

# Health promoting experiences in urban green space

## A case study of a co-design toolkit based on feedbacks from fNIRS, IoT and game probes

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### ABSTRACT

Promoting greener experience in urban areas is of utmost importance for urban development and for healthier cities. In this demo, we delineate a multi-disciplinary project for mapping the citizen experience and access to green spaces that can be used at a micro level context for promoting healthier actions, put in a macro level context. We sketch an intelligent monitoring system which collects a multitude of information including brain activities, stress levels, oxygen flow, and mobility data in order to make sense of the user experience in urban settings. The design of the system involves a group of experts (the authors) from different disciplines: health sciences, product design, game design, artificial intelligence and medical technology. We will present a mockup of the system at the workshop, a co-design toolbox and scenario, i.e., a visual or textual map of events illustrating a story of the journey of the interaction of a citizen with the system.

### KEYWORDS

assistive technologies, physiological parameters, fNIRS, IoT, design, well-being

## 1 Introduction

The opportunities that pervasive technologies offer for collecting health and well-being data from urban green spaces are immense and growing rapidly and include enablers such as the Internet of Things (IoT) [1], advanced methods for user involvement with digitized indicators that combine qualitative and quantitative methods. Product development teams in this context can explore innovative solutions based on a series of different research areas with highly specialized competence, such as in electronic engineering, product design, game design, artificial intelligence and public health. In general, there is a growing awareness related to health challenges in how technology can be used by the public. The research question in this study is therefore how can product design together with advanced technology in artificial intelligence, optics and electronics contribute to a health promoting experience in urban green spaces?

## 2 Approach and Demo

Pervasive solutions for the workshop will present scenarios where a helmet enhanced with fNIRS [2] technology for individuals, put in health promoting and sustainable urban development. A combination of methods is needed. The brain activities with fNIRS detect the oxygenation of the brain. Measuring the heart rate, body temperature and skin impedance are ways to monitor the physiological changes of the body. For instance, under stress, the heart rate and body temperature increase while the impedance of

the skin decreases. The exploration will combine this with other sources of information and technologies such as tracking itinerary, transport modes using network technologies enhanced with feedback information through artificial intelligence. Through positioning technology and sensor technology such as GPS together with an accelerometer, we can infer the activity of person, for example, walking, cycling, or driving. This will be seen in combination with qualitative methods such as engaging participants through game probes, interviews, and in a broader perspective such as policy development in relation to health promoting regulations and policy briefs for city development. In this perspective, a policy for supporting healthy experience should include biking areas, sports areas, and in general infrastructure that promote well-being. The design of the system will be achieved through participatory design involving a group of experts (the authors) from different disciplines: health sciences, product design, game design, artificial intelligence and medical technology. As part of the workshop, a mock-up of a co-design toolkit will be presented and extended with context-aware features, presenting different contexts for data acquisition, including game probes, fNIRS and IoT. We will present a graphical scenario together with the mockup showing how the system can augment and monitor citizens' experiences in their daily journey through the urban space and their access to green spaces, and how the system is able to provide feedback promoting healthy actions.



Figure 1. Functional Near Infrared Spectroscopy (fNIRS) used to measure brain activity in health promoting outdoor activities.

## REFERENCES

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