Towards Understanding Hikers' Technology Preferences

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Abstract
Many people enjoy hiking as an outdoor escape from everyday life. However, in our survey of 1002 respondants in the United States, 95% of respondents indicate that they prefer to bring their cell phone when hiking. This potentially creates distractions by reminding hikers of the daily pressures they sought to escape. We believe technology has the ability to enable or enhance outdoor activities, such as hiking, without taking away from the experience. But to begin to realize this vision we must first understand current attitudes towards technology in the outdoors. We present data from a nationwide survey conducted within the United States. We have used this data to identify clusters around attitudes towards hiking and technology use while hiking. We present initial results and analysis of this data as well as direction for future work.

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Outdoor recreation, Hiking

ACM Classification Keywords
H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous

Introduction
Recently much research has focused on novel interactive computing systems for use in outdoor recreation [1, 9, 5, 6,

7, 4, 8]. SIGs and workshops have been organized at CHI and other venues around this topic [3, 2]. While progress has been made in exploring how interactive computing might coexist with outdoor recreation, it remains unclear exactly what the current attitudes are in this regard. Our experience shows a wide variance in opinions, with some seeing technology as a distraction and others embracing it.

We present the results of a 1002-respondent survey conducted in the United States. From this survey we identified 5 clusters of hikers and 5 clusters of technology use preferences when hiking. We also identified correlations between preferences regarding hiking and technology.

Survey

Location United States—respondents from 916 unique ZIP codes

Survey Software: Qualtrics and Amazon Mechanical Turk

Respondents: 1042, with 40 eliminated by weeder question and/or missing data, for a total of 1002 valid responses

Ages: mean: 34.94, median: 32, st. dev.: 10.95

Sex: 579 male, 423 female

Related Work

Current research has focused on novel computing applications for specific sports. In ClimbAware [6], Kosmalla explores wearables for use in rock climbing. Posti enables hikers to maintain solitude with HOBBIT [7]. Others explore detection of ski turns [4], cycling applications [1], and augmentation of helmets [9]. These represent merely a few examples from a much larger body of work. We draw on this work, but choose as a first step to try to understand the current landscape of hikers and their usage of technology.

Other work focuses on desires, preferences, and needs of athletes. Examples include work by Knaving exploring the needs of "advanced amateur" runners [5], and work by Tholander and Nylander exploring athletes' experience with sports watches [8]. Our work is similar to these, although presently of a more quantitative nature.

Methodology

Our survey was intended to measure participants' preferences with regards to hiking and what technology, if any, they bring while hiking. Hiking questions were Likert-scale questions while the technology questions were binary. Constructs measured about hiking included preferences with regards to frequency, location, motivations, duration, difficulty, and companionship. Technology-related questions focused on whether or not individuals preferred to bring specfic consumer electronics with them and reasons for bringing them along. In order to avoid recall bias, questions were phrased to probe preferences rather than practices, e.g. "I prefer to hike alone," as opposed to, "I hike alone."

The survey data was partitioned into sections regarding hiking, technology, and reasons for technology inclusion or exclusion. The K-Means algorithm from the WEKA analysis tool was employed to cluster the data. Hiking and technology data were clustered separately, under the assumption that hiking clusters and technology use preferences would overlap in a number of different ways. Membership between clusters was then compared to determine if there were any correlations between membership in hiking and tech clusters. Calculations were also made regarding attitudes toward individual tech categories within hiking clusters.

Results

For the hiking preference data we tested values for k ranging from 2 to 10, ultimately settling on 5 as providing groups that were cohesive and strongly differentiated from one another. This process was repeated for technology preferences with 5 clusters being identified as well.

Figure 1 shows a radial chart of the 5 hiking clusters. We opted to name the clusters based on each cluster's characteristics. Full names for each cluster along with characterizations for cluster members appear in the sidebar.

Values plotted in the chart represent mean values for the Likert-scale questions regarding hiking, with values 1-5 representing "strongly disagree" to "strongly agree".

Hiking Clusters and Potential Characterizations

Cluster 1—*Hiking Club*: Members of this group like to take a short easy hike roughly once a month in a group with fun being the strongest motivator.

Cluster 2—*Non-Hikers*: Members of this group don't seem to enjoy hiking, and apparently would prefer short and easy if they must do so.

Cluster 3—*Tourists*: Members of this group enjoy hiking while traveling with a group of people and hikes that last half a day.

Cluster 4—*Hiking Enthusiasts*: Members of this group enjoy hikes of all lengths and difficulties, at home and traveling, and for all motivations.

Cluster 5—*Meditators*: Members of this group enjoy taking frequent hour to half-day hikes alone with health and meditation being the strongest motivators.

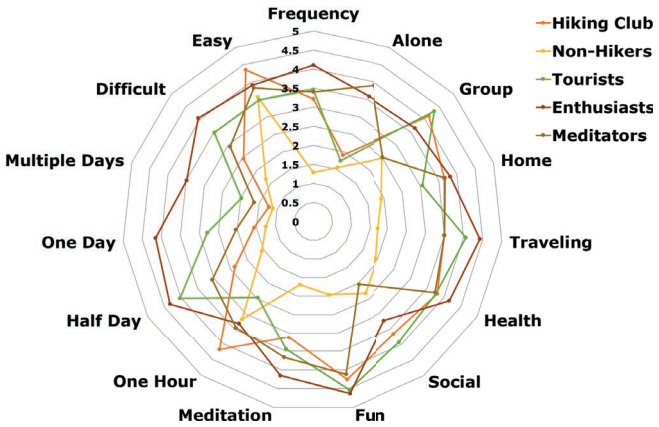

Figure 1: Five clusters of hikers identified by k-means clustering.

Figure 2 shows a radial chart plotting mean response values to questions about technology preferences. In this case, data points represent mean values ranging from 0 to 1, with 1 meaning that all individuals in a cluster prefer to bring that particular item and 0 none.

In examining technology clusters we found that 3 of 5 groups are characterized by bringing their cell phone and one other device. The fourth group brings only their cell phone and the last group brings a multitude of devices.

With clusters established, we calculated the difference between the percentages of members from each hiking cluster in each tech cluster and the overall percentages of people in each tech cluster, normalized for cluster sizes. This allowed us to reason about possible correlations between hiking and tech clusters. Results are presented in Table 1.

Comparing these probabilities leads to interesting insights. For instance, the *Hiking Club* is more likely (by 22%) to be

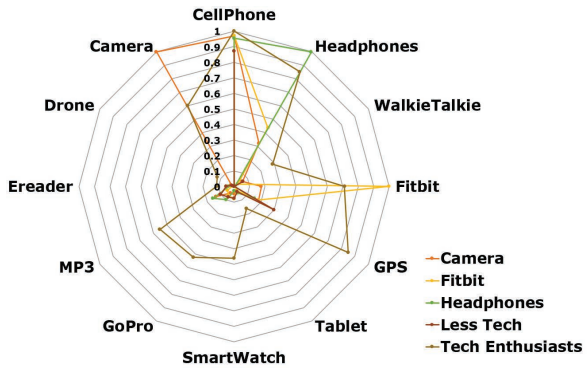

Figure 2: Five clusters of technology preferences identified by k-means clustering.

	Camera	Fitbit	Headphones	Less Tech	Enthusiasts
Hiking Club	6.31%	22.49%	-6.13%	-8.08%	-24.38%
Non-Hikers	-13.81%	-45.72%	14.54%	49.04%	-27.74%
Tourists	10.52%	14.81%	-15.19%	1.05%	-15.51%
Enthusiasts	1.63%	0.80%	-8.24%	-12.13%	49.11%
Meditators	-22.18%	-41.52%	37.43%	13.17%	-3.12%

Table 1: Differences in probabilities of belonging to each tech cluster given a certain hiking cluster.

in the *Fitbit* cluster. Similarly the *Meditators*, who prefer hiking alone, are 37% more likely to be in the *Headphones* cluster, and 41% less likely to be in the *Fitbit* cluster. Also of note, the *Tourists* display the strongest potential correlation with the *Camera* group. And *Non-Hikers* are just as uninterested in technology as hiking and are the most likely to be in the *Less Tech* cluster.

Discussion

While the data itself and the insights gathered thus far are interesting, there are more ways it can be looked at. While other methods provided by WEKA proved less than effective, there may be clustering algorithms, such as the Chi-

nese restaurant process, which could prove useful. More sophisticated statistical analysis may also prove fruitful. Also, additional work is needed to understand the groups and to further validate this grouping.

Beyond further analysis of this dataset, establishing hiking clusters provides a solid basis from which to conduct qualitative inquiry, which could provide a deeper and more nuanced understanding of hikers' attitudes toward technology usage. Ultimately, we hope to arrive at a set of principles from which to begin designing and building systems and tools for use in hiking and other outdoor recreation activities.

We are beginning to understand hikers' current attitudes toward interactive computing during hiking. In the future, we hope to develop and validate guidelines for designing interactive computing for hikers. Eventually, we may design, build, and test prototypes of computer-enbled hiking gear. We hope that a deeper understanding of interactive computing for hiking will inform interactive computing for outdoor recreation in general.

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