Everywhere Race!: A Social Mobile Platform for Sport Engagement and Motivation

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Abstract—A lot of medical researches demonstrate that in the last decades there has been a serious increase of chronic diseases such as obesity, diabetes and correlated pathologies. These studies emphasize the key role of a healthy lifestyle in the prevention and cure of these kind of health problems. A healthy lifestyle can be broadly summarized in terms of regular physical activity, a balanced diet, a positive outlook and absence of harmful substances such as alcohol and tobacco. Researchers around the world are experimenting with new techniques and technologies to support and motivate people in their daily physical activity. Ubiquitous mobile devices and their intrinsic relationship with social networks are becoming one of the most popular persuasive technologies adopted in this research area. In this paper we present and evaluate an innovative mobile Android application, called *Everywhere Race!*, designed to motivate people in a wide range of speed-based sport activities. The peculiarity of the application consists in its groundbreaking way to engage people in sports. Thanks to an intensive usage of social networks and its fun-oriented design it makes it possible, for the first time ever, to compete in real-time with people from all over the world as in a real competition. A preliminary evaluation of the application, conducted on 35 users, shows that the application motivates both non-habitual sportsmen to start working out and habitual ones to keep on exercising.

Keywords-Sport; Healthy Lifestyle; Motivation; Engagement; Gamification; Serious Game; Human Computer Interaction.

I. INTRODUCTION

Thousands of medical studies have put in evidence the benefits of regular physical activity. These studies demonstrate that a healthy lifestyle is a predominant factor for people well-being. It helps in the prevention of several chronic diseases and it is closely related to a wide array of mental health benefits (see for example, [2][3]).

Despite these scientific results, millions of people worldwide conduct a sedentary lifestyle. Data collected during the years 2008-2010 by the World Health Organization (WHO) reveal that we are living in a sedentary society. These statistics speak clearly [4]:

- In 2008 1.4 billion adults were overweight
- Nearly 40 million children are overweight
- 65% of world population lives in countries where overweight and obesity kill more people than underweight

WHO suggests some guidelines to be followed in order to overcome or prevent health problems. Here are some proposed tips:

- Engage in regular physical activity

- Limit energy intake from total fats
- Increase consumption of fruit and vegetables, as well as legumes, whole grains and nuts

In the last years, a conspicuous number of research teams and famous sport brands were and still are involved in studying and developing new techniques to motivate people to pursue a more active lifestyle. Many of these studies share a common approach: the exploit of new technologies, such as smartphones and social networks, as primary means of promoting an active lifestyle especially among young people.

As stated by Batussi et al. [5] the products developed by these researches can be grouped in three main categories:

- Computer-supported physical games
- Virtual trainers
- Mobile applications and devices

The last category seems to be the most promising one if we consider both the high number of related researches and the solutions developed. One key success factor is certainly due to the high potentialities of new technologies.

Mobile devices are highly portable and this allows users to be assisted everywhere and every time they need it. For example, Mulas et al. [17] exploit a mobile application that behaves as a virtual personal trainer for supporting and motivating people in their running activities.

Most of the proposed applications, however, try to motivate users focusing mainly on people performance rather than the social and ludic aspects of sport. In some cases this can be a limiting factor especially when the aim is to attract non-habitual sportsmen.

Everywhere Race! (EWR) has been designed to overcome these limitations. Its main purpose is to allow users from all over the world to compete against each other in different speed-based sports.

The application, in a completely different way than other existing applications, allows real-time virtual competitions among participants.

A virtual race is similar to a real one in the sense that it has a priori known start time and distance and both are the same for all the participants, no matter where they are.

The application is designed to promote a strong social interaction among users by means of the famous social network Facebook.

Indeed a user can easily check all races where its friends are enrolled in and join them. Alternatively, it can create a

new race and, perhaps, invite its friends. Furthermore, EWR highlights friends activities, such as their last race results and classifications, in order to foster social engagement.

Once a user chooses the race that best meets his preferences, he only has to wait till the scheduled start time. A few minutes before it, EWR begins a countdown for the user, so that all participants will start racing at the same time, wherever they are in the world.

During the competition the application records and shows to the user his race data – such as the covered distance so far, the average speed/pace and his current position in the competition – and those of their opponents in terms of position and distance from him as in a real event.

When all participants finish the race, the application establishes and publishes the final classification, with arriving positions, times and speeds, as in a real race (Figure 6).

If the user wants, his result will be posted on his Facebook wall.

Everywhere Race! offers another innovative feature: it is even possible to associate to a real sport event (such as a marathon) a virtual one. In this way people that can not be present at the real event can virtually participate and compete against all other participants. For example, imagine to take part at the New York Marathon without being physically there, perhaps running in your city park or in your treadmill (indeed modern smartphone are equipped with accelerometers that can be exploited to realize a pedometer).

Promising results coming from the relatively new serious game research area (see for example, [7][8]) suggested us to develop the application leveraging the importance of fun and social relationships as a means to promote the sport in as many people as possible.

With respect to the state-of-the-art solutions, our application offers users the opportunity to compete in real-time virtual races that are very similar to the real ones. At the same time the deep integration with Facebook community makes sport practice even more engaging. These factors help to push people toward a healthy spirit of competition that is a well known strong motivation element.

Other existing solutions do not offer users the possibility to perform real-time competitions with other people. The most common case is to allow a user to compete against his past performances as a means to improve himself. To the best of our knowledge there is only one application, named Softrace [23], similar to *Everywhere Race!*. The application allows users to take part in a virtual real-time competition. Anyway it differs from EWR mainly because it does not follow the common rules of a real race (see Section II).

The rest of this paper is organized as follows: Section II surveys the state of the art in the field of pervasive computing. Section III details the application design while section IV reports preliminary test results. Section V concludes the paper.

II. RELATED WORK

In this section, with no claim to being exhaustive, we will report some examples of technological systems developed to support people during physical activities.

Hoysniemi [9] illustrates some results regarding the use of the famous dance video game Dance Dance Revolution. In this paper the author investigates the positive effects of gaming with regard to motivational, physical and social factors.

Jayant et al. [10] studied the effects of using human movements as game controller. To achieve this they have developed MarioFit, a system to play the Nintendo game Mario Bros on a PDA.

IJsselsteijn et al. [11] propose a study on intrinsic motivation enhancement. The research is based on the experimentation with a virtual coach system on users while cycling on a stationary bike. The virtual coach, developed by the Philips Research Centre, is projected on a screen surrounded by a naturalistic landscape. Their results show a good users reaction to the stimuli provided by the virtual coach with some other interesting results about the effectiveness of informations provided by the coach during the workouts.

Your Shape Fitness Evolved [12] is a fitness game designed for Microsoft Kinect. The software guides users step by step during indoor workouts and let them customize their workouts in terms of goals to reach. The game allows users both to keep track/share their statistics through the community and to challenge other users.

Batussi et al. [5] developed a PocketPC application called Mobile Personal Trainer (MOPET) aimed to support users during their workouts. MOPET uses GPS device and vocal cues during training sessions. The application makes use of an embodied virtual trainer that guides users showing the proper execution of exercises.

Toscos et al. [13] propose Chick clique that aims to push teenage girls to adopt a correct lifestyle. The application collects informations about the caloric content of popular foods and the amount of steps necessary to burn them. The software promotes social interactions by means of SMS to boost a friendly competition among users.

Consolvo et al. [14] have developed a mobile application called Huston that, through a pedometer, counts and records the number of steps done. The results collected during Huston's experimentation are very interesting. Authors derived four key design requirements that may help developing such applications:

- Users want accurate measurements of their activities
- Deep use of long-term statistical reports
- Strong social interaction support
- Applications must be developed taking into account users lifestyle habits

Oliveira et al. [15] presented TripleBeat a mobile phone application that makes use of both an ECG and an ac-

celerometer to push runners to achieve their goals in terms of a certain heart rate. The results of the experimentation have revealed the importance of a well-designed and intuitive graphical interface to improve self-awareness and the effectiveness of virtual competition to enforce users motivations.

Mulas et al. [17] propose an Android-based mobile application called Everywhere Run! that aims at motivating and supporting people during their running activities. The application behaves as a virtual personal trainer helping runners to keep a predefined pace. With respect to other similar applications, Everywhere Run! is designed to promote interactions between users and real coaches by means of a community of runners.

Nike+GPS [16] as been designed by Nike for the IOS operating system. It is one of the most complete and popular applications in sport and health area. Some of the most important strengths are:

- Intensive use of social networks
- A well-designed system for the management of vocal cues and music
- A dynamic web community where users can create their workouts and at the same time interact with other sportsmen

There are a number of applications similar to these ones. Just to name a few (see Section "References" for websites): Runtastic, Endomondo, RunKeeper, MapMyFitness, Adidas miCoach and so on. All these products provide more or less the same features:

- Route and workout data tracking
- Workout statistics
- Results sharing through social networks

The last application we will discuss is the most similar to our proposal; it is called Softrace [23]. In this application, in addition to the just discussed features, users can compete with other people in a sort of real-time competition.

The trait that sets us apart from this proposal is the totally different implemented concept of real-time race. In Softrace a user can start his race when he wants. He then races against other people that are already running at that moment. Thus, there is not a real concept of "race". Our application instead implements a race in its classical meaning, thus with both a priori known start time and distance, both the same for all the participants. Furthermore, in Softrace, there is not the concept of virtual events associated with real ones.

III. EVERYWHERE RACE!

Everywhere Race! is an Android application (version 1.6 and newer compliant) designed to motivate people to exercise regularly. It is already available in the Google Play Store [24]. It engages people through the totally new concept of real-time virtual competition deeply based on fun and social interactions. The software, for the first time ever, makes it possible to create a real-time race in the
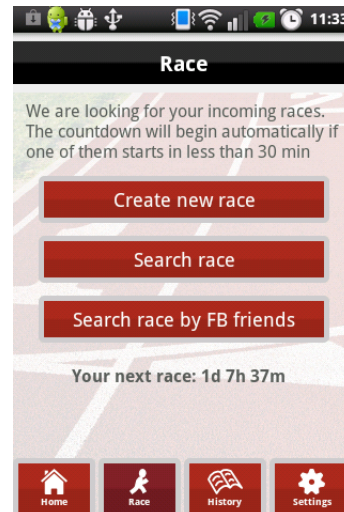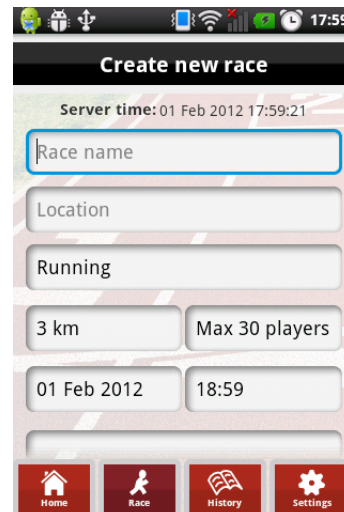

Figure 1.   Main menu

Figure 2.   Create new race menu

classical sense of the word. Users can choose almost any kind of speed-based sports and challenge their friends and other people from all over the world seamlessly from the application.

It follows a more detailed description of *Everywhere Race!*. Figure 1 shows the main race menu. From here the user can create a new race, perform a search for existing ones based on common attributes (e.g., sport, distance, starting time and so on) or directly search for races in which his friends are involved in. As it is possible to see from the screenshot, the application automatically displays the remaining time to the upcoming user's race. In this example, the next user's race will be in a little more than a day.

From the "Create new race" menu (see Figure 2), it is possible to create a new race by choosing the wanted race
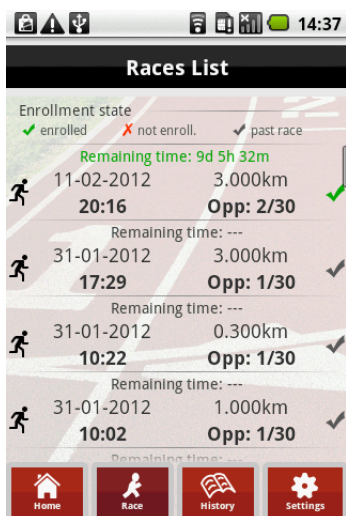
Figure 3.   Search results

Figure 4.   Countdown dialog

Figure 5.   Ongoing race

parameters such as, for example: name, length, number of opponents and start time. As stated above, the application allows two kinds of searches that return a list of races matching the query parameters. An example of search result is shown in Figure 3.

The user's membership state, the start time, the distance and the number of opponents enrolled so far are shown for every returned race. It is possible to have more details by tapping on the row corresponding to a race. We have just described the steps needed to create/find an existing race in order to enroll on it.

Let us speak now about the funniest and more important feature provided by the application, the race. As clearly stated in the top of the screen in the Figure 1, a countdown will automatically start if the next user's race begins in less than thirty minutes. Figure 4 shows that case, where a race will start in less than four minutes.

Note: to avoid misunderstandings, till the end of this section, we will use the word "user" for indicating the user of the current smartphone and the word "opponents" for indicating the other remote users (his competitors).

Figure 5 shows the user screen during a race. The most important information needed while racing is reported on this screen. Starting from the top of the screen, the user can see the race nominal distance and some other data like the GPS signal strength and the meaning of the colours that may appear while racing to report the state of the opponents. The rest of the screen shows a snapshot of the race at a certain point in time. In this particular case (see Figure 5) it is reported the state of the race among three contenders at about two minutes from start. The first row reports data of the current first player. In this case the first player corresponds to the current user and this explains why the row is bigger than others. The cell reports the user's
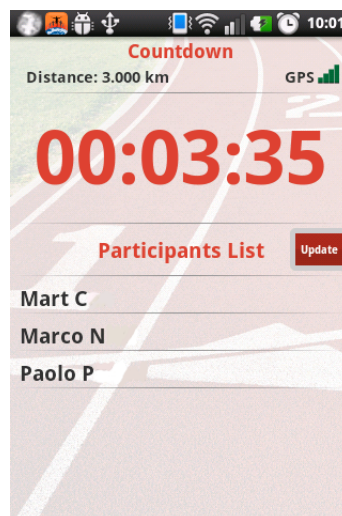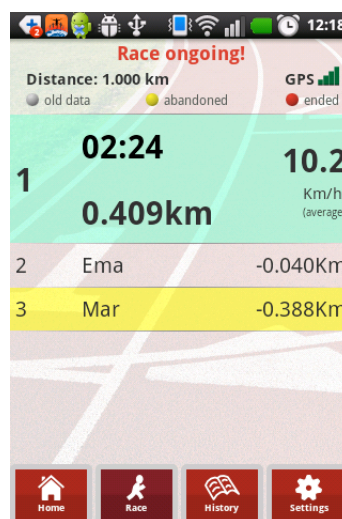
position, race time, distance and the average speed. The other two rows show data of the current second and third player with their gap (expressed as a distance) from the user, respectively.

As soon as the current user covers the whole race distance, the race for him is finished, as in a real one. At this point, the user can choose whether to publish his race result in his Facebook wall or not. Finally, EWR shows the actual classification (see Figure 6). Note that other opponents can be still racing (again, as in a real event), thus the classification can be not final yet.

IV. EXPERIMENTAL RESULTS

To evaluate the effectiveness of the proposed application we submitted a subjective evaluation test to a sample of 35 volunteers that used *Everywhere Race!* for 30 days.

Figure 6. Race results screen

The sample was composed of 25 male users and 10 female users aged between 19 and 40. Ten users regularly practiced sport at amateur level (6 males, 4 females), whereas the remaining testers were mostly sedentary. Among active users 4 exercised about four times a week, while the others from two to one times a week for an average training session duration of 30 minutes. Twenty-seven users (5 females and 22 males) were non-technical and they had never used before any application as a support to physical activity whereas the remaining part of testers already had some experience with such kind of applications.

With these evaluation tests, we wanted to investigate the influence of our application on users motivation in order to both validate current application features and understand how to proceed for future developments.

There are several definitions of motivation:

the psychological process that gives behavior purpose and direction (Kreitner)

a predisposition to behave in a purposive manner to achieve specific, unmet needs (Butford, Bedeian and Lindner)

an internal drive to satisfy an unsatisfied need (Higgins)

the will to achieve (Bedeian)

Ryan et al. [25] propose the following subclassification of motivation:

- Intrinsic motivation: refers to doing something because it is inherently interesting or enjoyable
- Extrinsic motivation: refers to doing something because it leads to a separable outcome

Vallerand et al. [26] studied the differences between intrinsic and extrinsic motivational factors in sports. They claim that intrinsic motives are generally considered to be more relevant than extrinsic ones especially for non-habitual sportsmen. These results are generally considered valid, although other studies (see [27]) show that the user's gender may affect the predominant motive. Females appear to have more intrinsic motives than males which, vice-versa, have more extrinsic motives than females.

The description of how *Everywhere Race!* impacts on motivational aspects has been evaluated follows. For this purpose, we chose to adopt the Exercise Motivations Inventory - 2 (EMI-2) developed by Markland et al. [28]. EMI-2 is composed of 51 items belonging to 14 scales. Testers are asked to rate each item on a five-point scale ranging from 0 ("not at all true for me") to 5 ("very true for me").

Scale scores are obtained by calculating means for each item belonging to the appropriate scale. The graphic in Figure 7 shows the obtained results.
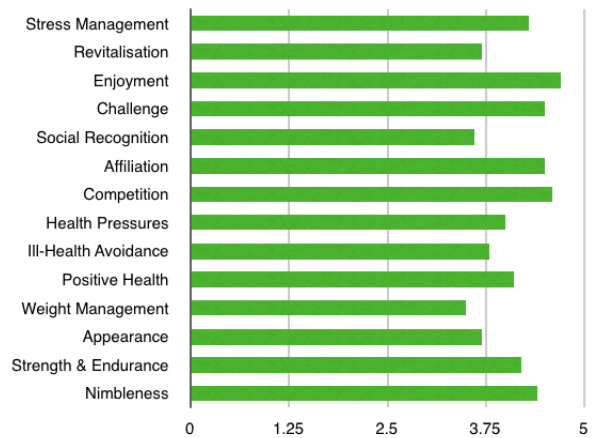

Figure 7. EMI-2 results

All the scales received good scores meaning that the application is a valid mean to help people to start working out. Some of the most important scales that we wanted to test were those related to enjoyment, challenge, affiliation and competition. This is because we aimed at evaluating the innovative features provided by *Everywhere Race!* in order to understand if our application is evolving in the right direction.

We submitted an additional questionnaire to deeper investigate the effects of the application on users sport habits. Testers were asked to rate each question with the same scale (ranging from 0 to 5) used to rate the EMI-2 items. Here are the questions:

1) "Did EWR help you to improve performances?"
2) "Were social features important to improve your performances?"
3) "Did EWR change your sport habits?"
4) "Will you continue to use EWR in the future?"

The average results shown in Figure 8 put in evidence that the majority of users perceive the application as a valid
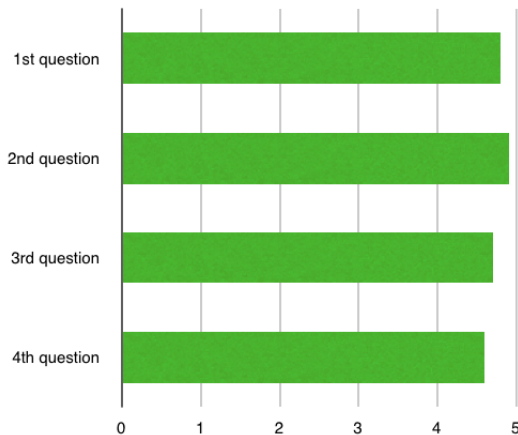
Figure 8.   Questionnaire results

tool that helps to achieve sport goals in a more enjoyable and regular manner.

As it is possible to see, despite the limited sample of test users, we have obtained encouraging preliminary results. The positive trend emerging from our tests shows that the application may help to increase motivational factors through this new engaging and social way of active gaming.

V.   CONCLUSION AND FUTURE WORK

Nowadays, many studies have been carried out trying to find possible solutions to the alarming increase of health diseases. These pathologies are mainly related to an unhealthy lifestyle often due to a lack of physical activity.

In this paper, we presented *Everywhere Race!*, a smartphone application that aims at attracting as many people as possible to start working out in a totally engaging and social fashion. For the first time ever, users can challenge people from all over the world in real-time races very similar to real ones directly from a smartphone. It is like a game, but the participants can move for real! All participants start the race at the same time wherever they are. At any moment in time, all players can see both their position in the race and that of their opponents. At the end of the race, *Everywhere Race!* shows the final classification with arriving positions, times and speeds as in a real race.

As proven by our tests, one of the strengths of the application is its fun and social-oriented design. These features allowed us to exploit the complex social dynamics that has been proved to be very important and effective for people engagement, especially in sports (see, for example, [29][30]).

To evaluate the effectiveness and ease of use of *Everywhere Race!*, we have conducted some preliminary tests with a group of 35 volunteers. The tests have been designed to actually prove the benefits of our software to users motivation. Our results showed that the majority of people that in the past had a sedentary lifestyle got motivated

to working out more often. All these benefits, as shown by numbers, have a close relationship with the innovative features of the application.

Our research will proceed in several directions. First, we are currently developing a web community associated with the application to enforce social interaction among users. Second, we plan to add new features to the application. Among the most forthcoming: more detailed users and community statistics, more social functions and speech synthesis support. Thanks to these improvements we aim to gain a greater visibility on Google Play Store in order to perform more accurate tests on a more statistically meaningful sample of users.

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