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A cross-domain framework for designing healthcare mobile applications mining social networks to generate recommendations of training and nutrition planning

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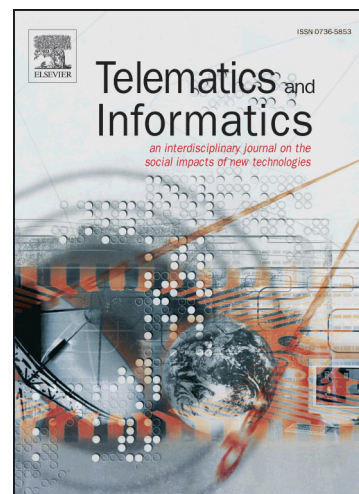
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Abstract

Nowadays, people are practicing physical exercise in order to maintain good health conditions. Such physical workouts are required by a plan, which should be designed and supervised by sport specialists and medical assistants. Thus, the exercise sessions shall start with consultation of a coach, doctor and dietician; however, many times this scenario is not presented. In typical activities such as running, cycling and fitness, people use health mobile apps with their smartphones, which offer support for these activities. Nevertheless, the functionality and operation of these applications are isolated, because many and long questionnaires are performed. Additionally, the physical and health state of a user is not considered. These issues would be taken into account for determining recommendations about the time for doing exercise and the kind of activity for each person. In this work, a social semantic mobile framework to generate recommendations where a mobile application allows sensing the physical performance, taking into consideration medical criteria with smartphones is proposed. The approach includes a semantic cross-information that comes from social network and official data as well as sport activities and medical knowledge. This knowledge is translated into application ontologies related directly to health, nutrition and training domains. The methodology also covers physical fitness tests and a monitoring tool for evaluating the nutrition plan and the correct execution of the training. As case study, the mobile application offers to evaluate the physical and health conditions of a runner, automatically generate a nutrition plan and training, monitor plans and recomputed them if users make changes in their routines. The data provided from the social network are used as feedback in the application, in order to make the training and nutrition plans more flexible by applying spatio-temporal analysis based on machine learning. Finally, the generated training and nutrition plans were validated by specialists, they have demonstrated 82% of effectiveness rate in exercise training routines and 86% in nutrition plans. In addition, the results were compared with isolated approaches and manual recommendations made by specialists, the obtained overall performance was 81%

1. Introduction

Athletics in several countries has always been one of the most popular sports, there are runners interested in keeping physically prepared for workouts everyday and other people do exercise to maintain good health or by hobbies. However, not all runners know the risks involved in their training, without the monitoring of their physical performance or their nutrition plans that should handle. Even though, today exists technologies for supporting the workout sessions (*e.g.* wearable sensors like Garmin (Ertin et al., 2011; Bandodkar & Wang, 2014), mobile applications like Johnson (Wing et al., 2007), and *MyFitnessPal* (Rooksby et al., 2014)), they are only informative. In the case of Apple Watch, its platform is focused on biometric technology, specially for health monitoring. It collects physical activity and nutrition data but does not provide a semantic interpretation of them and the app is not designed to specialized athletes or users (Hill, 2015). These devices and mobile systems do not make suggestions, recommendations, computation of training sessions or nutrition plans. Currently, it is difficult to find telematics applications and tools for evaluating and recommending physical training and daily diet with integral supervision and control.

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