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Everywhere Run: a Virtual Personal Trainer for Supporting People in their Running Activity

Fabrizio Mulas, Salvatore Carta, Paolo Pilloni, Ludovico Boratto

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***Abstract*— Many medical researches, conducted on people from developed countries, have proved a strict correlation between some health diseases and a sedentary lifestyle.**
Obesity and linked pathologies like diabetes and cardiovascular diseases are alarmingly becoming ever more common in rich societies. The most effective solution to these problems, as reported by the former studies, is a healthy diet regime together with a constant and monitored physical activity.
As a consequence, many research efforts have been carried on finding strategies for motivating people to exercise regularly.
In this paper, by taking advantage of the growing spread of mobile devices on a worldwide scale, we present an Android-based mobile application, called *Everywhere Run,* that aims at motivating and supporting people during their running activities. It behaves as a virtual personal trainer, assisting users during their run and helping them to stick to the right pace. In this way, users can fully focus on the run. Most important, *Everywhere Run* fosters the interaction between users and real personal trainers, in order to make it easy to non expert people to start working out in a healthy and safe way.

1 Introduction

In the last years sedentary lifestyle has become one of the major risk factors for people's health. Indeed it is reported to be the cause of several serious illnesses like obesity, diabetes, hypertension and so on. For example, the percentage of sedentary people in European cities ranges from 43,3% to 87,7 [12]. There are many reasons why people do not perform any physical activity, differing from person to person, but they tend to fall in one of the following most common ones: motivational lack, time constrains, difficulties to start, gym membership fees, equipment costs, etc. Besides, watching television and playing video games usually lead people to have a sedentary lifestyle.

Running can in part address some of the above obstacles to start exercising.
For example, it does not require special equipment, there are not any fees to pay and it can be done anytime, anywhere. One of the biggest barriers beginners face is about the way they should work out. Questions as "how much distance should I run?", "how many times at week?", "how do I warm up?" are quite common to come across in specialized websites, blogs, running magazines, etc. Often people do end up designing their workouts on their own, perhaps exposing themselves to serious consequences. Indeed it is relative easy for beginners to overtrain. They then feel tired and stop working out labeling running as "too tiring". Instead, if they persist training in an incorrect way they can incur in pains and injuries (as various types of tendinitis).
In any case they stop exercising, a situation that it is mandatory to prevent for a healthy lifestyle.

Everywhere Run addresses this scenario fostering a social interaction between runners and real personal trainers, so that the former can get a workout plan specifically tailored for their needs. Thus it makes it easy to start running and avoiding common errors. The application allows a personal trainer to build a detailed running regime and send it to a user by e-mail. The latter will receive his tailored running regime inside *Everywhere Run*, seamlessly. Then the application will assist the user as if a real personal trainer were there with him, assuring he will run the proper distance at the right pace. Hence a beginner does not have to worry about anything else but just run.

Indeed several researches demonstrate ([6] [11] [5] [7]) that social interactions motivate people to exercise. Running (or more in general performing any other physical activities) under the constant support of a qualified personal trainer is much more motivating and safe too. Nevertheless many people avoid this possibility for economic reasons or just because they do not want time constrains (users must meet the personal trainers). The ideal solution would be to have a personal trainer available everywhere every time it is needed, for free. It is obviously an unreal scenario. *Everywhere Run* is designed to addresses this situation: it allows users to get in touch with a real trainer and obtain a customized workout regime, then it behaves as a virtual personal trainer, available anytime, anywhere. The real personal trainer still needs to be paid, but given that it is not (strictly) necessary to meet with him, some of the costs are cut down and it should lead to cheaper fees.

With respect to the state-of-the-art proposals, our approach promotes interactions between users and real coaches through a community of runners. At the end of

Fabrizio Mulas, Salvatore Carta, Paolo Pilloni and Ludovico Boratto, Dept. of Mathematics and Computer Science, University of Cagliari, Italy (✉{fabrizio.mulas, salvatore, paolo.pilloni, ludovico.boratto}@unica.it)
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their workouts users can easily share their results with the community in order to receive feedbacks.
This pushes people to improve their performances and encourages a positive competition among them. Other existing solutions only focus on the interaction between the user and the application, thus just relying on “artificial intelligences”. They can be engaging, but can not provide the same level of support that a qualified "human" trainer can offer. Besides, this kind of games can be exciting in the short time, but tend to lose their appeal with time.

It has been shown that often video games are responsible of causing a sedentary lifestyle, especially among young people. *Everywhere Run* exploits new technologies, like mobile games, to obtain the opposite result. Indeed through its features and an intuitive interface it aims at engaging people and pushing them to exercise.

The rest of the paper is organized as follows: Section 2 gives an overview of the state of the art; Section 3 describes the main features of the application; Section 4 shows the result of our experiments and Section 5 concludes the paper.

2 Related Work

Many studies have been conducted on various aspects of increasing physical activity motivation by means of mobile technologies. In this section we will try to give an as much as possible exhaustive description of the main results so far.

Toscos et al. [11] propose a mobile application, called Chick clique, that mainly aims at encouraging teenage girls to adopt a correct lifestyle. The software provides information about food calories and the necessary amount of steps needed to burn them. Users can invite their friends and share with them their achievements by means of SMS messages. They showed that social factors like sharing results and friendly competition can motivate people to further exercise.

In [6] authors propose Houston, a Symbian OS based application. This software, through a pedometer, is able to count and to record the number of steps done by the user, giving him the possibility to share daily results within a small group of friends. From the analysis of data collected during Houston's experimentation the authors have derived four interesting key design requirements to be used in this class of mobile applications:

- give users proper credit for activities: users expect to have pretty thorough measures;
- provide personal awareness of activity level: users suggest the use of long-term statistical reports in order to have a more detailed overview of the whole activity;
- support social influence: users like to share their results and receive feedbacks from buddies. In this way it is encouraged both a friendly competition and an enforcement of motivations;
- consider the practical constraints of people lifestyles: users prefer an all-in-one device. They complain about the use of other external and sometimes uncomfortable devices (e.g., the pedometer).

Battussi et al. [5] propose the use of mobile guides to support physical activity by developing a PocketPC based application called Mobile Personal Trainer (MOPET). It uses a GPS device to record user's position and provides speech cues to assist him during a training session. The most interesting feature provided by MOPET is the embodied virtual trainer, called Evita, that shows users how to correctly perform exercises and at the same time motivates them through visual and vocal feedbacks.

In [7] is presented TripleBeat the successor of MPTrain presented in [10].

TripleBeat is a mobile phone application that, in combination with an ECG and an accelerometer wirelessly connected to the mobile phone, assists runners to reach their goals in terms of a certain heart rate. The software tries to increase users' motivations through musical feedbacks, an intuitive design interface and virtual competition.

The results of the experimentation emphasize both the importance of a glanceable interface to improve real-time personal awareness and the power of the virtual competition as means to stimulate motivation through social pressure.

Nike+GPS [3] is an application made by Nike and designed for the iPhone platform. It provides almost all the design patterns suggested by the experimentations made in previously presented works.
Just to name a few:

- intensive use of social networks both to share results and to receive real-time cheers from friends or famous athletes;
- music management and vocal feedbacks to inform the runner about his performance;
- web community to organize trainings and to share their own experiences with others.

There exists a number of softwares that aim at encouraging physical activity through gaming. An example is [8] where authors propose to take advantage of the widespread use of video games among young people to propose a new way of gaming in which users actively interact with the game.

MarioFit is a system to play the Nintendo game Mario Bros on a PDA device using human body movements as game inputs instead of the classic game controller.

In [4] is presented Monster&Gold, a funny fitness game for mobile phones that aims at guiding and motivating users to run at a controlled intensity.

3 Everywhere Run

Everywhere Run [2] is a software designed for the Android OS (version 1.6 and upper) [1] which supports runners during their activity. It allows users to fully design their own regimes or to get them from a qualified personal trainer. Figure 1 shows the workout creation screen where a complex regime has been created. It is composed of several

"sessions", called "traits": for each of them, it is possible to define the distance and pace to keep. It is possible to have as many sessions as desired or just one. For example, trait 1 in Figure 1 means the user wants to run 2km at a pace of 5 minutes per kilometer (note: in running the speed is generally expressed as the time to run one kilometer or mile). After trait 1 follows trait 2 where the runner wants to run 10km at a quicker pace and so on. Hence *Everywhere Run* permits to define quite complex regimes in order to satisfy the needs of even the most demanding runners.

Section 3.1 describes the virtual personal trainer feature, while in Section 3.2 it is put an emphasis on its social aspects.

Fig. 1 Workout cretaion

3.1 Virtual Presonal Trainer

One of the most important features of *Everywhere Run*, as already pointed out, is its ability to act as a virtual personal trainer. Indeed it guides the runner through the whole workout in such a manner for him to meet his predefined goals (i.e., as defined in the workout creation screen, see Figure 1).

This is achieved using an intuitive application interface where the user can get at a glance all needed data while running. In Figures 2 and 3 it is possible to observe the ongoing workout screen and how the virtual personal trainer feature works.

Fig. 2 The user has the right pace

Fig. 3 The user has to slow down

The virtual trainer, represented by the orange icon in the left center of the screen, behaves as a pacemaker (note: a pacemaker is a runner that leads the race to keep the pace for other runners). The user (the green icon in the center of the screen) has just to follow him, focusing only on the run.

In the topmost of the screen an horizontal bar gives an overview of the whole workout (note that the workout length is known a priori, as defined in the workout creation screen, see Figure 1) and the actual position of both the runner and the virtual trainer (w.r.t. the whole workout length). Using the two buttons in the bottommost of the screen, it is possible to zoom in/out the part of the whole workout depicted in the central part of the screen. This makes it easier for the user to estimate the current distance to the trainer.

In order to make even more intuitive the application, two big arrows in the right of the screen communicate to the user if he has to slow down or speed up. In between the arrows the current distance of the runner to the trainer is clearly indicated. Furthermore the two arrows will be alternatively filled proportionally to the need of slowing down or speeding up. Hence the user knows his running status with just a quick glance at the screen. All that can be observed in Figure 3. In that showed example, the user is

ahead of the trainer of 0.103km, thus the bottom arrow is partially filled to signal the need of slowing down. Compare also Figures 2 and 3 that depict two different situations.

Everywhere Run, to be even more intuitive, provides useful and handy audio cues in addition to the just described workout screen. So the runner can even avoid to watch the screen.

3.2 Social Interaction

As previously showed (see Sections 1 and 2), social interaction is a key point to motivate people to exercise.
Sharing achievements is a crucial aspect to provide motivational enforcement and social pressure.
Everywhere Run fosters the interaction among runners and between runners and personal trainers.
It permits to share workout recipes so that beginners can easily get them by asking other runners (perhaps more skilled) or by paying a professional coach.
Indeed it is quite common to find beginners asking in specialized forums questions like "how much time should I run?", "how many times at week?", "what pace should I keep?", etc. This kind of doubts can lead beginners to design their workouts on their own often with dangerous consequences.
In our work we propose some features that try to overcome these problems by promoting a continuous interaction between runners and real personal trainers. Indeed, using the application, the latter can design a workout plan based on specific user needs and send it to the requesting user, that will receive it inside the application. Then the user has just to start the received workout, supported by the "virtual personal trainer" feature that will guide him through all the performance. The main advantage is that a beginner runner has not to worry about anything else than just run. *Everywhere Run*, in its beginner configuration, will signal him to slow down or speed up (see Section 3.1 for further details).
The workout recipes created by the application are coded as xml files, so they can be easily shared in many other ways. For example in specialized forums.

4 Experimental Results

We performed some preliminary experiments to evaluate the main software features (like visual advices and vocal cues) and to test its overall usability.
Section 4.1 describes the usability tests and their results.
Section 4.2 reports the results about a survey that has been conducted to evaluate the software.

4.1 Usability Tests

We performed some usability tests in order to discover potential misbehaviours and features to improve.
They basically consisted on observing users while interacting with the software.
Indeed, as demonstrated in [9] and [13], it is sufficient to test a software with no more than five users to preliminarly verify its usability.
Tests mainly focused on:

- performance: it evaluates the time needed to complete a single task;
- accuracy: it measures the number of mistakes made by a user;
- emotional response: it estimates the user satisfaction.

For our experiments we chose five people with age ranging from 20 to 35 and with some experience using smartphones. Only two people were expert runners while others were just occasionally joggers.
We instructed the group with a quick overview about the application but without giving any explanation about its usage. Then, in order to assess the application usability, users were asked to perform some operations, such as creating a workout, editing it, and so on.
Observing their interaction with the application we were able to detect and correct some troubles.
In general our testers reported a positive evaluation about the software usability (using a rate scale from 0 to 5, we scored an average rating of 3.8).
The application resulted very intuitive for experienced runners. On the other hand, at the first submission, two inexperienced users came across some difficulties while creating a workout. The cause of the fault was the unit of measurement. Indeed runners are used to indicating the speed as time to run one kilometer (or mile), for example 5:30/km (5 minutes and 30 seconds per kilometer). This misled the two above users that interpreted it as the time to run the whole workout distance. As a consequence they created an incorrect workout.
We then corrected this source of troubles putting the more usual speed unit of measure (i.e., km/h or mi/h) as the default one and adding a better explanation of the other unit.
As consequence, at the second submission, users do not encounter the same difficulties.

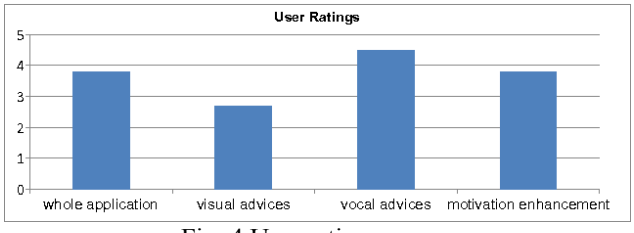

Fig. 4 User ratings

4.2 Software Evaluation

To evaluate the software's capabilities we submitted a survey to a group of ten runners that tested *Everywhere Run*

for three weeks. The group consisted of five males and five females with an average age of 28.3. Only four users were used to exercising regularly. We asked them to rate the application with regard to several characteristics. The score ranged from a minimum of 0, meaning “strongly disagree”, to a maximum of 5, meaning “strongly agree”. Figure 4 shows the characteristics under valuation and the corresponding results.

As it is possible to see in Figure 4, the average rating for the whole application was 3.8. Users said that *Everywhere Run* had been very useful to support their workouts. In particular they preferred audio cues over visual advices, pointing out that the former are handier while exercising.
Indeed vocal advices were found absolutely necessary scoring 4.5. With regard to motivational aspects, the rate was 3.8. Runners noticed that working out with our application is more engaging. The just discussed results suggest us that the software is perceived as a valid support tool that greatly helps runners to follow their predefined training programs.

5 Conclusions and Future Work

People living in developed countries experience a range of diseases mainly related to a sedentary lifestyle. Pathologies like diabetes, hypertension, heart attacks and many others register an increasing incidence.

In this paper we presented *Everywhere Run*, a mobile phone application that attempts to motivate people to exercise regularly in order to stay healthy. It acts as a virtual personal trainer, supporting runners of any levels in their running activities. It is focused on helping not expert people to start working out. Indeed it promotes the interaction with a real personal trainer in order to get a proper regime and avoid unhealthy patterns. The software supports the user step by step during his run, guiding him to follow the predefined routines. Hence it makes it easier to get started even for beginners. It fosters an healthy lifestyle leveraging the social interaction among runners and between them and personal trainers.

We performed some preliminary tests with a group of ten people in order to assess the impact of the software on the user's motivation to exercise. We also tested its usability. The results showed an average enhancement of the motivation among participants.

There are several improvements we are currently working on. For example, we are including heart rate monitors in *Everywhere Run*.
Furthermore, we want to promote the interaction with social networks in order to assess the social impact on motivating people.
Finally, through the diffusion of the application on the Google Play Store, we plan to set up a large scale survey to better investigate the effectiveness of the application on users' motivations.

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