Beyond Quantified Self:
Data For Wellbeing

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Abstract

Sustaining our health and wellbeing requires lifelong efforts for prevention and healthy living. Continuously observing ourselves is one of the fundamental measures to be taken. While many devices support monitoring and quantifying our health behavior and health state, they all are facing the same trade-off: the higher the data quality is the higher are the efforts of data acquisition. However, for lifelong use, minimizing efforts for the user is crucial. Nowadays, few devices find a good balance between cost and value. In this interdisciplinary workshop we discuss how this trade-off can be approached by addressing three topics: understanding the user's information needs, exploring options for data acquisition, and discussing potential designs for life-long use.

Author Keywords

wellbeing; data analysis; user oriented design

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.
J.3. Applied computing: Life and medical sciences: Consumer health

Introduction

Being healthy is one of the fundamental wishes of the human being. Research has discussed the potential of eHealth systems for a long time. eHealth interventions aim to help sick or vulnerable people e.g. to deal with chronic diseases more independently [1], to mitigate an unhealthy behavior [2], or to improve the doctor-patient communication [3]. However, helping the healthy person to stay healthy (what we will subsequently call wellbeing) takes a different perspective that requires careful consideration [4]: Aspects such as lifelong use or data ownership must be seen in a different light [5], and our research approaches e.g., on evaluation may need to be adopted [6].

Monitoring the user's current behavior and health is one of the fundamental measures to be taken. While research is frequently addressing monitoring in the context of e.g., behavior change [7], aspects such as long term usability in real life hinder the direct adoption of the research results to wellbeing. E.g., for activity monitoring, high-precision accelerometers may be used for fairly precise measurements of a person's behavior [8], but the devices are not suitable for daily use in a broader group, so the steps per day are still a dominating measure for a person's level of activity [9]. The Quantified Self movement [10] has attracted attention to personal health monitoring and is some kind of pioneer demonstrating possibilities and stimulating new ideas. However the average user is usually not interested in technology and data, but rather in easily understandable information and knowledge about one's own health.

Challenges

There is an inherent trade-off between quality of data – in terms of precision, reliability and availability – on the one hand, and usability and user's effort for data acquisition on the other. More precise and more reliable data usually has an impact on usability and user's effort. Hardware improvements by better and cheaper sensors alone cannot solve this problem. E.g. sensors for heart rate, heart rate variability or skin conductance need skin contact, thus must be worn directly on the body. This may be considered unacceptable, too uncomfortable, or it may interfere with daily life, e.g., hygienic requirements for nurses or cooks.

The perceived effort of monitoring is furthermore influenced by the user's personal motivation. Changes in life such as the start of the career or the birth of a child change the way people think about their own health and raise interest in, e.g., weight control or cardiovascular prevention, which in turn increases the willingness to use specific health systems at the cost of higher efforts. On the other hand people may not want to monitor in phases of stable health state or as other aspects of life gain more importance.

Creating systems to empower people to effectively manage their personal health requires an interdisciplinary approach for data collection, aggregation and reflection. Collecting data involves e.g., designers, HCI experts, sensor developers, and device producers. Data aggregation requires e.g., data analytics and big data, visualization, psychology, social behavior, and machine learning, to make sense of the data and make recommendations. And reflection again brings in design, HCI, hardware and devices. Collection, aggregation, and reflection mutually influence each

other: We can only aggregate what we can measure, we should only aggregate what the user will reflect upon, and we can only offer reflection about measurable values. Therefore the involved disciplines need to work together before we can build effective systems for health behavior maintenance and change.

One of the key aspects is the required quality of data. Medical experts ask for data that is as precise and complete as possible. Data analysts point out that data is imprecise and unreliable. Designers appraise ease of use higher than precision of data. And the user comes with changing interests and motivation over time, resulting in changing needs in his current and also past data.

Goal

The workshop brings together researchers and practitioners from different communities including life logging and quantified self, data analysis, health and wellbeing to:

1. develop a joint understanding of the competing priorities on data quality and usability,

2. discuss potential solutions and concepts to approach the problems,

3. give new ideas into the contributing communities for future research questions and requirements, and

4. help shaping a research community for HCI and technology for wellbeing.

Topics

Three topics are discussed in the workshop:

 (1) User - What are the information needs of the end user? This includes direct needs about what the user wants to know right now. Such needs can be better understood by using health behavior models that we need to adapt to wellbeing. It also includes indirect needs, i.e. what the user wants other persons like his doctor to know about his health now or a prediction of the future. This often requires a comparison with data from the past and a medical model how disorders develop from initial signs. Here we must understand the medical and professional information needs and how we can and must interpret wellbeing data in this context.

(2) Data - What are the options for data acquisition? We are interested in novel and practical forms of direct data acquisition involving e.g. dedicated sensors and forms of interaction that fulfill the specific requirements of wellbeing monitoring with respect to usability, acceptance and daily long term use. Moreover we are interested in "indirect" data acquisition by analyzing data from sources that was originally intended for something else like postings in social networks. Novel forms of data acquisition will particularly improve either the precision and expressiveness or the availability of data without increasing the effort for the user. Or they will reduce the effort for the user without reducing the data quality.

(3) Design - How can we design systems for wellbeing? With the area of tension between data quality and ease of use, we are looking for approaches and examples that successfully fulfill the user's needs, thereby sustaining long term usability in daily life. We are interested in successful examples of hardware and system designs possibly going beyond today's

monitoring devices. We are also interested in examples of feedback and interaction with the user, as visual or non-visual on-device displays, or as innovative smartphone or PC based systems.

Conclusion

Wellbeing takes a different perspective on health that needs to be taken into account when designing technical systems. We contribute to one of the main points of discussion, the area of tension between best possible data for medical purposes on the one hand, and ease of use and feasibility for long term use on the other.

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