UbiMount - 2nd Workshop on Ubiquitous Computing in the Mountains

Florian Daiber
DFKI, Saarland Informatics
Campus
Saarbrücken, Germany
florian.daiber@dfki.de

Keith Cheverst
Lancaster University
Lancaster, UK
k.cheverst@lancaster.ac.uk

Michael Jones
Brigham Young University
Provo, Utah, USA
jones@cs.byu.edu

Felix Kosmalla
DFKI, Saarland Informatics
Campus
Saarbrücken, Germany
felix.kosmalla@dfki.de

Frederik Wiehr
DFKI, Saarland Informatics
Campus
Saarbrücken, Germany
florian.daiber@dfki.de

Jonna Häkkilä
University of Lapland
Rovaniemi, Finland
jonna.hakkila@ulapland.fi

Abstract

Mobile and wearable computing has great potential to support alpine outdoor sport activities. This includes, but is not limited to, rock climbing, hiking, mountain biking, paragliding, and skiing. Interestingly, technology for tracking, monitoring and supporting sport activities is broadly used in sports like running or cycling, but has not reached *the top of the mountains* yet. Nevertheless, such technologies could support people in many *mountain scenarios* such as activity tracking, navigation, or emergency support. Technologies and applications for mountaineers can learn from ubiquitous computing research in many ways to provide more joyful, motivating and safer outdoor experiences.

This workshop is building on the ideas and findings of the successful UbiMount '16 workshop and aims to further explore the newly established research direction of ubiquitous computing in the mountains. During this one day workshop the participants will present their positions and research, followed by a demo session and group exercises.

Author Keywords

Alpine sports; Outdoor Activities; Sports Technologies; Technology Acceptance; Activity Tracking; Wearable Computing.

ACM Classification Keywords

H.1.2 [User/Machine Systems]: Human factors; H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.

Motivation

Mobile and wearable computing has great potential to support alpine outdoor sports (e.g. rock climbing, mountaineering, hiking, paragliding, mountain biking and cross-country or downhill skiing). Activities in the mountains depend on various factors (e.g. route difficulty, access, remoteness, and weather conditions) that require fitness, experience, and planning. The use of technology can be beneficial in numerous ways: It can be used as an assistive system for the mountaineer (e.g. a digital instructor or a navigation aid), as an additional safety measure (e.g. a real-time weather monitor for paragliders), or as a training tool (e.g. an activity tracker for cross-country skiers).

Although sports like hiking, running and biking received a lot of attention in research, alpine sports were, to a certain extent, neglected. Some work exists that addresses sports tracking, assistive systems, games & play and training. There is a vast corpus on related work in the area of supporting people while navigating in outdoor environments as for example described in [8]. New interaction technology can be used to bring people to defined places to enjoy the same experiences [2] or to facilitate solitude by providing guidance on how to avoid other people [7]. Sports tracking [1], for example, has been suggested for climbing [4, 5, 6] and backcountry skiing [3]. The relation of performance and experience of sports watch usage has been studied in runners [9] indicating that wearable technology can improve both performance and the experience.

The first workshop has shown that several research groups in the UbiComp and HCI community already started to explore the challenges when applying technologies to mountain sports. In our workshop we want to bring them together again. The Workshop on "Ubiquitous Computing in the Mountains" aims to provide an interactive forum to discuss the challenges that appear when UbiComp technologies are applied to activities in the mountains. Some of these challenges are finding a good balance between the beneficial use of technology without distracting the users from their nature experience, the application and adaption of already manifested interaction techniques to the mountaineering domain, or the design of unobtrusive body worn devices which do not hinder the user in pursuing their outdoor activities. We believe that the workshop is very interesting for the UbiComp community, since the results will also inform other application domains (e.g. ubiquitous computing in health and wellbeing).

Topics and Goals of the Workshop

Submissions for the workshop could address but are not limited to the following topics:

- Design & implementation of (ambient) assistive real-time systems
- Notification design under different physical and cognitive loads
- Social acceptance of technology use in alpine activities
- Novel navigation systems, tailored for the special needs in mountaineering or climbing
- Systems that enable disabled or impaired people to pursue outdoor activities
- Emergency or quick response systems for e.g. mountain rescue
- Tools and methods for movement analysis

- Design and analysis of gamification components in climbing or mountaineering, e.g. for training or motivation
- Interaction techniques for motor skills learning
- Wearable computing technologies for mountaineers

This workshop aims to bring together researchers from academia and industry (e.g. sports technologies, tourism, natural resources) to discuss and share their research, experience and insight. We welcome participants working with user research, ethnography, design, prototyping, or evaluation and want to facilitate a multidisciplinary approach throughout the workshop.

As stated above, mountaineering and climbing is still in an early stage in the UbiComp and HCI community. The higher level goal of this workshop is to further strengthen the foundation of a growing research community, pursuing UbiComp and HCI in the mountains. For this, the most important goal of this workshop is, 1) to bring together researchers who address the use and design of ubiquitous technologies in the mountains in their work and to build a network among these people. The additional goals of this workshop are 2) to identify and discuss the challenges of current research and how to tackle them, and 3) promote the research of UbiComp technology usage in the mountains, and discuss the promises and risks related to the topic. Finally the workshop should 4) provide a forum for idea generation during group exercises.

Workshop Organization

Pre-Workshop Plan

The call for the workshop will be distributed in HCI and Ubi-Comp related emailing lists. A flyer will be designed and distributed at HCI venues, and we will advertise the workshop at e.g. CHI, NatureCHI, DIS, PerDis and among key research groups. The important dates associated with the workshop's organization are as follows:

- Distribution of CfP: April 28, 2017
- Submission deadline for workshop papers: June 9, 2017
- Notification of acceptance: June 30, 2017
- Deadline for camera ready version of research papers to include in the ACM DL: July 14, 2017

Workshop Structure

The workshop is organized as a one-day workshop. It will consist of short workshop paper presentations, discussions, a demo session, group exercises and an optional outdoor activity. The workshop-day will start with short (max. 5min) presentations by the participants. A demo session will run in parallel to the coffee break. After the break the participants will continue with short presentations which are concluded in a lunch break. During the afternoon the participants will engage in group exercises. The group work will consist of an interactive exercise done in groups of 4-5 people. In this out-of-the-classroom (if possible) exercise the participants will have 45 minutes to explore the environment and find a place where they design a concept around a mountain experience. To prepare a short presentation (preparation time: 30min) of their concepts, the participants may take pictures and videos or collect artifacts. After a discussion with all participants, the groups can use physical low-fi prototyping equipment, such as wire-frames, transparencies, or post-it notes for refinement of the concepts. After the final presentations and a closing discussion an optional workshop dinner will conclude the day.

A lecture room for approximately 30 people is required for the workshop. The estimated number of workshop participants is around 12-18 people. Each participant will contribute to the workshop with a position or research paper (4

pages in CHI EA format). Research papers will be included in the ACM digital library. Submissions should contain a distinct position on research or design work within the scope of ubiquitous mountaineering and climbing technologies. The submissions will be reviewed by the organizers and the workshop program committee. The selection of participants is based on the reviews. We are aiming for a good balance of different perspectives on the workshop topic.

Post-Workshop Plan
We will apply to have a summary article for the ACM Interactions Magazine. Furthermore, we will also reach out to the alpine sports community by writing an article for an alpine sports magazine. In this article we will present the current state of research, reflecting on the predictions parts of the workshop organizers made in 2007 (http://goo.gl/dYwy2x), and update our vision for mountaineering in the next decade. We also plan to organize a journal special issue where the participants will be encouraged to publish their work.

Organizers' Backgrounds

Florian Daiber   is a post-doctoral researcher at the German Research Center for Artificial Intelligence (DFKI). His main research is in the field of human-computer interaction, 3D user interfaces and wearable computing with a strong interest in wearable sports technologies.

Keith Cheverst   is a reader with the School of Computing and Communications, Lancaster University. A significant focus of his research over the last 20 years has centered on the design and deployment of mobile systems that provide support for locative media experiences and wayfinding in both rural and urban settings.

Michael Jones   is an Associate Professor of Computer Science at Brigham Young University. His research interests include prototyping methods for the internet of things and the role of interactive computing in outdoor recreation.

Felix Kosmalla   is a doctoral student at the German Research Center for Artificial Intelligence. His primary interest lies in Human Computer Interaction in sports, including on- and off-body sensing, and assistive systems to support learning and collaboration.

Frederik Wiehr   is a doctoral student at the German Research Center for Artificial Intelligence. In his research he explores how we can build technology that assists in overcoming physiological and ultimately cognitive restrictions, by trying to extract higher-level information from sensors in the environment and on body worn devices that helps to understand the users' current activities and ongoing mental processes.

Jonna Häkkilä   is a professor at Faculty of Art and Design, University of Lapland. Her research interests include mobile and ubiquitous interaction and user experience design, and user studies in-the-wild. Currently she is working e.g. on using natural materials for tangible interactions and HCI in the nature.

REFERENCES

1. Aino Ahtinen, Minna Isomursu, Ykä Huhtala, Jussi Kaasinen, Jukka Salminen, and Jonna Häkkilä. 2008. Tracking Outdoor Sports — User Experience Perspective. In *Proceedings of the European Conference on Ambient Intelligence (AmI '08)*. Springer-Verlag, Berlin, Heidelberg, 192–209. DOI: http://dx.doi.org/10.1007/978-3-540-89617-3_13

2. Keith Cheverst, Trien V. Do, and Dan Fitton. 2015. Supporting the Mobile In-situ Authoring of Locative Media in Rural Places: Design and Expert Evaluation of the SMAT App. *Int. J. Handheld Comput. Res.* 6, 1 (Jan. 2015), 1–19. `DOI:` `http://dx.doi.org/10.4018/IJHCR.2015010101`

3. Anton Fedosov and Marc Langheinrich. 2015. From Start to Finish: Understanding Group Sharing Behavior in a Backcountry Skiing Community. In *Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct (MobileHCI '15)*. ACM, New York, NY, USA, 758–765. `DOI:http://dx.doi.org/10.1145/2786567.2793698`

4. Raine Kajastila, Leo Holsti, and Perttu Hämäläinen. 2016. The Augmented Climbing Wall: High-Exertion Proximity Interaction on a Wall-Sized Interactive Surface. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. ACM, New York, NY, USA, 758–769. `DOI:` `http://dx.doi.org/10.1145/2858036.2858450`

5. Felix Kosmalla, Frederik Wiehr, Florian Daiber, Antonio Krüger, and Markus Löchtefeld. 2016. ClimbAware: Investigating Perception and Acceptance of Wearables in Rock Climbing. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. ACM, 1097–1108.

6. Cassim Ladha, Nils Y. Hammerla, Patrick Olivier, and Thomas Plötz. 2013. ClimbAX: Skill Assessment for Climbing Enthusiasts. In *Proceedings of the 2013 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp '13)*. ACM, 235–244. `DOI:http://dx.doi.org/10.1145/2493432.2493492`

7. Maaret Posti, Johannes Schöning, and Jonna Häkkilä. 2014. Unexpected Journeys with the HOBBIT: The Design and Evaluation of an Asocial Hiking App. In *Proceedings of the 2014 Conference on Designing Interactive Systems (DIS '14)*. ACM, New York, NY, USA, 637–646. `DOI:` `http://dx.doi.org/10.1145/2598510.2598592`

8. Johannes Schöning, Antonio Krüger, Keith Cheverst, Michael Rohs, Markus Löchtefeld, and Faisal Taher. 2009. PhotoMap: Using Spontaneously Taken Images of Public Maps for Pedestrian Navigation Tasks on Mobile Devices. In *Proceedings of the 11th International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI '09)*. ACM, New York, NY, USA, Article 14, 10 pages. `DOI:` `http://dx.doi.org/10.1145/1613858.1613876`

9. Jakob Tholander and Stina Nylander. 2015. Snot, Sweat, Pain, Mud, and Snow: Performance and Experience in the Use of Sports Watches. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15)*. ACM, New York, NY, USA, 2913–2922. `DOI:` `http://dx.doi.org/10.1145/2702123.2702482`