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**Figure 1:** Day three hiking companion talking on a smartphone with rare cell reception.



**Figure 2:** Day four charging technology during the night.



**Figure 3:** Day five first author using the GoPro to take photos.

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# Hiking The Appalachian Trail With Technology

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## Abstract

Hiking provides the opportunity to connect with nature, with accompanying technology challenges and opportunities. This paper presents a personal narrative experience project toward understanding the impact of technology on extended hikes, seeking to put into practice the preparation, experience, and reflection that is necessary in hiking. Specifically, the first author undertook a week-long hike with a companion, describing three technologies (a smartwatch, a wearable camera, and a smartphone) with initial promise to match the needs of the planned experience and the desire for subsequent reflection. The paper concludes with recommendations for selecting, connecting, designing for, and using technology on the trail.

## Author Keywords

Technology, trails, nature, hikes, design, data

## ACM Classification Keywords

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

## Introduction and Related Work

Hiking is often viewed as an opportunity to escape from daily tasks, including technology. But technology is ingrained in our lives, providing opportunities to enrich and facilitate experiences in ways that some hikers may appreciate.

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Garmin Fenix 3 HR Watch	
<b>PROs</b>	
• Battery life last a lot longer than advertised with GPS on (about 60 hours with GPS constantly on with watch at 100% battery).	• Heart Rate sensor helped track when there should be a break.
• Watch size helped with reading information.	• The 4 four split screen feature was greater for additional information to be displayed.
• Provides real-time data to influence important hiker decisions.	
<b>CONs</b>	
• Size of watch made it hard to bend wrist without hitting a button on the side of the watch.	• Syncing to GarminExpress requires a 4G connection (Bluetooth would not connect otherwise.)
• Interface was confusing.	

ate. Our broader efforts look at the influences, both positive and negative, of technology when used on extended trail hikes and similar activities. Widely available technologies and apps, including mobile devices, GPS, biometric sensors, photo and video apps, and mobile blogging tools allow the capture of data and information related to a hike. However, appropriate ways to use it are not well understood, and methods for design are still under way. This paper categorizes hiking efforts in a way to explain some of their challenges and opportunities, and provides an analysis of a personal group experience in preparing for, experiencing, and reflecting on a multi-day hike with technology.

We explore this intellectual space based on three categories: preparation, experience, and reflection. *Preparation* is the act of planning, purchasing, and connecting by bringing technology away from technology-friendly areas when attempting to stay connected [1]. *Experience* has a focus on notifications and information from the hike through pictures, videos, writings, audio, biometric data, location data, etc. [1] *Reflection* pertains to thoughts of the experience through processing, reflecting, visualizing, and making sense of the experience to understand its focus on not only what was learned but costs of time and attention that is accompanied by technology use [1]. Of course, there is significant overlap in these categories, but we found that the categorization allows us to think about how prior and ongoing work can apply to the under-studied domain of hiking.

The experience focuses on two hikers, the first author, a 23-year-old white male with a technology background, and a hiking companion, a 61-year-old white male who is not tech-savvy but is knowledgeable of the wilderness and outdoors. The hike took place March 4th through March 9th. During the preparation, the first author and the hiking companion traded multiple emails and phone call to create an

itinerary for locations, weather forecasts, day-by-day plans, and gear selection. Both hikers worked with the second author to choose devices within a limited budget that could be acquired in an expedient manner, making sure to pick each device that would be particularly valuable on an extended hike. Both hikers received the same set of technologies for the hike.

This effort was part of a larger Technology on the Trail initiative that seeks to explore the influences of technology when used on extended trail settings. Our recent Technology on the Trail workshop focused on a handful of the many aspects of this topic: extended adventures on trails, looking at technology impacts [4, 8], science and education in the outdoors [6, 10], and conflicting communities on the trail [7, 14]. Other efforts consider how to design technologies not for urban environments but instead tailored for interactions with nature [2, 11]. Theoretical considerations of how to study technology in the wild, contrasting it to technology in urban areas, helps guide and refine our choices of technologies and activities [3, 12, 13].

In summary, understanding these influences provides a means to note the challenges of bringing technology onto the trail and reflect on the noted patterns to understand, acquire, design and deploy technological solutions. This paper draws from these lessons in preparing for, experiencing, and reflecting on a hike, concluding with lessons learned and future imagined opportunities for bringing technology on the trail.

## Findings

### *Preparation*

To prepare for our hike, we reviewed literature and talked to various self-identified hikers to determine what was important to consider on a hike. Because the information we got was

GoPro HERO Session	
<b>PROs</b>	
<ul style="list-style-type: none"> <li>• Chest mount made for easy access to the hand's free camera and never got in the way of backpack straps.</li> <li>• Great photo quality.</li> </ul>	
<b>CONs</b>	
<ul style="list-style-type: none"> <li>• Battery life was affected by the cold temperatures.</li> </ul>	

Smartphones	
<b>PROs</b>	
<ul style="list-style-type: none"> <li>• Great backup for photos if GoPro failed.</li> <li>• Great photo quality.</li> </ul>	
<b>CONs</b>	
<ul style="list-style-type: none"> <li>• No signal most of the time.</li> <li>• Extremely unreliable as most of the functions on the phone required a connection to interface with Garmin or GoPro.</li> <li>• Wasn't waterproof. Potential water damage.</li> <li>• Not hands-free. A hassle to remove from pocket multiple times throughout a hike.</li> </ul>	

largely based on hiker opinions, there was contradictory advice. Key factors for consideration included weight, cost, power needs, quality, durability, data collection and exporting, and utility; all worthy of thought before going out on the trail. Some of these themes pooled into choices of technology to consider.

We crafted to a long list of candidate technologies. For each piece of technology we considered the factors listed above based on their advertised use, professional papers, online blogs and reviews, and other experiential writeups, sometimes projecting for long-term outdoor use (often beyond the stated use).

We chose six technologies. Though for this paper we closely examine three pieces of technology that have PROs and CONs lists denoted by an asterisk:

- Garmin Fenix 3 HR Watch with GPS\*
- GoPro HERO Session\*
- Sony Audio Recorder
- ETON FRX-BT All-Purpose Device
- RAVPower & Anker external battery pack
- Motorola Droid Turbo 2 & Kyocera Brigadier E6782 Smartphone(s)\*

These devices were chosen to reflect current technology available to hikers commercially among other qualities. The Garmin Fenix watch is widely used for tracking personal sports data among an array of features. The main feature utilized was the Hike widget, which provide GPS tracking, length of hike, distance traveled, heart rate, and similar data. The GoPro is a popular camera device used in extreme sports, built for the outdoor activities though not necessarily for distance hikes. It is also reported to be durable, making it good for recording video and pictures. The Sony

audio recorder be used to document daily activities in journal style. The ETON All-Purpose device features included lights, solar panel charger, a crank for mechanical charging, and a radio which proved to be a great choice for emergencies. The batteries were chosen to keep all our technologies charged for the duration of the trip, regardless of solar or mechanical charge that could be collected. Lastly, smartphones are indispensable in our urban lives but typically not built for the outdoors. In addition to each person's usual apps, smartphones can utilize apps like GarminExpress and GoPro CONTROL to view and collect information from their respective devices and have a means of communication in case of emergency.

We purchased the technologies, used it for about a week, and once they were tested and documented we set off on our hike.

### *Experiences*

The hike was done by two individuals over the course of six days for 53 miles and took place early March 2017. The weather ranged from sunny to rainy with fluctuating temperatures between 9 to 70 degrees Fahrenheit (or -12.8 to 21.1 degrees Celsius). It allowed for a wide range of experiences and their uses given these settings. The entirety of hiking experience was spent on the trail. No town or city was ventured throughout the duration of the hike.

While the picked technologies are meant to be used to understand the impact technology has on the hiking experience, they serve to collect data like GPS coordinates, heart rate, rate of travel, audio recordings, and pictures. All this data can be used to create a context by linking them to their timestamps which can present themes and trends quantitatively. The AT hike yielded 1058 photos, 132 audio recordings, 7 videos, and 6 days of GPS coordinates showing an accurate representation of the trail we traveled.



**Figure 4:** Garmin Fenix 3 HR Watch.



**Figure 5:** GoPro HERO Session 5.



**Figure 6:** Motorola Droid Turbo 2.

### *Reflection*

After the hike, there was huge value in gaining a hiker's perspective. Noting these pros and cons from a hiker's perspective provides a view on how technology can positively and negatively effect a hike. Not only was software performance an issue, but also physical design. The devices worked as expected out of the box, but a single device (or closely interconnected devices) might better meet the needs. Having to deal with multiple devices in itself was a minor distraction and obtrusive to the experience. During the course of the hike, there were many noted positives and negatives for each device. For the scope of this paper, the compiled tables along the margins are compilations of both hikers of the three picked device above in list above.

The first author and hiking companion utilized technology differently. For instance, while the first author valued the data being collected by the Garmin watch, the hiking companion used the heart rate function to consciously determine when there should be a break just to avoid potential health issues. This is one of many notable themes to consider when construction devices for the trail.

Most surprising was the smartphone. Generally, both on and off the trail the smartphone was considered a popular technology to bring on a hike because it's so versatile. However, our reflection on the usefulness of the smartphone shows a low appeal. Today's smartphone is designed for the urban world where accidents are not a prevalent, connectivity is the standard, and electrical power is at our finger tips. This is not the case on the AT as shown in the smartphones table.

### **Discussion and Conclusion**

In this paper, we demonstrated the Preparation, Experience, and Reflection of technology use on the AT. The ex-

periences and reflections revealed many design potentials for future technologies with a focus on the trail. In an urban environment a lot for our technologies are data driven. Routinely data is being processed non-stop to make sense of it to find themes or trends [5]. And there are less urgent but valuable needs; e.g. opportunities for advancing science by collecting data, reminders to capture pictures, videos, and blog comments about an adventure.

### *Human-Computer Interaction (HCI) Perspective*

Hiking is seen as an escape from technology for most, but people all too often want their technology for small pockets of time. There should be a focus on better understanding of hiker needs and desires. Thus, technologies need to be tailored for the experience and practicality. How can hardware and software developers help craft technology experiences that match the needs of hikers. This can lead into reflection tools that match personal and group reflection. How can tools contribute to reflection through classic HCI overview and filtering techniques.

### *Trail visualization tool*

Large amounts of data are generated on hikes and other outdoor adventures, but there is a lack of tools tailored to help hikers reflect on their own adventures as well as a plan using the adventures of others. Our own prototypes have explored hiking blog visualization tools as well as geo-location tools for hike areas [1].

### *Balancing notifications and tech-free environments*

Appropriate notifications can help with important, even life-essential information; e.g., health monitoring for at-risk individuals, inclement weather alerts. There is already works of a SmartSole for where it uses sensors to help improve form and technique for outdoors activities with a potential to collect useful personal data that could generate notifications for specific reasons tailored to the soles use [9].

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