Linking Human-Computer Interaction with the Social Web: a Web Application to Improve Motivation in the Exercising Activity of Users

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Abstract—A current open issue in the Human-Computer Interaction research area is the study of applications that can work in the Social Web environment. This paper presents a persuasive web application for sport and health, designed to motivate people in their exercising activity. For the first time ever, our application makes available on a web browser some features previously available only through a mobile application. Moreover, it allows a richer interaction with the Facebook social network. This work shows how linking Human-Computer Interaction with the Social Web can be exploited, to improve the motivation of users to a more active lifestyle. This is done by providing an improved user experience, through the targeting of new types of devices and new communication networks.

I. INTRODUCTION

In the recent years, both Human-Computer Interaction and the Social Web (also known as Web 2.0) have had an exponential growth.

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, Turekten and Olfman 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 several 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 create virtual competitions (races) with people anywhere in the world [8]. With respect to the state-of-the-art approaches, 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 only in the Android mobile application, in a web browser. This web application extends the number of devices from which a user can access to the application, by allowing to manage the races also from a computer and not only from a small device. Thanks to its design and features, it is able to create an artificial cognitive system able to enhance the training experience of users by stimulating them to exercise regularly. The social interaction features allow users to have an improved perception of their performances, thanks to the possibility to share their experience with their Facebook friends. Moreover, the attention, motor, visual, and spatial processing capabilities are stimulated also by means of the mobile application, by allowing a user to keep a pace or to know how well the other users in a race are doing.

With respect to other similar and famous applications that provide users with a web community (e.g., Endomondo, Runtastic, Nike+, etc.), our web application is designed to favor social interactions before a user works out. So, these interactions aim at attracting people to participate in a race, rather than allowing to share the experience with the application only a posteriori, when a user has already completed her/his workout.

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 improve the social interactions that, as previously mentioned, are a key aspect in a motivation scenario. In fact, due to the phenomenon of the "social influence" (a widely known concept 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 enhance the social engagement on more devices and the capability to interact with a different environment (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 relevant scientific contributions, both to the Human-Computer Interaction and the Social Web research areas, listed below:

- in literature, there are not 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. This simplifies the access to the functionalities and improves the user experience, in order to push people to organize more races and thus exercise more;
- moreover, by using the web application, users can create new races and challenge their friends in real time. This pushes them to exercise more.

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 contains comments, conclusions, and future work.

II. RELATED WORK

This section presents some examples of technological systems, developed to support people during physical activities.

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

In [13], Jayant et al. studied the effects of using human movements as game controllers. To achieve this, they have developed MarioFit, a system to play the Nintendo game Mario Bros on a PDA.

Isselsteijn et al. [14], 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. Results show a good user reaction to the stimuli provided by the virtual coach and a good effectiveness of the information provided by the coach during the workouts.

Your Shape Fitness Evolved [15] is a fitness game designed for Microsoft Kinect. The software guides users step by step during indoor workouts and lets them customize their 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 [16], 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] 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 [17] 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 sportmen.

The last application we will discuss is the most similar one to that used in the paper. It is called SoftRace [18]. In this application, in addition to the previously discussed features, users can compete with other people in a sort of real-time competition. The 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, a real concept of “race” is not present. 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 no concept of virtual events associated with real ones.

III. ANDROID APPLICATIONS THAT MOTIVATE USERS IN EXERCISING ACTIVITY

In the past, we presented several studies that motivate users in their exercising activity, by using two Android applications. The first application, named Everywhere Run!, supports users by allowing them to get workout plans from a personal trainer. The latter, Everywhere Race!, makes it possible to create virtual competitions (races) in speed-based sports.

At the moment, these two types of features (i.e., the capability to get a plan from a personal trainer and the capability to create races) are offered by the two previously mentioned Android applications. However, all the functionalities will be soon be merged in a unique application.
This section briefly presents *Everywhere Run!* and *Everywhere Race!*

### A. Everywhere Run!

*Everywhere Run!*[^1] [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 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 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 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 training 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 (a pacemaker 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].

### B. Everywhere Race!

*Everywhere Race!*[^2] [8] is an Android application designed to motivate people to exercise regularly. 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 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 further details on the approach and the experiments, see [8].

[^1]: http://www.everywhererun.com/

[^2]: http://www.everywhererace.com/
Fig. 2: Main menu of Everywhere Race!

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

IV. A WEB APPLICATION TO SUPPORT SOCIAL INTERACTION IN THE ORGANIZATION OF RACES

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

A. Architecture

Here we present the web application architecture and how it interacts with the mobile Android version.

1) Architecture of the Project: 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 users 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 all the features previously mentioned and to others, 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.

2) 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 from the server they are forwarded to the web service, which stores the data in a database.

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. Functionalities

This subsection describes the characteristics and the functionalities offered by the web application. As the top left part of Fig. 5 shows, the web application is divided into 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 allows to keep track of her/his racing activity.
The top right part of the figure shows the button that allows a user to login and logout using Facebook and the social buttons developed by AddThis, 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 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 into 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 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. Interaction with Facebook

As previously mentioned, it is possible to create a post on Facebook for each race, according to its state (ongoing, finished, or future) and based on the participation of the user. Table I shows examples of the six possible posts. Moreover, 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. CONCLUSIONS AND FUTURE WORK

This paper presented a web application, developed to bring to a web browser some of the functionalities of an Android application that motivates users in their exercising activity. This web application extends the number of devices from which a user can access to the application, by allowing to manage the races also from a computer and not only from a small device. Moreover, users can interact with the Facebook social network. Thanks to this, it is now possible to study how the user interaction with the web application can motivate users in a Social Web scenario, contributing to the Human-Computer Interaction field. As highlighted in the Introduction, employing Human-Computer Interaction applications in a Social Web environment has not been widely explored in the literature.

The enhancement in the motivation of the users is currently being tested, by first letting a set of users manage the races only through the Android application and then introducing the possibility to also use the web application. Preliminary results show an improvement both on the number of races created and joined by a user, with respect to the situation in which users only used the mobile application. Moreover, the interaction with the Facebook social network is showing the “social influence” effect previously highlighted.

Future work will include improving this web application by adding new functionalities.

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REFERENCES


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