

HabitAR: Motivating Outdoor Walk with Animal-Watching Activities

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Abstract. Outdoor exercise has been indicated to have physical and mental benefits over indoor exercise and tends to take place in more engaging and attractive settings. Increasing motivation is a critical factor in behavior change. We envision that the interaction between users' walking data and components of their walking environment can be a potential method to motivate physical activity and offer novel opportunities. In this study, we introduce HabitAR, a blog-community-based application connecting the walk experience with the animal watching activities that provide different routes in which the types of animals that can be watched are proportional to walking distance. Following the research-through-design approach, we explored how this concept works on users' motivation by building an emotional connection between users and animals with social blogging. We present the results of the pilot study and the insights gained from this study.

Keywords: Interactive System · Physical Activity · Interaction Design

1 Introduction

Physical inactive has become a serious public health issue globally, which can be prevented by motivating people to exercise regularly. Moreover, growing evidence indicates that outdoor physical activity (PA) has considerable benefits for physical and mental health than indoor physical activity [4, 16]. Indeed, a steady stream of interactive technologies has been developed to enhance users' exercise experience. However, most of them are designed to track PA data and reflect on performance through a quantitative presentation, such as charts and graphs, which are reported to potentially harm motivation [12]. And common motivating strategies used by these apps are rewards in terms of points and virtual badges or competitions by ranking on the leaderboard based on PA data, of which these kinds of fun are not enough to keep users using over two weeks and maintain behavior change [14].

To motivate people to exercise more sustainably, we propose a new approach from the perspectives of human-computer interaction and human-environment interaction, linking peoples' movement with the interesting elements in their walking environment as rewards to strengthen the emotional and social value. Specifically, we developed Habit AR, a community-based platform, using animal-watching activities on the walking route as stimuli to motivate people to walk out and walk longer. In this preliminary study, following the research-through-design method, we explore the impact of this approach on users' motivation to walk outside. Beyond the implications of encouraging outdoor walking with an AR-based animal-watching app, we believe our findings could serve as a novel lens for extending the digital intervention to a more public and environmental context.

2 Related Work

In the HCI domain, flora and fauna metaphors have been used to represent PA data. To engage people in tracking and reflecting on their fitness data, many researchers explore the effect of mapping fitness data into the growth of flora and fauna on users' motivation. For example, Consolvo et al. designed a background-screen-based glanceable display of a mobile phone in which butterflies indicate goal attainments; flowers mean activity variety [5]. The development of virtual pets also has been used to map individuals' [17] and groups' [10] daily exercise progress toward their goals. For instance, Fitbit Pet [17] turns users' step counts into treats to feed a virtual pet. Lin et al. developed Fish'n'steps, a computing game mapping users' walk steps to the growth and emotional state of a virtual fish pet in a shared fish tank [10]. Most participants developed a certain emotional attachment to their virtual pet, which provided extra motivation. Their results from a 14-week study reported that this fun and engaging method could generate sustainable behavior change, although the initial fascination with the game subsided after a few weeks. Beyond virtual metaphors, Botros et al. designed Go & Grow, a living plant physically visualizing users' PA by watering it according to owners' walking steps [3]. This study suggested that living visualization results in a strong commitment to maintaining healthy behavior.

These trends show that a non-literal, aesthetic representation of physical activities and goal attainment through virtual and physical metaphors can improve awareness and lead to behavior change. Flora and fauna could create multiple emotional and social connections with users, such as responsible, curiosity, and concern, which can trigger implicit motives for PA. Our work is to extend this trend to a more public and physical context by connecting walk distance with the types of animals in their walking environments. We aim to explore how people's attachment to the animal can be an engaging motivator for behavior change. Additionally, it is suggested that users can be more involved in PA by engaging in activities that enhance social value or finding social support from (online) communities [19]. Building on this, we focus on applying elements like collaboration and reward to strengthen the social and positive impact.

3 HabitAR System

We created the HabitAR system (Fig. 1), a community-based platform to motivate walking, which is consisted of a mobile application (bottom right of Fig. 1) and public displays mounted on wooden poles (right of Fig. 1) in the outdoor environment. The HabitAR system features animals in users' walking environment as motivators to encourage walking, providing different routes with the function of navigation and blog (personal walk data-driven blog). The public displays are situated outdoors where people walk and can find animals, such as parks, with an interface offering different routes accessible to anyone passing by to attract more people to participate. The types of animals that may be encountered on the route are proportional to the length of the route. Users can choose or customize their route on the public displays and scan the popup OR code to log in and start their journey. After a route is created, users will see question marks on the maps that show the expected area of a certain animal (these are generated by the blog post by others in the community). Then they can start walking along the route navigated on their phone. When they spot the animal, they can start watching it, use this app to take a picture of it and add a blog post. After uploading a blog about a specific animal, the user can unlock all blogs about that specific animal and stay updated about it as a reward. It means that users, who upload pictures, maintain this blog and therefore create a bond with the animals in their walking environment. However, after seeing three new blogs, the blog will automatically lock and cannot be read. If they want to know the latest situation of that animal, they need to walk back to this area and upload a new picture of it to contribute to the community.

Initial design steps involved extracting the design concept from brainstorming and concept sketching. Then a low-fidelity prototype was made to test this concept further. Figure 2 shows examples of such artefacts. Following the gathered insight, we improved our concept. Then HabitAR was developed using FlutterFlow and attached to a Firebase database which stores the users' information, photos and blogs. Next, APIs were created in the Google Cloud platform to realize a safe connection between the app and the databases (for Android, IOS and Web). Lobe.ai was used to test the functioning animal detection system with machine learning, which worked well in our test of distinguishing two different stuffed animals with similar features, shown in the top right of Fig. 2. It was not integrated into the demonstrator app but is part of the final concept.



Fig. 1. The HabitAR system components overview (top left), App interface (bottom left), and the public displays in the wild (right).



Fig. 2. Examples of design artefacts, including the outcome of a brainstorm (top left), sketches (bottom left), mockup app (top middle), storyboards (bottom middle), the result of Lobe.ai test (top right), prototypes (bottom right).

4 Pilot Study

We conducted a pilot study, deploying mixed methods to collect quantitative data through a questionnaire and more in-depth qualitative data through user experience tests and a semi-structured interview afterward. Through the pilot study, we aimed to explore if a system with features like HabitAR could motivate people by creating a valuable bond with people and the environment's component to have more physical activity.

4.1 Questionnaire

An online questionnaire was used with a storyboard explaining the concept of HabitAR for evaluation and to find design opportunities, which consisted of 11 questions focused on the effect of motivation and general walking experience. As HabitAR is a system including a digital app and public display in the public space, anyone has access to participate. Participants were recruited online by publishing the questionnaire online through social media. Completion of the questionnaire was anonymous and voluntary,



Fig. 3. Result of sentence completion on the HabitAR concept

and no demographic questions were asked. Since our design was designed to motivate the general public, we did not limit the demographic characteristics.

Twenty-four participants agreed or strongly agreed on "When I see an animal while walking, it attracts my attention" This shows that animals as a part of the environment influence almost every walking participant's experience and attract their interest. However, participants were motivated differently; namely, seven indicated that after spotting an animal, they were not motivated to spot another animal, ten were motivated by this to spot another animal, and eight responded with neutral. For the result of sentence completion (shown in Fig. 3), the most frequently chosen words are stimulating (16), creative (14), motivating (13), exciting (13), and entertaining (10). The ratio between positive and negative terms was 17:5, meaning that the majority chose positive words to describe the concept. Fourteen participants (56%) have a positive feeling about our concept, and nine (36%) are neutral. Two participants (P12 and P21) had negative feelings about our concept. These two participants also chose only negative words (boring, frustrating, ineffective, irrelevant, annoying) in the previous question. This outcome, combined with the ratio of positive and negative terms, showed that people are overall optimistic about the playfulness and motivating effect of HabitAR.

The concept features that had the most potential and motivating effect were: creating your route, seeing where other people had spotted something on your route and the disappearance of other users' posts that became visible again when you performed physical activity. In addition, three participants indicated that they would like an option to spot other things instead of animals (P6, P16 and P21). It is because their interest was in a different area. P6 stated, "When people love animals, they will probably like it (HabitAR)." Regarding motivation, 10 participants (40%) indicated that HabitAR would motivate them to walk outside more often. Seven participants (28%) are neutral. Eight participants (32%) stated that HabitAR was unlikely to motivate them. But six of them indicated that some features of the concept, like spotting things, taking pictures, uploading and disappearing posts, were motivating and stimulating. Two participants did not like to be on their phones while walking (P7 and P12).

4.2 User Test

To further get more in-depth feedback on the experience with the application and its usability, an in-the-wild user test and a following semi-structured interview was conducted. Five participants were recruited by word of mouth for the user test on our university campus, aged 19 to 23 years old). During the preliminary testing, we, following the Wizard of Oz method [21], placed different types of stuffed animals on terrains according to the routes users chose to represent real animals to control the same setting for different users.

In general, all participants reported the experience of walking with HabitAR as fun. The features of the app that the participants considered the most useful correspond to the answers from the questionnaire, namely being able to create their own route and seeing where other people have spotted something. In addition, the ability to create, upload and read posts from other users was also mentioned. Features that the participants would add in the future are being able to add comments under the posts of others (P2, P4 and P5). According to the participants, other things that could be added to the concepts were

fun facts or more information about the animal found. Furthermore, participants prefer filtering what they want to find on the route so that they can adjust their route accordingly (P1 and P3). P3 explained that his interests were in mammals, which he wanted to spot, rather than birds, which he disliked. It made a big difference in his motivation when using HabitAR, which shows that personal differences greatly influence the concept's effectiveness.

However, four participants (P1, P3, P4 and P5) indicated that HabitAR could motivate them to walk more and they would choose a longer route if they saw on the app that another user had spotted something a little further on. For them, building a connection with the animals through a shared blog is a motivating aspect. "What I like the most about using this app is reading the blog posts of others, and what they write about the other animals." (P4) and "With the shared blog, you have engagement with the animals and learn about them." (P1). Based on quotes like "What is the challenge?" (P5) and "I liked the scavenger hunt element" (P3), it seems like the other participants experience it more as a game and therefore see it as motivating rather than wanting to maintain their connection with the animals.

5 Conclusion

This paper presents HabitAR, a system designed to motivate outdoor walking with the connection between walkers and animals. Its feasibility was empirically demonstrated through preliminary user studies. Both our survey and interview showed that HabitAR has a motivating effect on encouraging people to walk outdoors with a fun experience. The degree of motivating effectiveness depended on personal factors such as the value the individual attaches to the interest, which seemed to work better on users who were more interested in animals. It provides insight that customized applications with personal interests can be considered to stimulate people's intrinsic motivation when designing PA interventions. It also suggests providing interactivity regarding the elements of the physical walking space, which may engage people to walk outdoors and result in long-term behavior change, but lack relevant research and design practice [1].

Habit AR Video https://surfdrive.surf.nl/files/index.php/s/OSIvGlBLybXpfRP.

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