Outdoor Nature Lovers vs. Indoor Training Enthusiasts: A Survey of Technology Acceptance of Climbers

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Abstract
Especially runners and cyclists have a variety of possibilities to record and analyze their workouts. In contrast, climbing did not find much attention in consumer electronics and human-computer interaction. If quantified data similar to cycling or running data were available for climbing, several applications would be possible, ranging from simple training diaries to virtual coaches, or usage analytics for gym operators. In this position paper we report our experiences from a survey on climbing technology that enables similar features as running and cycling technologies. The goal of the survey is to gain insight in the acceptance of technology in climbing. The main finding of the survey is that the sample can be divided into leisure-oriented outdoor climbers and sports-oriented indoor training enthusiasts.

Author Keywords
Climbing; technology acceptance; activity tracking; survey.

ACM Classification Keywords
H.1.2 [User/Machine Systems]: Human factors; H.5.2 [User Interfaces]: Evaluation/methodology, user-centered design.

Motivation
Rock climbing in its original form was only practiced by smaller, more adventurous groups of people who have gained expertise in handing the necessary protection equip-

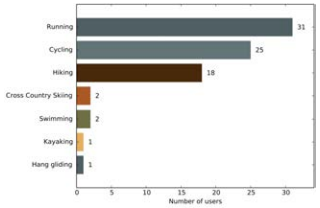

Figure 1: Tracked sports.

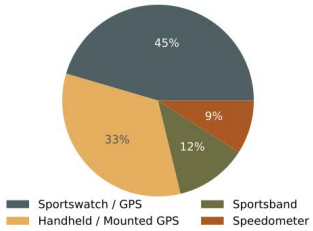

Figure 2: Used tracking devices.

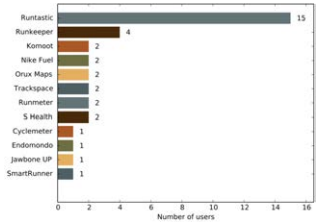

Figure 3: Used tracking apps.

ment such as ropes and bolts whilst climbing outdoors. Rock climbing in mountainous areas depends on various factors (e.g. route difficulty, access, remoteness, and weather conditions) that require fitness, experience, and planning.

In the last several years, a new style of climbing emerged which generally focuses on the athletic aspect and the physical exercise of the climbing activity. The latter is today known as *sport climbing*, differentiating itself from *traditional climbing*. Sport climbing can be performed both indoors and outdoors. Climbing outdoors usually requires more experienced climbers while indoor climbing is much more accessible. While indoor climbing on artificial walls and plastic was initially thought as a form of training for climbing outdoors, many people only engage in this form of climbing.

In wearable computing and HCI, climbing received little attention so far. Some related work exists regarding instrumented climbing walls [1, 3, 7, 8], automated skill assessment and route recognition using a wearable device [6, 5], and augmented reality [2, 4]. The relation of performance and experience of sports watch usage has been studied in runners [9] indicating that wearable technology can both improve performance and the experience. In this position paper we report and discuss the results of a survey on the acceptance of climbing technology that enables similar features as running and cycling technologies.

Climbing Technology Survey

An online survey has been conducted to get initial insights in the acceptance of climbing technologies and whether or not climbers are tracking their sportive activities. The study consists of an online questionnaire with 17 questions from five categories: (1) demographics, (2) climbing and bouldering, (3) general sports tracking, and (4) climb tracking. Altogether, 92 climbers participated (34 female, 58 male), with an average age of 29.8 ($SD = 8.5$). The average climbing experience was 5.6 years ($SD = 7.57$) while the average bouldering experience was 3.1 years ($SD = 4.76$). As a usual climbing and boulder location they mostly prefer outdoor rock for climbing (53 outdoors vs. 39 indoors), but indoor plastic for bouldering (63 indoors vs. 29 outdoors). In the following the main findings of the survey are briefly introduced.

Sports Tracking

Half of the participants did not use any sports tracking at all (52%), while the other half used either a special tracker (14%), a smartphone app (17%), or both tracker and app (17%). Tracked activities range from running and cycling to more unusual sports like kayaking or hang gliding (see Figure 1). A variaty of tracking devices (see Figure 2) and smartphone apps (see Figure 3) were used. Participants who do not track their workout mostly stated that they are not interested in the data. Another main reason for not using tracking technologie was the focus on fun and recreation rather than training ("I simlpy enjoy training and I listen to my body rather than statistics."). Online portals were used by 22 participants used to manage their activities. They were either related to a smartphone app (e.g. Runtastic, Strava) or synced with a tracking device (e.g. Garmin Connect, Suunto Movescount). Again the main reason for not using such a portal was the missing interest in the accumulated data. One participant had privacy concerns and stated that she does not trust the provider.

Climb Tracking

Regarding climb tracking two distinct groups can be identified: People who track their climbing progress and people how do not track at all. When asked how they keep track of the climbed routes, the following methods were proposed: Marking climbed routes in guidebooks (45%); Spreadsheets

or structured sports diaries (23%). Unstructured diaries or lists collected on paper or in books (19%); Smartphone apps or online portals like 8a.nu (16%). When asked why they did not keep track of their climbed routes, most of the participants stated that they do not see a benefit in it ("I could remember the routes they have climbed including routes that I have not send so far", "I can remember all routes I climbed outdoors or will at least recognize them when standing in front of them", "I can usually remember the routes I climbed"). Another reason that was stated multiple times was that it would be too cumbersome and time consuming. As in the question concerning general tracking, some participants stated that they are climbing for fun ("Climbing means fun and freedom to me not training an performance", "I am climbing for fun not performance", "I prefer to spend my time climbing and not documenting").

The 54% which would not use a tracking system stated that they are not interested in the data. One climber stated that such a system would only be useful if used during every climbing session. Some participants stated that it would be not worth the effort since they are beginners or are not climbing enough. They supposed that such a system would be more useful for competitive climbers. The participants who where not reluctant against tracking were asked whether routes or climbing style should be tracked (1=routes and 10=style). Most participants ($M = 7.05$, $SD = 2.32$) prefered tracking style, e.g. static, dynamic, or fast rather than climbed routes. 46% of all the participants (also including participants who do not track at all) would use an automatic tracking system. As possible manual interactions the participants would accept the press of a button on a wristband, scanning of a QR code with the smartphone, selection of a route in a smartphone application, or even a manual entry of an ascent.

General Feedback

The feedback on how technology could enhance climbing was quite varied. Some climbers suggested using a smartwatch that could guide the climber, e.g. by pointing them to the next hold. Sensors could be attached to the climber's arms and legs to sense how efficient they perform. Another idea was that these sensors could also determine which part of the route leads to an unstable position. An application could propose a motion sequence which would solve this problem. Heartrate sensors can determine the level of effort during an ascent. Several participants addressed statistics and virtual trainers. One participant described a system that would suggest routes that he did not yet climb, but would be able to, based on his climbing history. Many climbers requested a functionality which would be able to record the length of a route, time spend in the route and general statistics to climbing sessions and progress over time. One user stressed that it would be possible to create an objective difficulty measure instead of the currently used more or less subjective ones, based on the success or failure of cumulated ascents.

Discussion and Conclusion

The main finding of the survey is that the sample can be divided into two distinct groups of climbers. The first group is represented by climbers who perform climbing predominatly for leisure and relaxation purposes. They do not have any interest in quantifying their sport or even in the usage of technology. In contrast to that, the climbers of the second group represent sports-oriented indoor climbers. They track different sports and are also interested in tracking their climbing progress. The second group of participants are the ones who do not track at all. Most of them do not track out of persuasion, since for them, climbing is a sport which should be performed without consumer electronics ("The beauty of the climb and remarkable single moves can

only be experienced but not tracked by a computer"). One should consider if changing the attitude of those climbers is a goal which should be pursued. Nevertheless, there might be applications other than the envisioned tracking technologies that might attract this target group. Future work should study this target group more in detail, e.g. in open-ended questionaires or (semi-structured) interviews.

The findings of the survey may inform the design of climbing technologies, for example a climb tracking system. The results show that some of the climbers are willing and/or are currently recording the routes they already climbed. Many of the climbers stated that they would track other sport activities, but that it would be too cumbersome to track all the routes they are climbing. This could be, for example, a smartphone application which provides, besides the tracking functionality, an additional value such as more detailed information of a route or exhaustive statistics. Future work needs to further explore technical aspects as well as human factors of wearable climbing technology (e.g. the proven concept of a combination of wearable device and smartphone application for activity tracking).

In future work we plan a survey that will focuse on climbing technologies for outdoors climbing. We will further study tracking technologies enables similar features as running and cycling technologies were diverse.

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