFloor and getting familiar with the API
 - Connecting the SensFloor room terminal to a notification service (e.g. "Pushover") to transmit status messages
 - Developing a scheduler and simple graphical interface to obtain, send and display the activity status on a tablet and mobile phone
 - Presenting a showcase in a SensFloor LivingLab at the Saarlandversicherung in Saarbrücken (development partner)
 - Preparing a publication (conference paper, trade fair speech, journal paper)
 - Master thesis report
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- Optional: Starting a study in a real nursing home to compare the development of activity levels in apartments with and without this system

For the project, Future-Shape will provide the following:

- Access to various lab-style SensFloor installations
- Access to the SensFloor LivingLab at the Saarlandversicherung in Saarbrücken
- Optional access to real life SensFloor installations in a nursing home (development partner)
- SensFloor receivers (based on Raspberry Pi 4 with Buster OS and SensFloor API)
- Tablet and mobile phone for implementation
- Organisation of several coordination-visits at FutureShape
- Technical and organizational support by Dr. Axel Steinhage, R&D Future-Shape GmbH

The master student is responsible for organizing the university support of the thesis and to fulfill all formal requirements.

The practical part of the work will be accompanied by Future-Shape GmbH, Germany, the manufacturer of the SensFloor system. Contact person: Dr. Axel Steinhage, CTO, axel.steinhage@future-shape.com