

# Using New Communication Technologies and Social Media Interaction to Improve the Motivation of Users to Exercise

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**Abstract**—The number of communication technologies and devices from which users can access information has rapidly increased. Moreover, users now have the chance to interact through social media channels, in order to share what they like and what they are experiencing in their everyday life. Both these aspects influence the design and development of Human-Computer Interaction applications that aim at motivating users to exercise more. In fact, the possibility to manage the exercising activity from different types of devices and the possibility to interact with other users, can increase the motivation of a user to exercise more. This paper presents a persuasive web application for sport and health, designed to motivate people in their exercising activity. The innovative aspect of our application is the possibility to use on a web browser some features previously available only through a mobile application. Moreover, it allows a richer interaction with the Facebook social network. Preliminary results show how different types of devices and new communication networks can be integrated, in order to improve the user experience and motivate users to a more active lifestyle.

## I. INTRODUCTION

The new communication technology types and social media forms that arose in the recent years have had a strong impact in the society and on how users access and share information.

In [1], Human-Computer Interaction is defined as “a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them”. On the other hand, [2] defines the Social Web as “a set of relationships that link together people over the Web. ... The Social Web is not just about relationships, but about the applications and innovations that can be built on top of these relationships”.

As the two definitions quoted above suggest, the two disciplines can work well together. In fact, a Human-Computer Interaction application could be developed in the Social Web scenario, in order to study and improve relationships among people. Moreover, it was recently highlighted that the ‘any time, any place’ nature of Human-Computer Interaction has not been widely explored in the Web 2.0 research area [3].

Several studies highlight that social interactions motivate people to exercise [4], [5], [6], [7]. In previous works, we presented researches that motivate people in their exercising

activity, by using Android applications that allow users to get a workout plan from a personal trainer [9], [10], or to create virtual competitions (*races*) with people anywhere in the world [8]. With respect to the state-of-the-art, the interaction between users and personal trainers and the capability to interact in real-time with other users, highlighted great improvements in the motivation of users to exercise regularly.

This paper presents a web application, designed to port some race management features (e.g., the creation, the subscription or the participation to a race), previously available in the Android mobile application, in a web browser. Moreover, the web application offers an improved social experience, by implementing several new innovative social features by means of the Facebook social network. In this manner, users can share their workout experience with their friends, enhancing the engagement and keeping the motivation high.

The web application provides features to manage the races that were only available in the mobile application, improving the whole user experience. Moreover, the interaction with Facebook allows to enhance the social engagement that, as previously mentioned, is a key aspect in a motivation scenario. In fact, due to the phenomenon of the “social influence” (a concept known in sociology and viral marketing) in the social network domain [11], the enhancements of a user in her/his exercising activity can inspire and motivate other users to improve their performances. So, the availability of the features to manage the races on more devices and the capability to interact with a social network, should improve the motivation to exercise regularly. The choice to develop a web application that focuses on the organization of races, was made because a race involves more than a user, so this scenario lends itself well to link Human-Computer Interaction with the Social Web.

This paper brings significant scientific contributions, both to the Human-Computer Interaction and the Social Web research areas, listed below:

- in literature, there are no researches that exploit virtual races to motivate people, thus this is the first scientific work of this kind;
- the use of a web application, which brings to a web browser some of the functionalities of the already existing Android application, allows to manage the

races not only from small devices, like mobile phones and tablets. As proved by usability preliminary results, this simplifies the access to the functionalities and improves the user experience, in order to push people organize more races and thus exercise more;

- also, the social influence brought by the web application, encourages users to create new races and challenge their friends in real time.

The rest of the paper is organized as follows: Section II presents an overview of the state-of-the-art; Section III briefly introduces the two Android applications developed to motivate users in their exercising activity; Section IV illustrates the web application, by presenting its architecture and functionalities; Section V reports preliminary evaluations; Section VI contains comments, conclusions and future work.

## II. RELATED WORK

This section illustrates the systems recently developed to support people in their physical activities.

Hoysniemi [12] illustrates results regarding the use of the famous dance video game “Dance Dance Revolution”. In this paper, the author investigates on the positive effects of gaming, by considering motivational, physical and social factors.

IJsselsteijn et al. [13], propose a study on intrinsic motivation enhancement. The research is based on an experimentation with a virtual coach system on users that cycle on a stationary bike. The virtual coach, developed by the Philips Research Centre, is projected on a screen surrounded by a naturalistic landscape. Results show a good user reaction to the stimuli provided by the virtual coach and a good effectiveness of the informations provided by the coach during the workouts.

Your Shape Fitness Evolved [14] is a fitness game for Microsoft Kinect, which guides users during indoor workouts and lets them customize the workouts in terms of goals to reach. The game allows users both to keep track/share their statistics with the community and to challenge other users.

Batussi et al. [6] developed a PocketPC application, called Mobile Personal Trainer (MOPET), aimed at supporting users during their workouts. MOPET uses a GPS device and vocal cues during the training sessions. The application makes use of an embodied virtual trainer that guides users by showing the proper execution of exercises.

In [15], Toscos et al. propose Chick clique, a technology that aims at pushing 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. [4] have developed a mobile application, called Huston, that counts and records the number of steps done through a pedometer. Thanks to the results obtained, the authors derived four key design requirements that may help developing such applications: (i) users want accurate measurements of their activities; (ii) long-term statistical reports should be deeply used; (iii) strong social interaction should be supported; (iv) applications must be developed taking into account users lifestyle habits.

TripleBeat [7] is a mobile phone application that makes use of both an ECG and an accelerometer, in order 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.

Nike+GPS [16] as been designed by Nike for the IOS and Android operating systems. It is one of the most complete and popular applications in sports and health area. Some of the most important strengths are: (i) intensive use of social networks; (ii) a well-designed system for the management of vocal cues and music; (iii) a dynamic web community, where users can create their workouts and at the same time interact with other sportsmen.

The last application we will discuss, SoftRace [17], is the most similar to the one used. In this application, users can compete with other people in a sort of real-time competition. The strong difference with our approach is the totally different implemented concept of real-time race. In SoftRace, a user can start her/his race whenever she/he wants. The user 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. IMPROVING MOTIVATION TO EXERCISE BY USING MOBILE ANDROID APPLICATIONS

We recently presented in several studies how the use of a mobile application can improve the motivation of users to exercise [9], [10], [8]. These researches were conducted on two Android applications. The first, named *Everywhere Run!*, allows to get workout plans from a personal trainer. The latter, i.e., *Everywhere Race!*, makes it possible to create virtual competitions (*races*) in speed-based sports. These two mobile applications will soon be merged in one unique application that will feature all the above characteristics.

This section briefly presents *Everywhere Run!* and *Everywhere Race!*.

### A. Motivation in Running Activities

*Everywhere Run!*<sup>1</sup> [9], [10] is a mobile application designed to support people during their running routines. By using it, users can design their own regimes or get tailored ones directly from a real personal trainer, seamlessly inside the application. Figure 1-a shows the workout creation screen. Through this screen, users can plan relatively complex regimes like the one showed in figure, called “Monday”. Each training is composed of several “sessions”, called “traits”, defined in terms of distance and pace (or speed) to keep. “Trait 1” in Fig. 1-a means that the user wants to run 2km at a pace of 5 minutes per kilometer (note that runners generally express speed as the time to run one kilometer or mile). The first trait is followed by “Trait 2”, where the runner expects to run 10km at a higher pace than before. Hence, *Everywhere Run!* allows

<sup>1</sup><http://www.everywhererun.com/>

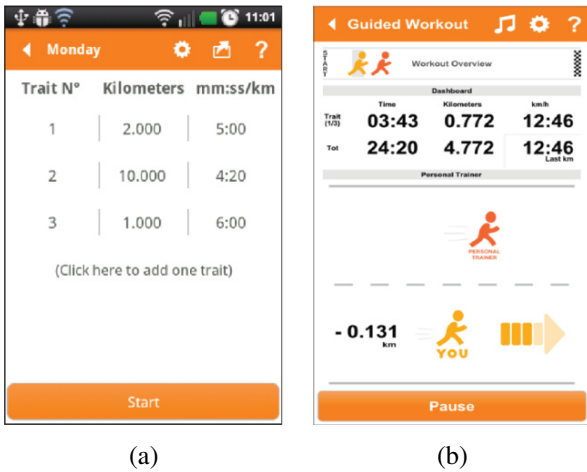


Fig. 1: Workout creation menu (a) and Personal trainer screen (b)

to define quite complex regimes, in order to satisfy even the most demanding runners.

The virtual personal trainer is the core feature of *Everywhere Run!*. By means of this functionality, the application is able both to guide and to motivate the runner during the whole workout, in order for her/him to reach predefined goals (i.e., the goals set in the workout creation screen shown in Figure 1-a). In Figure 1-b, it is possible to observe an ongoing workout and how the virtual personal trainer feature works.

The topmost part of the screen contains an horizontal bar that gives to the user an overview of the whole workout (note that the workout length is known a priori, since it has been defined in the workout creation screen), with the actual position of the runner with respect to the virtual trainer.

Under the horizontal bar there is a dashboard that reports current speeds, distances and times regarding both the current trait and the whole training session.

The next portion of the screen depicts the user and the virtual coach during a session (i.e., the “Personal Trainer” area in the lower half of Figure 1-b). The virtual personal trainer, represented by the red icon on top of the Personal Trainer area, acts like a pacemaker (who has the task to keep the pace for the other runners), so that the runner, virtually represented by the yellow icon on the bottom of the “Personal Trainer” area, has just to follow her/him focusing only on the run.

The arrow changes its orientation accordingly to the current position of the user, with respect to the virtual personal trainer. The distance gap between the user and the trainer is near the icon representing the user, in its left. In this way, we try to keep training data as compact as possible by decreasing the total number of graphic elements for a better user experience.

The performed tests assess both the impact of the software on the user’s motivation to exercise and its usability. The results obtained so far showed an average enhancement of the motivation among participants.

For further details on the approach and the experiments, see [9], [10].

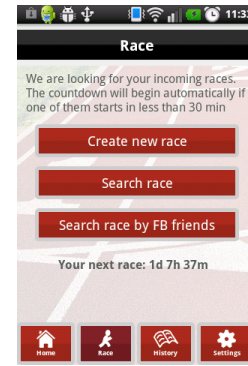


Fig. 2: Main menu of Everywhere Race!

## B. Motivation in Races

*Everywhere Race!*<sup>2</sup> [8] is an Android application designed to motivate people to exercise regularly. It engages people through the new concept of real-time virtual competition, based on fun and social interactions. The software, for the first time ever, makes it possible to create a real-time race in the 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.

Figure 2 shows the main menu. From here, a 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 her/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.

When players are engaged in a virtual race, they can see, at any moment in time, both their position in the race and that of their opponents (Fig. 3-a). At the end of the race, *Everywhere Race!* shows the final classification with arriving positions, times and speeds as in a real race (Fig. 3-b).

As proven by experimental 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.

For details on the approach and the experiments, see [8].

## IV. A WEB APPLICATION TO MANAGE RACES AND SUPPORT SOCIAL INTERACTION

The web application presented in this section works in cooperation with *Everywhere Race!*, i.e., the Android application that allows to manage the races. This web application was designed to offer part of the functionalities and of the content available in the mobile version. As previously mentioned, another important characteristic of this web application is its capability to interact with the Facebook social network.

<sup>2</sup><http://www.everywhererace.com/>

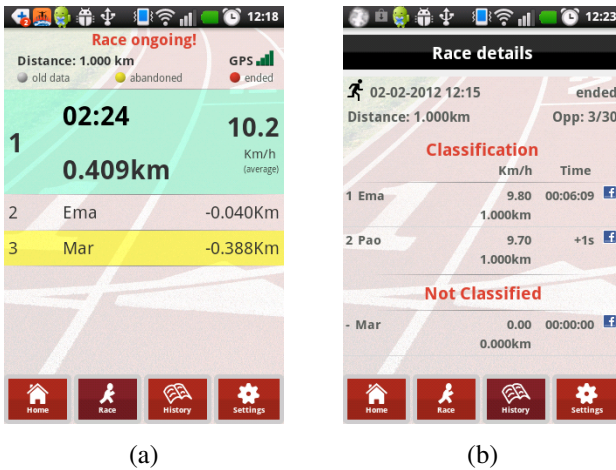


Fig. 3: Ongoing race (a) and Race results (b) screens.

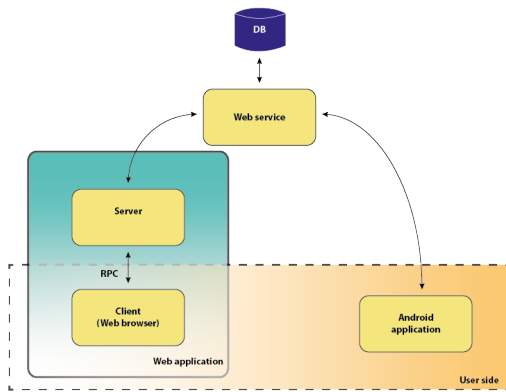


Fig. 4: Architecture of the project

### A. Architecture of the Project

Here we present the web application architecture and how it interacts with the mobile Android version. Fig. 4 shows the architecture of the entire project. The user side includes both the Android and the web versions. The Android application gives the user the access to all the functionalities related to the races, like the creation, the subscription and the participation. During the races, the Android application sends and receives from a web service the data of the users who joined a race, like the speed of the users, the position of the race and the geographic coordinates.

The web application can access to the features previously mentioned and to other ones, like the results of the races (the complete set of functionalities offered by the web application will be described in the next subsection). Like the Android version, also the web application sends and receives from the web service the data generated by the users.

1) *Architecture of the Web Application:* The web application is divided into two parts, which are the Client (executed by the browser) and the Server.

The user generated data are sent to the server by means of a remote procedure call (RPC) and then forwarded to the web service, which stores the data in a database.

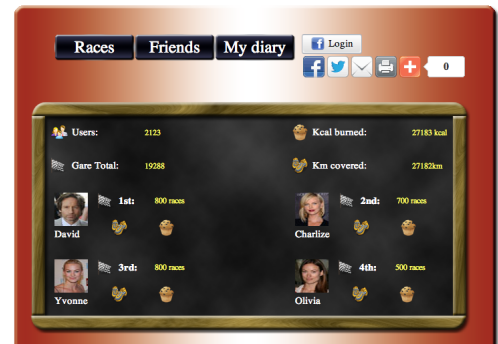


Fig. 5: Top of the web application (Dashboard and login features)

In a similar way, the data traffic from the web service to the Client is handled in the following way: the Client makes an RPC to the server and requests the necessary data (e.g., a list of races), the server forwards the request to the web service and after it receives them, the data is returned to the Client.

### B. Features Offered by the Web Application

Here we describe the characteristics and the features of the proposed web application. As the top left part of Fig. 5 shows, the web application is divided in three parts, named “Races”, “Friends” and “My Diary”. By clicking on one of these three buttons, the content shown in the *Dashboard* (lower part of the figure) changes. The Dashboard shows the first four users in the general rank and statistic data of the application, like the number of subscribed users and number of created races. According to the pressed button, the Dashboard will show the following information:

- pressing the *Races* button, the dashboard shows the data related to all the users that use the application;
- pressing the *Friends* button, the data of the Facebook friends of the logged in user are shown in the Dashboard;
- pressing the *My Diary* button, the Dashboard shows only the data of the logged in user and, as the name suggests, it can be considered as a sort of diary that allows the user to keep track of his racing activity.

The top right of the figure shows the button that allows a user to login and logout using Facebook and the social buttons developed by AddThis<sup>3</sup>, which is a free service that allows to interact with several social networks.

The web application continues under the Dashboard with more functionalities, shown in Fig. 6. The top of the figure shows a search feature, that allows to look for already created races through a set of constraints (i.e., the sport, the date and the distance). Next, a list of the races, divided by status (i.e., ongoing, finished and future), is shown. Every race in the list contains a button with the Facebook logo, that allows to make a post of the considered race on Facebook (Facebook posts will be described in detail in the next subsection). Note that also

<sup>3</sup><http://support.addthis.com>



Fig. 6: The list of races shown by the web application

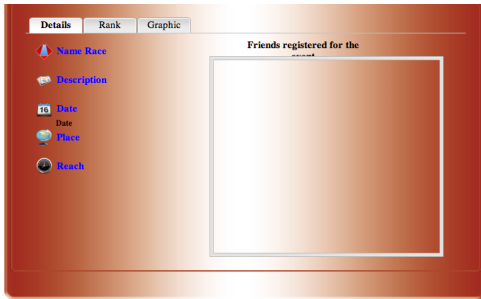


Fig. 7: The details of a race shown by the web application

the list of races will change according to the button pressed on top of the web application, i.e., “Races”, “Friends” and “My Diary”. The “Create race” button allows to create a new race, by compiling a form that includes a set of fields (i.e., maximum number of participants, date, start time, distance, place, sport, race name, description).

By selecting a race in the list, the URL of the considered race is shown (bottom part of Fig. 6), in order to allow the user to share the details of the race by copying its URL. Moreover, the details of the race are shown under the URL, as Fig. 7 shows. The section shown in Fig. 7 is divided in three parts, now described in detail:

- *Details*, which contains the details of a race (i.e., name, description, date, place and distance) and the list of Facebook friends that joined the race;
- *Rank*, which shows the list of the participants to the race and, for each participant, it indicates the the current or the arrival position in the race, the name, the status of the race and the amount of time taken by the user to perform the race. This section is obviously useful only for ongoing and finished races (i.e., it would be impossible to rank the users of a future race);
- *Graphic*, which allows to show the evolution of a race through a graphic.

### C. Social Interaction

The web application offers the possibility, according to the state of the race (ongoing, finished or future) and based on the

TABLE I: Facebook posts

	Participant	Not participant
<b>Finished</b>	I just finished this race: Final position: 1 Distance: 10km Date: 06/01/2014 Sport: Running Time: 1:30:00 Medium speed: 10km/h Medium pace:10km/h	This race is finished: Distance: 10km Date: 06/01/2014 Name: Charity Marathon Description: Charity Marathon
<b>Ongoing</b>	I'm participating to this race: Temporary position: 1 Distance: 10km Date: 13/08/2013 Sport: Running Time: 1:30:00 Medium speed: 10km/h Medium pace:10km/h	This race is ongoing: Distance: 10km Date: 13/08/2013 Name: Charity Marathon Description: Charity Marathon
<b>Future</b>	I'll participate this the race: Distance: 10km Date: 06/01/2014 Name: Charity Marathon Description: Charity Marathon	There will be this race: Distance: 10km Date: 06/01/2014 Name: Charity Marathon Description: Charity Marathon



Fig. 8: Dialog window of a Facebook post

participation of the user, to create different posts on Facebook. Table I shows an example of the six possible posts and Fig. 8 shows an example of the dialog window of a post.

These Facebook posts allow to motivate the user in several ways. In fact, thanks to the “social influence” [11], the enhancements of a user in her/his exercising activity can inspire and motivate other users to improve their performances. Another important aspect is that, by sharing the results of a race, a user might receive a feedback from her/his friends through Facebook’s comments and likes, that might motivate her/him to do better.

## V. EXPERIMENTAL RESULTS

Given the relatively low maturity of the platform, we decided to conduct a preliminary usability and social influence evaluation. Through a standard System Usability Scale (SUS) questionnaire [18] we investigated how users perceived the overall usability of the system. To this end, we recruited 20



volunteers that used EWRace supported by the web platform for at least one month. The sample was composed of 6 males and 14 females with an average age of 24.5 years and standard deviation equal to 5.56 years. From the evaluation of the SUS questionnaires we obtained a mean value of 76.25 with standard deviation equal to 14.50. In order to obtain a more meaningful estimate for the mean value, we computed a 95% *t*-confidence interval obtaining the following estimates: 69.47 and 83.35 [19]. In other words, we can be 95% confident the actual score is between 69.47 and 83.35. Even if we consider the lower estimate (69.47) we obtain a percentile rank of 53% meaning that the web platform is more usable than 53% of products in [20].

While, to evaluate the social aspect of our system, we monitored the average number of races created per week, over a period of eight weeks. During the first four weeks, users could not use the web application and each user created an average of 1.4 races per week. Instead, with the introduction of the web application the average number of races created per week grew to 1.8 (+28%). Moreover, we asked users to evaluate, in a scale from 0 to 5, how much their performances have been influenced by the social pressure provided by the real time races. We obtained a result of 3.7 out of 5.

In conclusion, our evaluation suggests that the early design of the platform has an acceptable usability and, thanks to the advice of beta tester users, we are currently working to give users a more effective and innovative tool to organize their activities and to reinforce social interactions. Moreover, the results also highlight how social aspect can help users in their physical activity.

## VI. CONCLUSIONS AND FUTURE WORK

The way users interact with the information drastically changed in the recently years, thanks to the development of new communication technology forms and new social media forms, like social networks. Both these aspects have been considered in the design of a novel web application presented in this paper, which offers part of the functionalities of a mobile application to a web browser. Moreover, it allows the users to interact with the Facebook social network. This web application extends the number of devices from which a user can access to the race system, by allowing to manage races also from a computer and not only from a small device. Thanks to this, it is now possible to study how the user interaction with the web application can motivate users in a social media scenario, contributing to the Human-Computer Interaction field.

Preliminary studies show that the use of this web application and its deep interaction with the Facebook social network, improve the user motivation to exercise.

Future work will improve this web application by adding new functionalities.

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