A Short Workshop on Next Steps Towards Long Term Self Tracking

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Abstract
Long term self tracking of health for periods of years, decades or ultimately lifelong provides tremendous opportunities for personal health. However, people face barriers that many find insurmountable for making use of self tracking. It has become clear that considerable work is needed to turn tracking from a toy to a tool. We suggest three research themes: The user's double role in long-term self-tracking as a consumer of information and as a producer of data, as they try to make sense of long term data, and the needs, challenges and opportunities arising for creating new applications. As a cross-topic issue, we address challenges for HCI research on long term tracking.

Author Keywords
Self tracking; long term; health; wellbeing

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous; J.3 Health

Background
New sensors, miniaturization, the ubiquity of smart phones, networking and the internet of things, to name just a few, have given us a plethora of new applications and systems that promise to support and improve personal health, wellbeing and fitness. New devices are

emerging regularly, addressing physical activity, endurance sports and resistance training, sleep monitoring, mindfulness practice, posture monitoring, weight management, breathing techniques, cardiac health status and numerous more. There has been substantial work also in the CHI community demonstrating benefits of short term tracking (e.g. [1, 2]), often in the context of behavior change, with Consolvo et al's UbiFit Garden [3] maybe the best-known early example.

Now it is more and more understood that there are considerable potential opportunities from long term tracking covering periods of not just weeks or months, but years or decades, and ultimately lifelong use [4, 5, 6]. There are already numerous ways of tracking large amounts of long term data, using dedicated tracking and logging tools, deploying the sensors in our smart phones and smart watches, or analyzing the digital traces that everybody leaves behind in social networks and online systems. Such long and very long term data should be able to facilitate uses cases beyond behavior change, e.g. discovering long term trends in behavior, monitoring progress against a long term target, reflecting on long term trends and patterns, supporting decision making, giving a lifelong health support, or discovering the impact of N-of-1 experiments.

However, the current state of the art leaves people facing barriers that many people find insurmountable for making such uses of self tracking data. It has become clear that considerable work is needed to turn tracking from a toy to a tool. Based on previous discussions [7] we suggest three research themes and one cross-topic issue.

The user's role in long term tracking

The user has a double role in long term tracking: first, acting as the ultimate consumer of all services relating to the tracked data; second, as the producer of data, interacting with tracking devices to collect data in real life over many years. Different needs arise from these two roles, and there may well be conflicting requirements, such as the wish for complete data as a consumer, but with the risk of low adherence or abandonment due to high effort in tracking, as a producer. Understanding these needs and the potential conflicts is crucial for successful self tracking. This includes questions of long term use, adherence and abandonment, interaction with multiple devices, new concepts for tracking devices. It must, moreover, be understood how users wish to make sense of the data, e.g. by visualizing large amounts of temporal and heterogeneous data, or using it for goal setting and verifying personal hypotheses. Questions also relate to secondary data use and data ownership, e.g. provenance management and control, how data ownership is handed over in times of changes, such as from the parent caring for the child to the adolescent, or after the death of a user to her or his digital heir.

Making sense of long term data

Data is the raw material of tracking. Understanding the quality, properties, and limitations of data is therefore crucial for designing successful applications. There is also, but not just, a question of better measurement technology to improve precision. Particularly, the user's role as a producer has a significant impact on the data. Lapses, breaks, and abandonment of tracker use result in gaps or completely missing data [8]. This compromises the meaningfulness of the tracker data, reducing the user's trust in the data and the utilization in applications (e.g. [9, 10]). Reducing gaps as well as recognizing and accounting

for incomplete data are necessary to facilitate the data. Applications may also face restrictions arising from data vaults, with data being hidden in different producers' storage systems, with limited APIs and limited access opportunities.

Application needs, challenges and opportunities
Applications are the tools for deploying the tracking data and fulfilling the user's requirements. There is an emerging need to make the case for if, how and when self tracking can be useful to users [11, 12]. Health is a personal issue, and many applications will relate to personal use, such as behavior support, understanding relations, identifying trends, and improving health literacy. There is also an overlap between self tracking and medicine; this raises questions such as provision of medical information from personal data, regulatory issues, or opportunities arising towards personalized medicine. Lastly, the broad utilization of self tracking also provides new opportunities for social health care. Big data analyses of large amounts of long term self tracking data from large populations may provide highly interesting insights into community health, as has been demonstrated by Althoff et al [13].

Challenges for research in HCI
Long term self tracking also imposes challenges for HCI research. Research on self tracking is inherently interdisciplinary, involving, amongst others, computer science, engineering, design, but also medicine, psychology, and sociology. Conducting studies is a key tool for research; however, there are huge differences in understanding the set-up of studies in, e.g., HCI and medicine. Long term studies, covering years and decades, would, in principle, be necessary to rigorously evaluate long term tracking applications; however, this is implausible, not just because the effort is far too high for most HCI projects, but also it is impossible to design such study to account for the fast-changing technological world. Lastly, collecting long term tracking data is a high effort; however, sharing such data among different researchers is hampered by issues such as lack of data interchange formats, the difficulties of ensuring anonymity e.g. when location data comes into play, or restrictive data protection requirements.

Goals of the workshop

The goal of the workshop is to discuss challenges and issues, and identify potential solutions and next steps. The primary result will be the development of a research agenda for long term self tracking that we aim to publish as a "manifesto". Moreover, concrete follow-up projects may be identified to address concrete challenges for HCI research; ideas include establishing a pool of long term tracking data, or developing a list of recommendations for designing and evaluating long term self tracking systems.

Organizers

The organizing team is a mixture of young and engaged academics working, for some years, in self tracking and health and experienced researchers with a long term track record of activities in the community. Members of the team have organized numerous successful events and have a strong network. They collaborated successfully in the past on joint publications.

Jochen Meyer (main contact person) is director of the R&D division Health at OFFIS Institute for Information Technology in Oldenburg, Germany. He is an active researcher in personal health, has organized multiple workshops, was local chair of PervasiveHealth 2014, workshop chair of IEEE International Conference on

Healthcare Informatics 2016, and is associate editor of the Journal of Healthcare Informatics Research.

Daniel Epstein is a Ph.D. Student in Computer Science & Engineering at the University of Washington and a member of the DUB group. He studies the design of personal informatics and self-tracking tools to integrate into people's everyday lives through surveying people's ongoing practices and implementing new technology.

Parisa Eslambolchilar is a Senior Lecturer (Associate Prof) in the School of Computer Science and Informatics, Cardiff University. She has organized multiple ACM workshops on behavior changes using ubiquitous computing and she is the guest editor of the Springer Pervasive and Ubiquitous Computing (PUC) theme issue journal Persuasion, Influence, Nudge, and Coercion using UbiComp. She has received multiple research fundings from the UK government to conduct research in health and wellbeing (total £1.2m in the past 10 years).

Judy Kay is Professor of Computer Science and leads the Human Centred Technology Cluster at the University of Sydney. Her research areas are in human computer interaction (HCI) and ubiquitous computing (Ubicomp). She is Editor-in-Chief of IJAIED (Intl J of Artificial Intelligence in Education), Associate Editor for ACM IMWUT, Interactive, Mobile, Wearable and Ubiquitous Technologies and ACM TiiS (Tran on Intelligent Interactive Systems) and has served on Programme Committees of several HCI conferences including CHI.

Lie Ming Tang is a Ph.D. student at the School of Information Technology at the University of Sydney. His research focuses on the use of trackers to promote long term health and well-being. His past research projects include analyzing long term physical activity tracker data for large cohorts of users and designing learning dashboards for existing long term trackers.

Website

The website *https://longtermtracking.offis.de* will be set up for the workshop.

Initially it contains the basic information on the workshop such as background, call for participation, description of the organizers, a link to the submission system, and the tentative program.

After the notification, it will be updated to contain the detailed program and practical information about the workshop.

After the workshop it will be further be updated to provide a retrospect of the workshop by including links to the submissions, a list of the participants (consent to publish will be sought), a documentation of the workshop results, photos etc. The post-workshop activities also make use of this website, such as the call for special issue, the publication of the results etc.

Pre-Workshop Plans

This workshop builds on a series of other workshops, both at CHI (e.g. [4, 14, 1]), and at other venues (e.g. [15, 16, 17, 18, 19]), that have either been conducted by some of the organizers, or where the organizers have participated. It is therefore strongly embedded in a relevant scientific community, and further strengthened by the organizers' activities in communities beyond CHI, such as CSCW, ICHI, PervasiveHealth, and Ubicomp.

The organizers will reach out to these communities using mailing lists and personal contacts to make sure that relevant actors are aware of the workshop and an interesting mixture of participants will join. We expect to attract 15-20 participants to the workshop.

After the notification, the participants will be contacted early to ensure a timely preparation. The respective contributions will be made available to the participants, the program communicated, and the requests for preparation shared. Selected participants will be involved in preparations, with a lead time, before the workshop, to take over specific tasks during the workshop (see below).

Workshop Structure

General considerations

The workshop aims to encourage discussion, interactivity, and sharing of ideas. Therefore, "front desk" presentations are kept to a minimum and discussions in smaller groups and in the plenary are the main part of the workshop.

Nevertheless, presentations by the participants are important to introduce the participants and their ideas and scientific work, value the participants' efforts, enable particularly young researchers to present early work, introduce them to the scientific community and also, to allow for those whose travel guidelines require an oral presentation to participate in the workshop. To balance these requirements, a fast-paced presentation format such as an "Ignite Talk"[1], "PechaKucha" or similar will be chosen, also based on the final number of accepted participants.

To facilitate discussions, the "World Café"[2] format is used in the morning to engage the participants in the discussion of key topics of the workshop. Final topics for the tables are defined in time before the workshop, based on the participants' position papers; candidate topics are the key topics of the workshop, i.e.

- Use and abandonment
- Understanding incompleteness of data
- Designing interventions
- Use of tracking data by medical professionals
- New individual and community applications
- Challenges of long term research
- Long term tracker data as digital possessions

The goal is to break down the topics into more concrete challenges, identify needs and requirements. Moderators of the table are selected participants who have been identified before the workshop based on their position papers, and asked beforehand to prepare for this task.

Workshop schedule

9:00 Welcome and introduction by the organizers

9:15 Participants' Ignite Talk presentations

[1] See https://en.wikipedia.org/wiki/Ignite_(event): 5 min presentation with exactly 20 slides, auto-proceeding every 15 seconds.

[2] See https://en.wikipedia.org/wiki/World_Caf%C3%A9: Round tables are created, where each table is dedicated to one topic to discuss and scribble ideas, comments, keywords etc on the tablecloth/paper. The participants regularly move to another table to discuss the next topic based on the findings of the previous group. This format has successfully been used by the organizers in heterogeneous groups to bring in different viewpoints, stimulate discussion of new ideas, and make sure that the participants mix well.

10:30 Coffee break

11:00 Interactive session #1: World Café. See above

12:00 Presentation and discussion of World Café results

12:30 Lunch break

13:30 Interactive session #2: Elaborating challenges and solutions. Based on the results of the World Café groups are formed that tackle one of the identified challenges and suggest potential solutions and first steps to be taken. The groups are given a range of materials to support and boost creativity, such as paper, pens, sticky notes, cards, but also pipe cleaners, sponges, scissors, glue etc.

15:00 Coffee break

15:30 Presentation of the groups' results

16:00 Joint open discussion

16:45 Conclusion and next steps

17:00 End of workshop

Times are tentative and to be refined in alignment with overall CHI workshop schedule and after the number of participants is known.

Post-Workshop Plans

The workshop discussion and findings aim to result in a "manifesto" on the challenges and opportunities of long term self tracking which plan to submit to ACM Interactions.

We hope the manifesto will also be the basis of a special issue of a journal, where participants with an excellent contribution to the workshop are invited to submit an article. Potential journals are the ACM Transactions on Interactive Intelligent Systems (TiiS) and the Journal on Healthcare Informatics Research (JHIR), where two of the organizers are associate editors.

Within the workshop, it will be investigated whether it is feasible to implement a pool of long term self-tracking data sets that can be shared among interested researchers. In the positive case, activities will be initiated after the workshop to set up such a research data pool. If this is not yet possible, we will explore how to facilitate this for the future.

With the organizers' strong links in the relevant scientific communities, it can be expected that beyond concrete plans for this workshop, it will also contribute to further follow-up activities such as a workshop at CHI 2019. To facilitate such activities the workshop's website will stay online for at least one year after the workshop. Moreover, as the workshop is in the overall thematic area of the WISH community [20] of CHI, the participants are invited to engage in that community such as WISH's Facebook group, or possibly a WISH SIG taking place at CHI 2018.

Call for Participation

In recent years, we have seen an overwhelming development in sensors of personal health and wellbeing, enabling the technical and medical layperson to monitor parameters of health in real life for long periods of time. Such long term tracking provides

opportunities for radically new applications, but also imposes challenges.

We seek contributions investigating challenges and opportunities arising from long term use of self tracking tools, covering not just weeks or months, but potentially years or decades. Topics include, but are not restricted to:

- Use and abandonment
- Understanding incompleteness of data
- Designing interventions
- Use of tracking data by medical professionals
- New individual and community applications
- Challenges of interdisciplinary and long term research

Submissions can be position papers, presenting – potentially controversial – points of view or perspectives. Or they can present scientific work, also work in progress or in an early stage. Submissions must use the CHI Extended Abstract template and be 2-4 pages in length. They must relate to the overall theme of the workshop, long term self tracking beyond weeks and months. The submissions should not be anonymized.

Submissions must be made to https://easychair.org/conferences/?conf=longtermtracking2018. Submission deadline is February 2, 2018. Notification of acceptance is on February 22.

Participants are selected based on relevance of the submission to the workshop, the potential to stimulate discussion, and the overall quality of the submission. At least one author of each accepted paper must attend the workshop. All participants must register for both the workshop and at least one day of the conference.

https://longtermtracking.offis.de

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