musicWALK: Tunes from your walking experience

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Abstract
Despite various benefits of walking, some people still lack the motivation of walking. In this paper, we present an interactive musical application aims at enhancing walking experience for graduate students aging from 23 to 28. It generates music by collecting personal walking pattern and environmental data. By allowing people to listen to the interactive music generated through their walk, we hope to motivate people to walk more.

Keywords
Walking, interactive music, experience, interaction design

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
Walking, considered as a form of physical activity, plays a fundamental part in everyday life. The advantages of walking are felt not only at a personal level, but also at the level of the community as a whole, in fields as diverse as general health, commuting and environmental sustainability [4].

However, despite the rising interest in promoting physical activity, people still don't walk enough. This can be demonstrated by the increasing rates of health complications that result from the lack of physical activity. A US Department of Transportation Report has reported a decline in the number of people walking to work from 4.1% to 2.8% from 1977 to 2001 [7].

As we attempt to encourage walking, we must recognize that we are dealing with a problem of behavioral change. The task therefore requires introducing appropriate change in environments where people are situated [5]. Determining the location, timing, and nature of such change is a complex problem since we are dealing with everyday lives and the complexities of day-to-day human interactions. In addition to this, multiple disciplines have attempted to address the promotion of walking including ergonomics, architecture and urban design, health and public policy [8, 9, 11].

People, Walking, and Environment

Environment plays a primary role in shaping people's walking behavior [6, 10]. Therefore, the features of the surrounding environment and what it provides are significant factors to consider. Furthermore, walking is strongly associated with a subjective understanding of the surrounding environment and what it offers [3]. This shows that what people think about their surroundings is an important factor in shaping people's walking behavior. We believe that people's view about their surroundings is shaped by accumulative experiences that arise from continuous interaction within the environment.

In our design we addressed the problem by considering personal factors. We focused on enhancing the personal experience of walking by enhancing an individual's awareness of themselves and their surroundings. In particular, we chose interactive music as our medium to promote the walking experience.

People, Music, and Environment

As we considered different approaches to promote the walking experience, music was of special interest. This was due to the close analogy we could draw between walking and music: they both involve continuous experiences and meanings associated with these experiences. We were therefore interested with the potential benefit by joining these two activities.

On the other hand, the experiences of walking and listening to music are fundamentally different. While walking is interactive and puts the walker in the proactive position of the actor, listening to music is a passive experience where the listener is an audience. We are therefore interested in modern musical trends in interactive generative music, which, in contrast to conventional music, is dynamically generated according to certain contexts. In Herber's study, he considers the interactive relationship between music and the listener in urban spaces. [1]. Also, Herber argues that the interactive nature of modern media calls for a fresh look at the potential of music [2]. He argues that music can be interactive and generated according to people's actions and contexts, which re-positions musical experience from passive-listening to interaction. We find this approach particularly appealing in our context of promoting dynamic, interactive experiences.

In the following sections we demonstrate our research findings that motivated our approach. We then explain our design concept and conclude with the results of our preliminary evaluation.

Primary research

To inform our design, we conducted an ethnographic observation and a focus group to understand the relationship among the walking experience, music and environment. From the ethnographic observation, we aimed to get a general idea about how people walk and define our target group. From the focus group, we intended to get detailed information about our target group's walking behaviors.

Ethnographic Observation

Our ethnographic observation was conducted in multiple locations in Bloomington, Indiana, including Well's library of Indiana University Bloomington, a shopping mall, downtown streets and cafeterias at varying time of the day. We spent 2 to 3 hours to observed people's walking styles, and artifacts they carried in one location. The people we observed ranged from university students to elders no more than 70 years old. These observations helped us to narrow down the target user group and generate a design concept. Our main findings were:

- For most people, walking is not demanding – People do other things while walking, such as using a mobile phone.
- People have varied walking styles in different places or surroundings. For example, most of the people in the mall tend to look around with little attention to their cell-phones, while people in the downtown street attend to their cell-phones more.
- Individuals are more likely to look around while people in groups are more involved in conversations.
- Lots of young people aging from 18 to 30 approximately used electronic devices such as music players.
- The most common objects walkers had with them were bags, cell-phones, foods, keys and musical players.
- People are aware of elements in their surroundings such as people, scenery and transport vehicles on the road.

From the ethnographic observation, we defined our target audience is the graduate students aged from 23 to 28 who are under the pressures both from academic achievement and career development. We chose this group because we believed that they would greatly benefit from the physical exercise walking affords. We found in the observation that graduate students seemed to be relaxed when they walked along with music players, which indicates walking and music can be common ways to relieve pressures. What is more, our observation shows that this group is receptive for new things, which means the design is possible to be merged into their lives.

Focus group

After the ethnographic observation, we conducted a focus group, in order to explore more about the walking behaviors of graduate students. We sent out a university wide invitation at Indiana University and organized 6 graduate students from varying disciplines for the 45-minute focus group. We found out the following points in the focus group:

- A person’s decision to walk depends on factors such as weather, location, and time.
- Graduate students sometimes walk for relaxation.
- Graduate students are attentive to the walking environment, and sometimes prefer to walk to discover new things in their surroundings.
- Cell-phones and music players were frequently used while graduate students are walking.

Design Process

According to our findings of our primary research, we drew three major insights that helped us inform our design:

- Walking is associated with people's perception of their environment, which means the experience people have while walking plays an essential role in shaping the current walking activity and future intention to walk.
- Walking can be easily coupled with other simple activities to achieve different goals, such as relaxation.
- Music has the potential impact on walking.

Based on these insights we concluded that walking experience has been shown to play a central role in people's walking behaviors, especially the feeling towards the surroundings. Moreover, music is considered as one of the incentives of walking. We approached the design with the goal of encouraging people to walk by enhancing their walking experience through interactive music. We focused on using music to represent the interaction between people and their surroundings, making the walking experience more attractive.

Design Concept

Our design concept – “musicWALK” is an iPhone application that generates interactive music while people are walking. “Interactive music” is defined as music composed both dynamically and selectively, which is determined by three major aspects: walking styles, environment and the interaction between them. When a piece of music is generated dynamically, the music has no fixed rhythm and is composed by the three major aspects. When a piece of music is generated selectively, the music has a fixed rhythm as a song and is influenced by the above major aspects.

Five elements are considered as the input elements in our design: the frequency of step, the length of step, the stress of step, surroundings and weather. The reason why we use these elements as the parameters for generating music is because they can represent the specific situation when someone is walking. Step frequency, the length of the step and the stress of step represent a personal pattern of walking. Surrounding tells us about the place where the users are. Weather is an important factor for walkers, which counts for another walking environment condition.

Specifically, there are two kinds of music in our design. One is the background music which is dynamically generated by the above five elements, giving users a fresh musical experience every time. For instance, people may experience the fast-rhythm pop music as background music when they walk fast in the city street, and they may also get the peaceful and slow new age music when they walk slowly in the park.

The other is the basic sound track, which is selectively generated and influenced by the five elements. Users

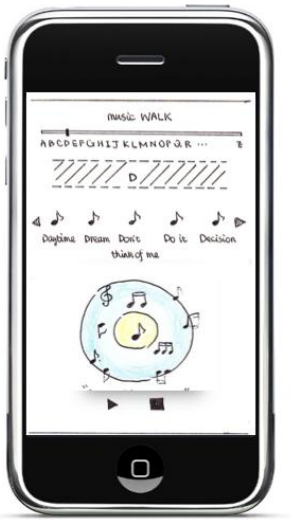

Figure 1: Main interface of musicWALK

Figure 2: Testing functionality of the application

can choose the sound track based on their preferences. For instance, the sound track would become fasters or slower according to the walking speed. But the rhythm of the track would not change.

Figure 1 shows the main interface of musicWALK. The top two bars show the current location of the song tracks of the device. The following five music notes represent the song tracks. The two circles of the screen represent these two kinds of music. The inner one with only one music note shows the song track currently being played, and the outer one with many music notes represents the dynamic background music. When the application is on, the background is automatically generated. User can have the option to listen to just background music, or he/she can choose a sound track by dragging the music note into the inner circle on the basis of that background music. A PLAY button and STOP button are showed at the bottom of the interface.

Values

The main value of our design is to provide interactive music to encourage people to walk more. It is not demanding of the users' attention, as the design approach is not providing a tool to let people compose the music. Instead, they will participate in generating music in another way, which will not occupy their minds and movements.

Moreover, our design provides the target audience the experience of performing their own styles of music when taking a walk, which is affected by the surrounding environment. Not only can our design promote people's awareness of the environment, but it also plays ever changing music that makes every walk a unique experience.

Also, our design has the potential of turning bad weather conditions into the incentives for walking. These seemingly negative factors, such as rain and snow, can enrich the musical experience. Our design is capable of incorporating these factors into the interactive music, making walking more attractive in not-so-attractive weather. For example, you can get an unique music of you walking in the rainy day.

Evaluation

In order to evaluate our design, we conducted a usability test with 5 participants. We developed a mock up of iPhone application, along with some music which could represent the scenarios of our test.

The usability test was made up of two main parts, one was for testing the functionality of the application, and the other was for testing the music experience during walking.

In the first part of usability test, our participants successfully completed 90 percents of the tasks, including opening the application, understanding the interfaces elements, navigating the song tracks, dragging the tracks and controlling the music. But at the beginning, some participants were confused about selecting the song tracks. One participant was unable to distinguish the background music and the song track.

In the second part of the test, we asked the participants to walk in the streets and to listen to some pre-recorded music that represented the walking surroundings. 80 percents of the participants admitted that the application could encourage them to walk in some circumstances. Three fifth of them even said that they would recommend their friends to use it.

Conclusion and Future work

Our design aims at encouraging people to walk by enhancing walking experience through interactive music. It has the potential value of encouraging walking. We intend to improve the interface of our design in regards to the suggestions of the evaluation, making the distinction of the background music and song track clearer. Moreover, we aim to provide a more enjoyable experience to our users.

In the future, we'd like to explore the music experience of a group of people and incorporate the selections of music moods and instruments in our design. Interesting as the idea is, but it does have the potential for issues of complexity due to people's subjective experience, which we need to carefully consider.

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