Peppy Pole: An Anthropomorphic Hiking Companion

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1 Introduction

Today, trekking and hiking is one of most popular outdoor and recreation activities. Many technologies such as GPS devices, satellite phones, personal locator beams, and smartphones are examples of technologies influencing the experience of hiking and other outdoor recreations[1]. It can be observed that while there are many technologies created and proposed to enhance the hiking experience in terms of navigation, safety, and comfort, there are no signs of using technological devices and interfaces for improving the social and emotional aspects of these outdoor activities.

Research on anthropomorphic interfaces and designing products with lifelike traits suggests that these technologies can influence the emotional connection between the user and the product[2]. However, the potential for using these interfaces in outdoor activities and the effect of the mentioned emotional attachment on the hiking experiencehas not yet been explored.

To engage hikers in personal experiences stimulated by the physical, emotional and behavioural traits of the hiking pole, we propose to design an anthropomorphic hiking pole that communicates its feelings to the hiker and responds to the hiker's actions. This form of interaction can create and enhance the emotional attachment between the hiker and the hiking pole. We will explore whether this attachment can subsequently encourage the hiker to hike more and make the activity more enjoyable. In order to add lifelike features to our hiking pole, we plan to mostly use existing parts of the hiking pole for different interactions.

Specifically, our user study aims to focus on addressing the following research questions:

- Will the Peppy Pole motivate the hiker to go on hikes more often, by displaying its "own" wish to be taken out on hikes?

  This question shall investigate how the existentialism of the hiking pole affect the user's motivation.

- Will the hiker find their hiking trips more enjoyable on using the Peppy Pole?

  This question shall look into the impact (on the user) of the pole's features such as communicating emotions with the hiker through mechanical swaying of the wrist strap, sensing the mood of the hiker (tired or excited) and displaying its own wish to take breaks on account of fatigue.

2 Background and Motivation

2.1 Introduction to Anthropomorphic Objects

Humans have a natural need for social connections which forms one of the strong motivation factors for the tendency to choose anthropomorphic gadgets[3]. Brown (2010) proposed that numerous anthropomorphic techniques have been increasingly applied nowadays, especially by marketing brands[4]. Beyond that, Mourey (2017) mentioned that the fast development of the Internet of Things has created items that appear to be "alive" through intuitiveness, interaction, responsiveness, and even personality[5]. The fact that individuals are engaged with anthropomorphic products consists with the belongings theory saying that people own a fundamental demand to belong and form social attachments with live being[5].

The manner in which anthropomorphic tendencies actualize differs based on different personal preferences. Previous research indicates that people who suffer chronic loneliness are more likely to assign human like traits to devices like an alarm clock, air purifier, battery charger, etc[6]. A study including 210 Australian participants, on effects of anthropomorphic tendency on destination attitude and travel intentions indicated that people with high levels of anthropomorphic tendency prefer to humanized destination, travel intentions and view a personified traveling advertisement[7].

2.2 Lifelike Characteristics in Anthropomorphic Objects

Adding lifelike characteristics to different products can influence the relationship between the user and the product. A study by Burneleit et al (2009) introduced a product prototype called the Impatient Toaster which presented lifelike traits to encourage people to use it more often. They showed that these traits help create an emotional bond between the user and the product[2]. Such an emotional attachment with everyday objects may be investigated further in all aspects of people's lives ranging from indoor activities to outdoor recreation such as hiking or trekking.

Row and Nam (2016) conducted a study on lifelike characteristics in interfaces. They found out that for the interfaces to feel more alive to the users, they must have certain features. Some important examples of these features are lively movement in the interface, behaving like an independent agent and acting autonomously without need for operation, and having an appearance resembling a living organism[8]. Features like these are included in the design of an anthropomorphic interface to make it feel more alive to the user.

2.3 Motivations to Anthropomorphic Hiking Poles

There is not much evidence that the existentialism of a pole or a walking stick has been discussed with regards to anthropomorphism, even though there are many patents owned and papers published on smart hiking poles/canes which are multi-functional. Karsten Hanlin (2020) invented a smart ski pole with

integrated speaker that includes a display, a speaker, buttons and a controller all within the pole grip[9]. 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[10]. Several versions of smart white canes for the visually impaired has also been designed and proposed[11][12][13]. These canes use ultrasonic or infrared sensors for recognizing obstacles and inform the user with haptic and/or audio feedback. Although these hiking poles are functional and have smart features, not much focus is directed on addressing how to create an emotional bonding with the hiking pole/cane and how that bonding will affect the user experience.

Anthropomorphism does not necessarily mean assigning superficial characteristics such as a human-like face or body, but rather to create objects with more significant human characteristics like the ability to think and feel emotions[14]. In the light of this definition, we observed there has not been much focus in existing literature on an anthropomorphic hiking pole for establishing emotional connection with the hiker that might improve the social and motivational aspects of the hiking experience. It is expected that this shall be a more intimate experience for the hiker than just a smart assistant on a smartphone, i.e., and in the design, the primary focus is on the pole's physically -"poleness".

3 Methodology & Design

3.1 Methods

We propose to design and build a living interface in the form of a hiking pole, capable of social interaction with the hikers. To design lifelike features of our living hiking pole we try to answer the question of how hiking pole would feel in different situations if it was alive. Unsurprisingly, the living hiking pole feels bored when sitting idle at home and excited when starting a new hike. Like most living creatures, it can feel tired after 'walking' for long and refreshed after a proper rest. The pole's general satisfaction increases with the number of steps it takes and decreases by the hours it sits idle and unused.

The anthropomorphic hiking pole, shall encourage the user to go out for hiking on a frequent basis on the account of "feeling lonely trapped in the closet for a long time". The pole shall express this emotion by mechanically flapping the wrist straps or make an impatient thud using some form of rolling ball mechanism to draw the attention of hikers. It may also indicate with a sliding extension that it is ready for the hike like an alive being.

During the hiking trip, our proposed hiking pole may communicate with the hiker by moving its wrist strap to express its feelings. Different mechanical swaying patterns of the strap shall display happiness, excitement, tiredness, sadness, etc. Likewise, the feelings of the hiker can be conveyed through the force behind hitting the ground with the pole during the hike. When the hiker taps the group more forcefully it can mean that the hiker is excited and energetic and when he/she hits the ground without much force it can mean that the hiker is tired or in a bad mood. The hiking pole can also respond to these feelings in an appropriate way by sensing the pressure imparted by the pole while tapping the ground during hike.

Based on which it shall judge the emotional state of the hiker and in response to this, the wrist strap will flutter or droop down respectively. This will allow for a two-way communication between the hiker and hiking pole and can help build an emotional bonding between the two.

Apart from interacting with hikers by responding their feelings, the anthropomorphic hiking pole can also initiate the communication of sharing feelings. When hikers take it out from the closet, it will express its excitement by swapping its strap quickly. After trekking for a while, the living hiking pole will feel weak and fatigue. It can express its feeling of tiredness by droop down its wrist swap. Meanwhile, the tiredness feeling will be based on a predetermined schedule, so that the hiking pole can assist hikers to make sure that they get enough rest and sleep during the long process of hiking.

The hiking pole shall be equipped with an Arduino Uno and an accelerometer for detecting the pressure imparted by the pole while tapping the ground during hike and counting the steps. A motor can move the wrist strap in different patterns for different emotions.

3.2 Prototype Design

Our prototype of the Peppy Pole includes means for communication between the pole and the hiker as discussed in the method section. We plan to use an Arduino Uno with motors to move the wrist strap in different patterns to show the feelings of the Peppy Pole. For the hiker to express whether they feel energetic or tired we shall use an accelerometer sensor that can differentiate between tapping three times (energetically) and tapping twice (tiredly) the pole on the ground by capturing the peak of motion data curve. The reason why we consider twice or tree times tapping instead of once is because it might be confusing for the pole to detect whether hiker is hiking regularly or tapping the pole to express emotion. Additionally, the accelerometer should also be used for counting how many steps the Peppy Pole has taken which is an indicator of its tiredness.

3.2.1 Accelerometer

After some consideration of budget and coding complexity, our first prototype was built by applying the accelerometer embedded in an Android phone instead of an independent accelerometer sensor. Pole tapping times and step counting are all based on the data retrieved from the accelerometer in an Android phone. As for how the Android phone was connected to the Arduino Uno, we originally planed to connect it via bluetooth. However, since bluetooth module for Arduino Uno was unavailable and our Raspberry Pi 3 had some issues with bluetooth devices detection, we proposed to directly connect and retrieve data from the Android phone through USB-C and USB cable in the first prototype.

Later, we will program the Arduino, so that the Peppy Pole's general satisfaction can increase with the number of steps in a hike and then decreases with the time interval it sits idle and unused. When the satisfaction goes below a threshold the Peppy Pole will start showing its eagerness to go on another hike by moving the wrist straps and making noise. It will keep making those noises until the hiker takes it on

Figure 1: Proposed Hiking Pole Design Prototype. Retrieved from `https://zpacks.com/products/zpacks-carbon-fiber-trekking-pole`

a hike. We plan to attach small metal bits to the wrist strap so that when the pole moves them around, the metal bits hitting each other makes enough noise for the hiker to notice even if the pole is in the closet or out of sight.

3.2.2 DC motor

Different actions and reaction of the Peppy Pole are shown using two motors to move two parts of Peppy Pole's wrist strap. You can see the two parts shown in Figure 1. Part A is loose and not held by the hiker during the hike. This part will move around fast or slow or with different patterns to show how the pole feels. For example, when the pole is tired it will droop down and when it is excited in the beginning of the hike, it will move around frantically. When the hiker taps the ground twice to show her/his high level of energy, the pole with move the loose strap to show its happiness. When the hiker feels tired and expresses that feeling with the pole, however, the second motor will move part B of the wrist strap which is around the hiker's wrist and squeezes the hiker's wrist to comfort her/him by tightening the strap. Having these two forms of reaction for the pole will increase the quality of the communication and make the Peppy Pole feel more alive to the hiker.

Due to the fact that our DC motors cannot move the strap as expected, and the spinning motion will only twist the strap without making the required movement, we propose to attach another similar-shape but light-material strap to substitute the original strap for strap Part A. In this case, the new strap can spin around following the DC motor with our expected motion in the first prototype. It is worth mentioning that this issue can be resolved if the motor is built inside the pole's handle and attached to the end of

the strap.

When reacting to the hiker's soft taps, the hiking pole will tighten the part B of the strap to squeeze the hikers wrist. This motion is generated using a second motor pulling the strap with an attached string. We need a motor driver component for squeezing and un-squeezing the hiker's wrist by changing the spin direction of the motor.

4 Evaluation Strategy

4.1 Pilot Study

In order to find problems in our prototype and experiment study, we plan to perform a pilot test recruiting 2 or 3 participants with hiking habits. The observations and the participantsâ feedback shall be noted down. The aim of the pilot test shall be to fix any errors in the questionnaire and to apply constructive comments in our prototype design. Additionally, the pilot study shall also form as a basis to gain more insights on the possible results we may expect from our main experiment set-up[15].

4.2 Main Experiment

The user study will be conducted in two phases (Phase A and Phase B) to evaluate our anthropomorphic hiking pole prototype and answer the main research questions. Our study is likely to consist of 5-10 participants preferably people who are fans of hiking and are most likely UBC students. The experiment will be divided into two phases because the Peppy Pole has two primary types of functions, corresponding to our two main research questions:

1. Hiking Function: It will sense and display various emotions during the trips as mentioned previously.
2. Indoor Function: It will show impatience and want to be taken out on a hike. It will show excitement once it senses that the hiker will take it out for a hiking trip.

Phase A shall be about addressing the functions that are observed during the hiking trip and Phase B will focus mainly on understanding the impact of the indoor function.

4.2.1 Phase A: Hiking Function

We plan to define a very short hiking trail preferably on a path with sand or some elevation for this phase of the user study. Due to time and resource constraints, it shall not be possible to conduct long distance hikes for each participant to try out the pole. We choose a path with lot of sand or some elevated trail, to

ensure the short distance hike is "tiring" enough for the pole and the hiker. This shall help demonstrate all the emotional features of our Peppy Pole aka feeling energetic or tired.

Before each experiment, we will conduct a training by briefing participants on how to communicate with the pole, and ask them to practice the tapping action to make sure they perform both communication approaches correctly: tapping twice to express tiredness and three times to express excitement. During the hike, they are required to tap the pole at least once when they feel relatively energetic or tired. We will program our prototype Peppy Pole so that it will get tired once or twice during the short-distance hike so that the hiker can get familiar with the Peppy Pole's behaviours. This experiment is estimated to take around 1.5 hour per participant including the survey and the interview.

We will record the whole experimental process with the permission of participants for further analysis. The hiker's feedback on the experiment will also be taken notes and recorded in the form of an semi-constructed interview and questionnaire: The questionnaire format would follow the Likert scale rules with 5 points scale (strongly disagree, disagree, neutral, agree, strongly agree), so the participants' feedback and opinions can be collected and analyzed holistically. The Likert scale is a widely-used psychometric tool used in social sciences and educational research[16]. The details about questionnaire questions can be found in the Appendix A.1.

4.2.2 Phase B: Indoor Function

In this phase of the experiment, the users shall experience the Peppy Pole's act of impatience by creating tapping/knocking sounds to indicate the fact that "it is time to take me (the pole) out for a hike" when left unused for some time.

Ideally we planned to ask users to take the Peppy Pole home with them with instructions. The would keep the pole for 3 or 4 days and after one or two days, when the pole's energy level decreased enough and it felt bored, it would show its eagerness to go on another hike by moving its straps around and making noises. This would give a better picture of the pole's functionality over time. Unfortunately, since our prototype consists of an android phone and we do not have one to spare, we decided to perform this experiment in a few hours instead. The pole will be programmed so that it gets bored after an hour and will keep making noise until the user picks it up and starts walking. After walking with it for at least 30 steps the pole's energy level will be high for another one hour before it gets bored again.

We will explain to the users how this experiment is designed to represents the pole's features in a short time and in reality it takes about a week for the pole to display these behaviours. This experiment will show how effective this feature of the Peppy Pole can be for increasing user's motivation to go on hikes more often and be more active. This experiment is estimated to take around 2.5 hours per participant including the survey and the interview and the pole gets bored twice during its time with each participant.

Based on the user's hands-on experience, we shall ask related questions in the form of semi-constructed interview and questionnaire to get useful feedback. This questionnaire format will also follow the 5-points

scale Likert scale rules, which can be found in Appendix A.2.

4.2.3 Post-experiment Interview

User's general information such as age group, gender, hiking experience, hiking frequency, etc will be recorded as well as their answers to the questions regarding their experience with the Peppy Pole for further analysis. We shall also include a personal comments section for each participant to gather more feedback on the Peppy Pole's impact. The interview was designed aiming to reduce the workload of reading lengthy questions and to receive personalized feedback to improve our work in the future without too much restriction on expected answers.

Based on these interview questions as given in Appendix A.3, which shall preferably have some forms of defined indices of indicating how strongly users feel about each feature, we shall conduct a qualitative analysis to investigate our research problem's answers.

References

[1] Blackwell, J., 2015. "Influences of hand-held information and communication technology on risk behavior and the experience of wilderness visitors".

[2] Burneleit, E., Hemmert, F., and Wettach, R., 2009. "Living interfaces: the impatient toaster". pp. 21–22.

[3] Epley, N., Waytz, A., Akalis, S., and Cacioppo, J. T., 2008. "When we need a human: Motivational determinants of anthropomorphism". *Social cognition,* **26**(2), pp. 143–155.

[4] Brown, S., 2010. "Where the wild brands are: Some thoughts on anthropomorphic marketing". *The Marketing Review,* **10**, 08, pp. 209–224.

[5] Mourey, J. A., Olson, J. G., and Yoon, C., 2017. "Products as pals: Engaging with anthropomorphic products mitigates the effects of social exclusion". *Journal of Consumer Research,* **44**(2), pp. 414–431.

[6] Bartz, J. A., Tchalova, K., and Fenerci, C., 2016. "Reminders of social connection can attenuate anthropomorphism: A replication and extension of epley, akalis, waytz, and cacioppo (2008)". *Psychological science,* **27**(12), pp. 1644–1650.

[7] Letheren, K., Martin, B. A., and Jin, H. S., 2017. "Effects of personification and anthropomorphic tendency on destination attitude and travel intentions". *Tourism Management,* **62**, pp. 65–75.

[8] Row, Y. K., and Nam, T.-J., 2016. "Understanding lifelike characteristics in interactive product design". *Archives of Design Research,* **29**, 08, p. 25.

[9] Hanlin, K., 2020. Smart ski pole and ski pole with integrated speaker, Feb.

[10] Alghazi, A. A. M. ., 2015. Multi - functional smart mobility aid devices and methods of use, Oct.

[11] Hung, D. N., Minh-Thanh, V., Minh-Triet, N., Huy, Q. L., and Cuong, V. T., 2018. "Design and implementation of smart cane for visually impaired people". In 6th International Conference on the Development of Biomedical Engineering in Vietnam (BME6), T. Vo Van, T. A. Nguyen Le, and T. Nguyen Duc, eds., Springer Singapore, pp. 249–254.

[12] A., N., Sindhuja, M., Asha, G., Subasree, R., and Monisha, S., 2019. "Smart cane navigation for visually impaired". *International Journal of Innovative Technology and Exploring Engineering,* **8**, 04, pp. 190–192.

[13] Yohannan, A., and Shyam, S., 2020. Smart cane for blind and visually impaired persons, 05.

[14] Waytz, A., Heafner, J., and Epley, N., 2014. "The mind in the machine: Anthropomorphism increases trust in an autonomous vehicle". *Journal of Experimental Social Psychology,* **52**, pp. 113–117.

[15] Hassan, Z. A., Schattner, P., and Mazza, D., 2006. "Doing a pilot study: why is it essential?". *Malaysian family physician: the official journal of the Academy of Family Physicians of Malaysia,* **1**(2-3), p. 70.

[16] Joshi, A., Kale, S., Chandel, S., and Pal, D. K., 2015. "Likert scale: Explored and explained". *Current Journal of Applied Science and Technology*, pp. 396–403.

A Appendix- Questionnaire

A.1 Phase A

How do you personally think about the following statements based on your experience with Peppy Pole (strongly disagree, disagree, neutral, agree, strongly agree)?

1. The Peppy pole seems alive (Acts like a live creature).
2. The Peppy pole communicates with me.
3. I could see when the Peppy pole was excited.
4. I could see when the Peppy pole was tired.
5. The Peppy pole could sense my excitement.
6. The Peppy pole responded to my excitement properly.
7. The Peppy pole's response to my excitement made me feel even better at that moment.
8. The Peppy pole could sense when I was tired.
9. The Peppy pole responded to my tiredness properly.
10. The Peppy pole's response to my tiredness provided comfort to me at that moment.
11. The movement of the Peppy pole's wrist strap made it feel alive.
12. Compared to a regular hiking pole the Peppy pole:
    (a) Makes the hike less lonely.
    (b) Makes the hike more enjoyable.
    (c) Makes the hiker more motivated to finish the hike.
    (d) Makes the hiker motivated to hike more frequently.
13. I will prefer the Peppy pole to a regular pole in future hikes.

A.2 Phase B

How do you personally think about the following statements based on your experience with Peppy Pole (strongly disagree, disagree, neutral, agree, strongly agree)?

1. The Peppy pole seems alive (Acts like a live creature).

2. It was clear when the hiking pole wanted to be taken out for a hike.
3. The sounds and the movements of the Peppy pole's wrist strap made it feel alive.
4. I like the feature that the hiking pole asks to be taken on a hike after a certain period of inactivity.
5. The Peppy pole's request to be taken out makes it more likely for me to go on a hike soon.
6. Compared to a regular hiking pole the Peppy pole makes the hiker motivated to hike more frequently.
7. I will prefer the Peppy pole to a regular pole in future hikes.

A.3 Post-experiment Interview

1. What do you think the positive points of the Peppy pole are?
2. What do you think the negative points of the Peppy pole are?
3. Do you have any feedback/comments to improve the Peppy pole?