
RoutePlanner

Marek Kudlacz

marek.kudlacz@utoronto.ca

Robert (Yu-Sheng) Tan

tanyu@utoronto.ca

Jon Prindiville

jon.prindiville@utoronto.ca

Marc Peters

marc.peters@utoronto.ca

University of Toronto
Department of Computer Science,
Undergraduate Department.
40 St. George Street, Rm. 4252,
Toronto, Ontario M5S 2E4.

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Abstract

This paper discusses the *RoutePlanner*, a portable personal training and motivational aide, which displays real-time statistical and locational data. We focus on the iterative design techniques associated with developing requirements and functionality, while looking at the role user testing and feedback played in the refinement of our design.

Keywords

Human-computer interaction, design, interface, RoutePlanner

ACM Classification Keywords

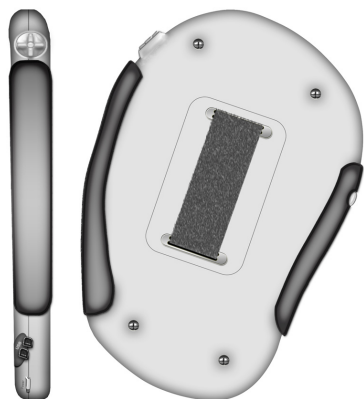
Category: H5.m. Information interfaces and presentation (E.g., HCI): Miscellaneous.

Introduction

In addressing the Design Problem of the CHI 2006 Student Design Competition – Nutrition and Health – we chose to focus specifically on improving physical fitness. Relating back to the Design Problem, information released by organizations such as the World Health Organization (WHO), and Statistics Canada all imply that lower levels of physical activity correlate with increased chances of obesity [1, 2], which in turn increases the risks of chronic diseases, such as type 2 diabetes, stroke, cardiovascular disease, and certain forms of cancer [1]. Our response employs



Figure 1. A fully realized visual rendering of the RP. A right-handed version of the device is shown, although it can be reversed to suit the needs of left-handed users.



technological advances in an attempt to help combat the lack of motivation for exercise and physical fitness.

The solution we propose is a device named *RoutePlanner* (RP): a compact, portable device that will encourage inline skaters, cyclists and runners to exercise outdoors by assisting with route planning and facilitating the collection and display of statistical information during a workout. The RP is held and used with one hand, and consists of a colour display, a control pad near the thumb, buttons on the side and front of the device, and earphones providing optional audio. The RP increases motivation to exercise in three ways. First of all, by allowing the user to choose a route – either by generating a random route according to parameters of their choosing, or defining a custom path – we help the user to vary his/her workout routine, and encourage them to venture into areas that they may usually avoid due to lack of familiarity. Secondly, using the Global Positioning System (GPS) the RP is capable of tracking a user's location, distance traveled and speed. Heart rate will also be recorded, using metal-plated heart rate monitors on the earphones. The fact that the RP allows users to record and view their day-to-day progress is an easy way to provide quantifiable reassurance to the user that they are benefiting from their activity. Finally, in combination with GPS, we included a function called the *GhostRunner* (GR). Using statistics gathered on previous workouts, the GR allows the user to quickly compare their current progress with that of a previously recorded session. They may choose to plug in a set of earphones in order to take advantage of the RP's audio features.

Related Work

In this section, we examine two currently marketed products which resemble different aspects of the RP, one in terms of concept, and the other in terms of interface. The features and functionality of each product are discussed below. For a comparison between RP and the two products, please see "Comparison to Existing Products".

Polar RS200sd Running Computer (USD \$199) [3]

The RS200 is in the form of a watch worn on the wrist. The interface mimics that of a standard digital watch, with a monochrome LCD screen, accompanied by buttons on the face and the sides of the watch. Its main features include running speed and distance calculation using a pedometer, lap counter, and a heart rate monitor with the ability to set a target range.

Garmin nuvi 350 (USD \$780) [4]

The Garmin nuvi is a portable GPS navigator that is about the size of a deck of playing cards. The interface contains an LCD touchscreen, on which maps can be displayed. Its main features include audio/visual directions to help navigate, 2-D and 3-D elevation views, automatic fastest route calculation, and touchscreen control.

Stage 1: Defining the Problem

Goals

We initially envisioned our main stakeholders as belonging to one of two groups: those with established exercise routines who are not satisfied with their current set of routes, and those who are just starting to develop a regular outdoor exercise routine and would benefit from a greater variety of routes.

We conducted research prior to the construction of our initial prototypes to find out whether or not we had assessed our potential stakeholders realistically and to gauge a few things about users' expectations of our potential product.

Methodology and Motivation

Using essential use cases, we envisioned and systematically explained the completion of two tasks which are integral to the RP. Examining the steps users would take to select a new route and to utilize the GhostRunner enabled us to gain a greater understanding of how to people would interact with the system.

Several scenarios were written exploring possible situations that may occur when using the RP. The positive ones offered insight into the potential utility of the RP, while the negative shed light on aspects of the design that required more thought.

We conducted seven semi-structured interviews and administered fifteen questionnaires to participants known to be active exercisers. Our participants varied from recreational exercisers to marathon runners. They were asked questions to find out how much, and what type of exercise they engaged in, in order to get an idea of whether or not a RP would be a useful item for them to have. We also wanted to determine what else they carried with them while exercising. Another focus of the interview was on likes and dislikes of other electronic devices. We investigated users' feelings about the things that they currently carried with them while exercising, and what features caused them to choose a particular device over competing models. We were also interested in seeing what sort of statistics

people were keeping track of while exercising to see if we could incorporate some of that functionality into the RP.

Finally, to get a better understanding of what people bring along with them while exercising, we spent some time in a public park observing their habits. We gathered information on the proportion of exercisers carrying things with them, their mode of exercise, and what sort of things they were carrying. Forty people were observed in total, half being runners and the remainder evenly divided between cyclists and inline skaters.

Results

An important first result from our research was that there seemed to be a positive correlation between questionnaire respondents' enjoying their current routine and frequent route changes. We feel that this bodes well for the RP's ability to keep users feeling enthusiastic about their exercise.

Questionnaire respondents confirmed that the tracking of statistics would be useful. Most commonly, people told us that they keep track of time and distance covered, while one interviewee expressed interest in maximum and average speed. GPS enables the simple recording of all of these statistics.

Approximately 40% of runners who were observed carried music players of some sort. This leads us to believe that a music playback feature would be important to include, since users are unlikely to want to carry both an MP3 player and our device.



Figure 2. This plasticine prototype enabled us to accurately visualize the size of the device, as well as locations of buttons and control pad.

Because of the environment of use, features of the device must be easily accessible during movement. To avoid distraction, some of the interaction may be done based on audio cues.

An innovative feature, called the Ghost Runner, was inspired by one of the interviewees, who stated that the most enjoyable aspect of their workout was "[the] sense of accomplishment ... when you push yourself further than ... your expectations." Allowing users to compete against their own previous efforts would be a simple way to keep motivation high.

As our device will be used by active individuals it will have to be able to withstand constant moving and shaking. Additionally, weatherproofing will be required, as a number of questionnaire respondents indicated that they continue to exercise outdoors in inclement weather.

In interviews, participants cited price, (small) size, ease of use, and battery life as purchase points for their electronic devices. Some sort of compromise will have to be reached in regards to the size of the device to balance ease of use and portability.

Stage 2: Functionality

Based on our initial research, we conducted a requirements analysis and developed user, environmental, technical, functional, and usability requirements. Using these requirements as a guideline, following is a list of functions that the RP would implement:

Choosing and Changing Routes. Users can define a route for a workout, either by a random process, by

loading a route previously created on a desktop PC, or by selecting a route previously saved into the system.

Statistical Recording and Display. The RP records statistics about every workout, which can be viewed on the device screen during a workout and later recalled to be analyzed. Such statistics might include time elapsed/remaining, distance elapsed/remaining, estimated calories burned, a heart rate vs. time graph, a speed vs. time graph, and performance relative to the user's personal best along an identical route. Graphs from different workouts can be overlaid in order for the user to track his/her progress more easily.

Positioning. The user's current position as determined by the GPS system will appear on the displayed map during a workout.

Directing the user. The RP can audibly notify the user along their predefined route.

Locating structures. Structures such as public bathrooms, public fountains, and sport shops will be marked with pointers on the device's map.

The Ghost Runner. Users will be audibly notified as to their relative performance compared to previous workouts along the same route.

MP3 playback.

Stage 3: Prototyping

Two prototypes were constructed to evaluate the usability of our system. Expert users gave feedback

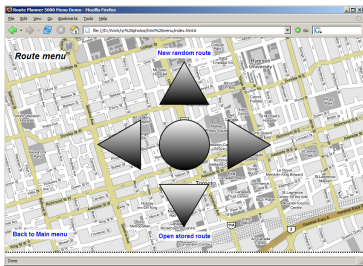


Figure 3. This interface prototype created in the form of a web page using HTML and JavaScript allowed us to conduct early user testing on the menu system.

about the usefulness of the RP and helped to discover potential design flaws in the prototypes.

A model of the RP (See Figure 2) was constructed from Plasticine to help us evaluate the approximate physical dimensions of the device. The location of elements of the RP's physical interface could also be tested.

The second prototype was an interactive HTML menu system (See Figure 3). Using a web browser, users of this prototype could simulate interaction with the RP, allowing us to measure the suitability of the graphical interface used in our menu system, its clarity and efficiency.

Three users were asked to help us evaluate our HTML prototype: two twenty year-old females, and one twenty year-old male. They also went through a pair of informal interviews to help us evaluate the prototype. One of these users competes in half-marathons and thus trains outdoors several times a week, while the other two exercise outdoors about twice a week, school- and work- permitting. We presented the prototype to these users and asked them to complete a series of tasks: generating a random route, changing the route, toggling the GR, and changing the currently playing audio. Our users agreed that the statistical functionalities of the RP were important to include. Some of our users felt that the proposed size of the screen would be insufficient for the type and scale of data that will be presented.

In our next stage of testing, several experts were asked to use our HTML prototype, while thinking aloud and being observed. Experts were selected based on their health and fitness knowledge and participation in one of

the outdoor sports we imagined the RP would be useful for.

Stage 4: Revisions

The number of physical buttons on the RP was reduced significantly from our initial concept. This was justified with the thought that users of our device would prefer a menu system controlled by the simple four-button hat switch and menu key. It became clear that some features were not well suited to being controlled through menus: buttons were added to allow easier control of the MP3 playback and a volume knob was added to the latest drawings (an earlier omission).

An experts and peer review brought to our attention that there was no easy way to bring the RP with you while running. To remedy this, we envision the addition of a clip with which the RP can be attached to an armband, or to a user's waist.

Comparison to existing products

From reviewing both the RS200 and the Garmin nuvi, we found that both were not as oriented to motivating the user as the RP. What the RS200 had in functionality, it lacked in interface, and vice versa for the Garmin nuvi. Note that we had not conducted a cost analysis for the RP. Below are comparisons of other select features particular to each device:

RS200: The RP is suitable for runners, cyclists, and inline skaters, while the RS200 is designed for runners only. There does not exist an altimeter to determine the slope of the route, which we addressed in the RP by highlighting altitude with a colour gradient. The device also lacked a map interface, as well as rechargeable batteries.

Garmin nuvi: This device was not designed to be used while exercising, for several reasons. Although similar to the RP in terms of the display, the touchscreen on the device prevents it from being used by one hand, which would hinder exercise convenience. Furthermore, its automatic route calculation only finds the quickest route, and is impractical when a user intends to set a certain distance for his/her workout. Finally, there is no mention of anything like the GR, nor the recording of any statistics.

Challenges

Though the RP uses only technology that is readily available today, packaging it as we intend to will introduce many constraints. GPS support is an important aspect of the RP, so we need to consider potential inaccuracy, and reception issues. Additionally we need to determine the quantity and type of internal storage we will use. The RP offers both navigational data and music playback – we need to provide enough storage to compete with navigational systems and portable music systems already available. These and many more are concerns that we would need to address in the future.

Conclusion

We have presented a prototype for a device that we hope will motivate people in pursuing and maintaining an active life style. By displaying an abstract map, we allow the user to view statistical information in respect to real positional data. In addition, features such as statistical tracking and route generation in accordance to specified criteria-influenced goals and skill development also invite fresh and ever-changing environments and challenges.

We feel it would be promising to further develop the RP, as there are many interesting areas yet to be explored. Introductory tutorials, an internal radio, real-time environmental data, anti-theft security, and additional statistical information have in particular been of interest. Furthermore, we believe introducing an online community for the sharing of statistical, course, and GhostRunner data would further boost user initiative.

We feel that the RP greatly benefits personal training in a manner no currently available devices do.

Acknowledgements

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Citations

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