My Solo Hiking Buddy: A Smart Interactive Hiking Pole

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1 Introduction

There are mixed opinions about hiking alone or solo-hiking among professional and amateur hikers alike. While engaging in outdoor activities such as hiking and backpacking all by oneself introduces many benefits such as increasing flexibility in timing and trail selection, strengthening confidence in hiking skills, and allowing self-examination in the solitude of nature[1], solo-hiking has its own risks as hiking alone increases the innate risk of getting injured or lost. Additionally, one significant disadvantage is that the experience of solo-hiking lacks human communication, which makes hikers feel lonely and might discourage them from going on future solo trips. In other words, communication among hiking partners can provide hikers with motivation to overcome the hardships along the trails. Without these communications, hikers can feel less motivated to complete their hike[2]. To address loneliness and lack of motivation in solo-hikes, we propose to design a smart hiking pole that communicates with the hiker and improves the hiking experience by acting like a digital travel companion. The smart hiking pole is equipped with an arduino, a speaker and a microphone to allow verbal communication and a small display for visual feedback. A smartphone application is designed to connect to the pole via bluetooth and control the interfaces.

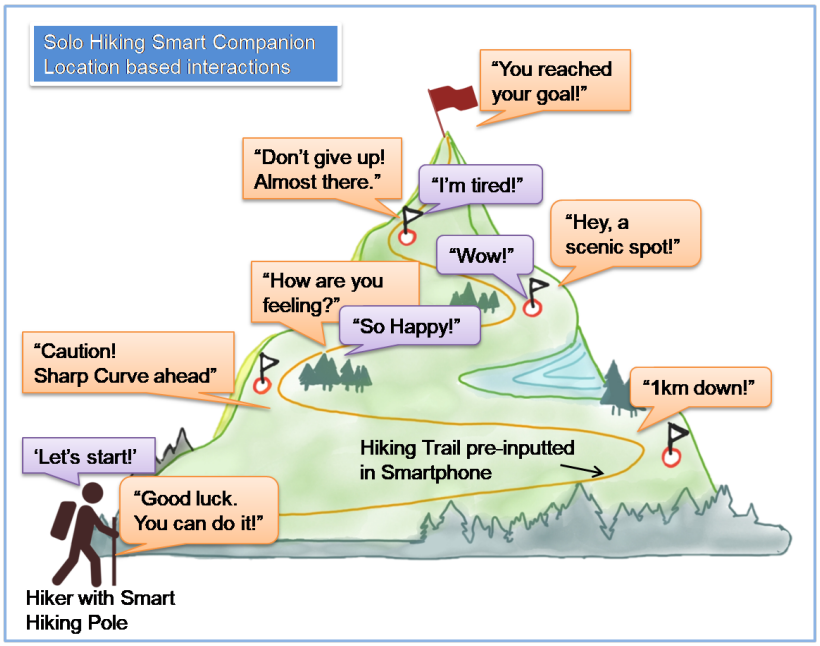

Figure 1: Proposed Interaction Between Hiker and Smart Hiking Pole.

2 Background and Motivation

Today, smart devices are embedded into different aspects of people′s lives, acting as a means for communication, entertainment, and socialization in the society. The advancements of wireless technologies have boosted the possibility of widely using these devices in the wilderness, when people are engaged in outdoor activities. GPS devices, satellite phones, personal locator beams, and smartphones are examples of technologies influencing the experience of hiking and other outdoor recreations[3]. In a survey with 635 participants, it was reported that among these handheld devices, smartphones are carried most by wilderness visitors (29%), followed by GPS (26%), and iPod, iTouch, Kindle (20%)[4]. In another survey with 541 participants, it was reported that 97% of the thru hikers in the Pacific Crest Trail (PCT) carried smartphones with themselves and spent an average of 3 hours and 23 minutes daily on their smartphones[5].

With the possibility of using these devices in the wilderness, many issues and difficulties of navigating and safety in the outdoors can be addressed. Global Positioning System (GPS) devices and smartphones as resources for topological maps and trail guides are used by hikers and mountain climbers. Personal locator beacons such as SPOT were also legalized for public use in 2003. While using these devices may lead to incorrect risk assessment and bad decision making for inexperienced and unskilled hikers[6], the advantages they introduce in communication and safety during the wilderness experience cannot be ignored.

In a survey on personal locator beacons (PLB), Martin and Blackwell (2016) collected data that showed that most users felt safer in the wilderness having this device with them. Both PLB users and non-users agreed that technology can create a sense of false safety in the wilderness. Among those who had a PLB, those hikers who visited the trail more frequently and were more likely to solo-hike (33 people), 20 expressed their reasons for carrying the device as safety and insurance in case of danger, 15 expressed their reasons as communication with family and reassuring them, and 6 expressed their reasons as a justification for solo-traveling[7].

With regards to existing technology in smart canes and hiking poles, there are certain patents and papers published. Karsten Hanlin (2020) has invented a smart ski pole with integrated speaker that includes a display, a speaker, buttons and a controller all within the pole grip[8]. With a different set of features, Ahmad Alghazi (2018) has invented a multi-functional smart mobility aid device that includes sensors to collect biometric information and perform activity tracking[9]. Several versions of smart white canes for the visually impaired has also been designed and proposed[10][11][12]. These canes use ultrasonic or infrared sensors for recognizing obstacles and inform the user with haptic and/or audio feedback. These devices provide more safety and decrease the risks that come with travelling alone in the wilderness such as getting lost or injured. However, there is no solution provided for the lack of human communication leading to loneliness and insufficient motivation during solo hikes.

Cacioppo (2008) in his research on loneliness emphasizes on the correlation between the psychology of loneliness and the hesitation for people to participate in solo travel[13]. Myers (2018) formed a conclusion on such research that people are more likely to be afraid of feeling alone than being physically

alone[14]. There is also a potential correlation between loneliness and the desire to travel alone especially in adults/elders [14]. In order to address loneliness on solo hiking, smart devices may replace the need for a travel companion keeping intact the solo-trip experience.

3 Methodology & Design

We will build the communication process between new hiking pole and hiker in three aspects: audio, vision and haptics. While audio aspect will be connected with the smart hiking pole in two parts: One part initiated by the hiking pole, and the other initiated by the hiker.

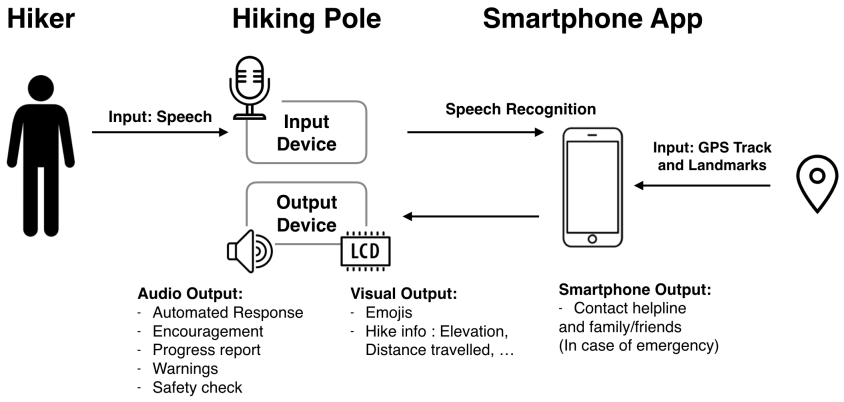

Figure 2: Process Flow for Smart Hiking Pole

In the hiking pole perspective, based on pre-inputted locations-based information along the trail, the hiking pole will offer warnings about dangerous parts of the trail, motivational advice in difficult and challenging situations, progress updates, and general inquiries about the scenery and how the hiker feels along the way. The hiking pole can also ask for the user′s description of how the hike has been so far and record the answers to create a voice memo. We want to use pre-recorded sentences for the smart hiking pole′s speech and avoid using robotic voices such as siri. The tracks recorded for hiking trails are mostly in GPX format and will be parsed and altered using gpxpy python library. Geopy library can also be used for accessing landmarks based on the GPS info.

In the other perspective, hikers will start the communication. A main reason for feeling lonely during the hike or in the wilderness is that the solo hikers do not have anyone to share their excitement and enthusiasm with. The hiker can activate the hiking pole by calling its name. After hearing its name, the smart pole will listen for keywords in the hiker′s following sentences and answer accordingly via the speaker and the display. For performing speech recognition we plan to use Speech Recognition library in python that uses Google Cloud Speech API.

Additionally, we will embed a tiny LED screen to display facial emoji corresponding to hikers′ feeling during certain communication. Building vibration effects to bring users tactile form of communication is

also considered, but it was eventually dropped since it might result in safety concerns.

In all above mentioned scenarios, our main objective is to propose a solution to solve the loneliness issue, which is our main focus in this project. Other features which can tackle with the problems of getting lost or injured in a solo-hike can also be added to the smart pole system. The communication initiated by the hiking pole can also serve as a navigation guide and notify the hiker whenever they leave the trail based on the inputted track. Another possibility is to implement safety features that hikers can use in dangerous or risky hikes. The smart poles can be programmed to check the hiker′s consciousness in certain time intervals by asking for a spoken response. If the user is injured and unconscious and does not respond to the pole′s query, the smart pole can notify others and ask for help by emitting SOS signals.

4 Evaluation Strategy

We will conduct a user study to test and evaluate how much our proposed smart interactive hiking pole will help hikers reduce their loneliness and boost their motivation during solo-hiking and whether users will choose to use our proposed hiking pole compared to other wearable technologies with the same capabilities. More detailed evaluation plan will be discussed in the next phase.

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