Jogging over a Distance - Citywide

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ABSTRACT

Jogging is a healthy activity and many people enjoy jogging with others for social and motivational reasons. However, jogging partners might not always live in the same location, and it may be difficult to find a local jogger who runs at the same pace, we found through a survey. We present "Jogging over a Distance", which allows joggers to socialize and motivate each other while jogging in geographically distant locations through the use of spatially distributed audio. A demonstration can be performed in a large spatial area that is suitable for jogging. With our demonstrator, we hope we can encourage active and future joggers to jog more often, while simultaneously supporting their social friendships.

Keywords

Jogging, running, social support, mobile phones, Exertion Interface, physical, sports, active, exhausting, social interaction

INTRODUCTION

We have found through the use of surveys and Internet forums that joggers often run with others [10]. Out of 77 responses, 57% replied that they run with at least one other person. Based on the survey results, the top four reasons for running with others were socializing (83%), motivation to run faster (78%), to have more fun (53%) and to be encouraged to show up (53%). We discovered that many social joggers value the ability to have conversations with their partners and use their exercise sessions as a way to stay in touch with their friends. One respondent noted, "*About twice a month I run with some of the girls I went to college with. It's a great time to chat and catch up! Even though we see each other and chat regularly, we always seem to talk more openly while we run.*" Another participant gave an example of the benefits he received from running with a partner: *"I ran on Sunday with another runner, and she wanted to add a little more distance to the route. We talked about it as we ran and agreed where to run. I ran more than I would have if I ran by myself. After the run, I was glad that I did the extra mileage. Also, my running companion ran faster than I would have in the early part of the run (I actually had to ask her to slow down a little for the 1st mile), and I think I pushed her at the end of the run. It was mutually beneficial."*

A frustration participants have with social jogging is finding the "right" jogging partner: one who can meet them at the same location and who jogs at roughly the same pace. This challenge of finding a partner resulted from people moving away or, through training, becoming faster than their jogging partner. One jogger explained that he only has one friend whom he could run with, but his friend moved across the country and "*now I know of no one my age who runs the way I do… many run longer and a lot run shorter... I still wish I knew people to run with to shake things up a bit.*"

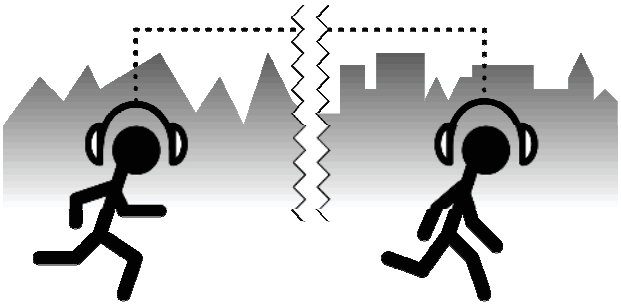

Figure 1. Jogging together although geographically apart?

JOGGING OVER A DISTANCE

One possible solution that facilitates finding social jogging partners is to enable people to jog with remote friends and other remote joggers [Figure 1]. With *Jogging over a Distance*, jogging partners could live in opposite parts of the world, yet share the experience of jogging together. By meeting at the same time in separate locations, long distance friends could become, or stay, social jogging partners.

Supporting a Sense of Presence

We were interested in the experience joggers would have if they would communicate with a remote partner through an audio channel only, and therefore asked 18 volunteers to go running at the same time, but in opposite directions, equipped with a mobile phone and a Bluetooth headset. (More details in [10]). We were intrigued by how much of a sense of presence the audio conveyed to the participants: they not only mentioned hearing the other person's voice,

but also the wind, the noise of the footsteps depending on the ground surface, and the breathing of the remote jogger, which they amounted to a social and enjoyable experience.

We decided to build a prototype that further pushes the idea of jogging "together" with geographically distant jogging partners by creating a pervasive prototype that not only supports conversation but uses the audio to communicate pace. We found this application domain suitable for a "calm" technology approach [13], in which current practices should not be interfered with by computers. Similar to jogging side by side and adjusting pace with one's partner, the *Jogging over a Distance* prototype transforms the conversation into spatialized audio to simulate hearing one's partner in front, to the side, or behind. We are interested in whether this pace information can contribute to an increased awareness of the other person's presence, hence creating a shared sportive experience.

EXPERIENCE

Figure 2. Joggers wearing the equipment.

Each jogging partner puts on a pair of headphones and wears the prototype in a small bag [Figure 2]. While each partner jogs, speed data is collected and used to position the audio of the conversation in a 2D sound environment. As one jogger speaks, their partner hears the localized audio and is able to detect whether the other person is going faster, same pace, or slower, and thus is in front, to the side, or behind, respectively. Similar to a collocated setting, the audio cues runners when to speed up or slow down in order to "stay" with their partner. The joggers can discuss running routes, motivate each other to keep pace, or simply listen to the environment noises of the other location. For joggers with differing athletic abilities who would like to have the experience of running together, a baseline pace variable can be adjusted that allows each runner to push their own personal pace rather than try to run at their partner's speed. Thus, the system allows joggers to do something that is not possible when running side by side - challenge their individual pace while running with friends who run at different speeds.

Sound Spatialization

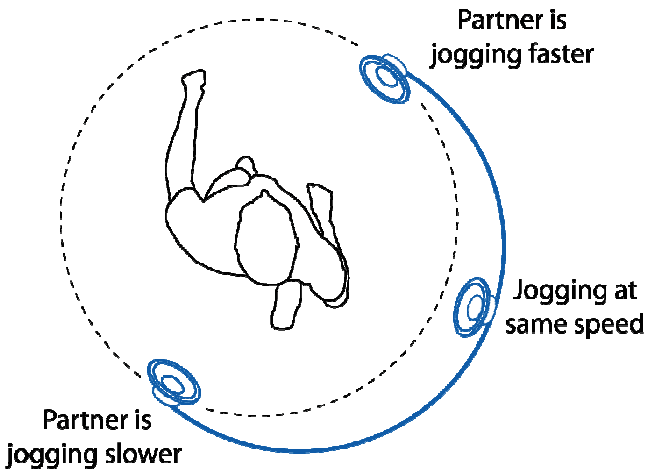

Figure 3. Bird's eye view of spatialized sound.

In order to develop *Jogging over a Distance*, it was important to find an audio setup in which users could clearly detect where the sound is coming from. Unfortunately, without the use of visual cues, it is difficult for people to differentiate between front and back sound sources, in contrast to left and right [4]. In addition, mobility has been found to decrease audio target accuracy by twenty percent [7]. Fortunately, target accuracy for our application does not need to be very precise. However, the user needs to be able to clearly differentiate if the other person's voice is coming from the front or the back. Jogging makes sound localization difficult due to the participant's exhaustion level and the moving around of the body and especially the head. We have therefore opted for an intensification approach for our prototype: instead of positioning the remote sound on an imaginary axis from 12 o'clock to 6 o'clock (from a birds-eye perspective, with the person being in the center of the clock, looking at 12 o'clock), we propose to position the sound on an axis from 1.30 to 7.30 [Figure 3]. This exploits a person's ability to easily distinguish between left and right audio sources, while simultaneously conveying an experience of hearing sound appearing from the front or back. Initial experiments confirmed that this design greatly improved the sound localization ability of participants, while still creating the

impression that the other person is talking either "from behind or in front".

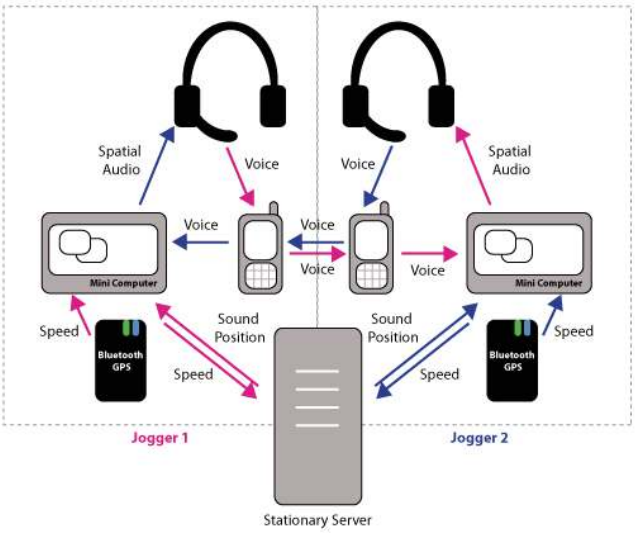

Figure 4. Technical implementation.

TECHNICAL IMPLEMENTATION

The prototype consists of two identical systems, each with a miniature computer, a Bluetooth GPS device, a wireless modem, a mobile phone and a headset [Figure 4]. Each system is carried in a small, close fitting bag while the user jogs. Speed and time data is collected from the GPS device, and sent to the computer. The computer then transmits this data wirelessly over a 3G network to a server, which calculates the speed difference. The server determines where each jogger is running in relation to his or her partner. A sound position value is sent to each computer. As each jogger talks, their voice is picked up by a microphone and sent to their partner's phone. Alternatively, we could use VoIP technology, although less reliable. The incoming audio is then sent to the computer, which uses the sound position value received from the server to transform it into spatial 2D audio.

TARGET AUDIENCE

Jogging over a Distance targets social, casual joggers who enjoy jogging with others and like to converse during their runs. Not all joggers talk during their exercise, however, the design of *Jogging over a Distance* is based on feedback from participants who claim they jog with others for social and motivational reasons.

Jogging over a Distance is not aiming to replace the traditional social "jogging together" experience, but rather providing a feasible alternative if the partners are geographically distant. Furthermore, the prototype has the potential to help joggers who would like to jog with others, but are not able to find a fellow runner that runs at the same speed.

RELATED WORK

Investigation of the social factors in motivating people to jog, or to exercise in general, has been described by McElroy in [8]. Commercial products and research prototypes have been designed to use audio to motivate individual users when walking, jogging, and running, including the *Nike+iPod Kit* [2], *MPTrain* [11], and *Melodious Walkabout* [6]. The *Nike+iPod Kit* is an MP3 player that tracks individual exercise performance and stops the music to verbally report on progress. Users are able to monitor their speed and distance on the go, without looking at a display. *MPTrain* is a mobile device that monitors heart rate and speed. Depending on progress, the device selects music with a particular tempo to encourage the user to slow down, speed up, or keep pace. *Melodious Walkabout* is a headphone based system that assists joggers finding their way by using directional audio. It plays music files to guide the wearer in the right direction using GPS data. A device which incorporates the user's activity to affect their audio is the *Are We There Yet?* system [1], which modifies the playback speed of audio books according to how much travel time remains for the user.

Prototypes using social interaction to encourage walking and jogging include *Houston* [5] and *Chick Clique* [12]. *Houston* is a mobile phone application that monitors step count and displays it alongside the step count of friends. *Chick Clique* is a similar mobile phone application for sharing step count. This social peer pressure approach focuses on teenage girls and uses instant messaging to keep the social group connected and aware of their progress. A project combining social interaction with an audio interface to motivate physical activity is *Actively Mobile* [3]. This work focuses on designing a mobile phone that a user can operate while exercising, with supporting conversations between joggers as a resulting benefit.

LIVE DEMONSTRATION

We understand that describing an audio experience in a textual form has its limitations, but informal feedback with volunteers showed that they were quite impressed with the effect their pace has on the audio. We also conducted jogging tests with the system outside, "in the wild", for many kilometers, and users reported an enjoyable experience. We therefore believe a live demonstration is the best way to demonstrate our work, because it needs to be "heard" to be experienced.

Requirements

This demonstration supports joggers, it is therefore a mobile demonstration, which can be executed in any area, preferable large enough to allow for short jogging activities or at least walking several meters. We are currently using GPS receivers to determine the speed of the joggers. GPS receivers only work outdoors, and we would therefore demo the system outside. The joggers do not need to jog far to experience the specialized audio effect; the extent of spatialization is a software parameter which we can adjust for a demonstration in which participants will not jog or walk far. The users will already experience the sound moving if they walk in opposite directions on a long

balcony, for example. Due to the costly equipment in the bag, the participants are not meant to run "away", but rather move in opposite directions from one another for a couple of meters, until they hear how their speed affects the audio. Then the participants can modify their jogging speed, and immediately hear the effect it has on the audio position of their conversation: for example, they will experience, if they stop jogging, and their partner, who was slower, speeds up, how the audio provides them with the sensation of the other person coming from behind, rushing past and eventually overtaking them, without actually seeing them. This is a typical *Jogging over a Distance* experience.

If an outdoors demonstration is not feasible, we could use Nike+iPod sensors that we are currently modifying to support our system, which would then also work indoors.

Acoustics

The joggers would need two separate areas were they can casually jog (or walk). They should not be able to hear one another, otherwise the microphones might produce feedback. Also, this setup would contribute to the concept that the two participants could be anywhere in the world.

Computational equipment

The two bags contain all the necessary technical equipment, however, we might need an additional wireless access point.

Networking

We would need wireless Internet access for both participants' equipment, supporting sufficient networking specifications for a successful Skype-like audio conference. This would eliminate the need for two mobile phone connections. If Wifi is not available across the envisioned jogging area, we would need wireless data cards from a local mobile phone carrier to provide Internet access to the mobile computers.

Power

We will need 4 plugs (240V) to recharge the equipment.

FUTURE WORK

We want to conduct a comparative study to measure whether spatial audio delivery has an effect on the perceived presence of the other person. Furthermore, we are interested in investigating if a greater sense of presence can serve as a motivational tool to encourage people to run faster, further and more often. The results of this research can inform future designs that aim to support social interactions between geographically distant participants in a mobile setting.

CONCLUSION

Jogging with others is enjoyed by many, but finding the right jogging partner, as indicated by our participants, can be difficult. Our solution, *Jogging over a Distance,* enables joggers to run with remote partners as well as those who run at differing speeds. Through the use of pace data influencing spatialized sound our prototype aims to create an experience similar to running side by side with someone, even when jogging in different locations. We believe our prototype support joggers' desire for socializing and motivation to keep pace although the jogging partners can be geographically apart.

ACKNOWLEDGEMENTS

This submission was based on work initially supported by CeNTIE (Centre for Networking Technologies for the Information Economy), which is supported by the Australian Government through the Advanced Networks Program (ANP) of the Department of Communications, IT and the Arts and the CSIRO ICT Centre.

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