Training Assistant: the Automatic Training Data Collection System

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***Abstract*—A lot of people visit gyms to compensate their insufficient activity level. They record completed exercises to diaries during workouts. This data can be used as a basis for development of individual training program that allows to increase productivity of next workouts. However, the manual addition of exercise records to the diary takes a lot of time and may be error-prone due to person's fatigue.**

We present our vision for the automatization of the training diary, a system that consists of

- **devices on gym apparatus that detects parameters of user's exercise;**
- **a server that collects data from the devices and derives exercise records;**
- **a personal electronic training diary that provides access to collected data and allows to manually add records for the specified user.**

This system automatically collects data about exercises into the storage and gives user tools to view and analyze records.

Each component of the system has a certain role. A device on the exercise machine authorizes a user via his/her mobile device or some tag, collects data about performed exercises, transfers it to the server and exercise records back to the user's mobile device if it presents. Devices on gym apparatus do not store any data and act as a proxy between sensors, the server and the mobile device.

To identify the user and to transfer data we have chosen the NFC (Near Field Communication) technology. NFC is the high frequency wireless and a short-range communication technology that allows to exchange data between devices a distance less than 10 centimeters. Due to this short range we can be sure that particular user performs an exercise on the gym apparatus.

The use of NFC allows to identify user not only with expensive smart phone, but also with the cheap tag. It can be useful in case if a user has no mobile device with NFC support or does not want to carry it around during the workout. The gym can provide these tags to their users in a form of the locker's key holder.

The server is a repository of all collected data from training machines. When the server receives data the describing exercise from the device it derives exercise description, that includes the count of repeats and sets, the overall lifted weight, the time spent for individual exercise and the whole workout. The derived data can be transferred to the user's mobile device or viewed via the web interface.

The last part of the system is the application for mobile devices running Android operating system. The application is an electronic diary that has following features:

- **it assists in creation of individual workout programs;**
- **it helps to carry out one of created workout programs;**
- **it represent data about performed workouts;**
- **it contains extensive description of the exercises and correct execution techniques.**

The core use case of the system is the following. First of all a user authorizes in the system via the NFC tag in his key holder or via his mobile device with NFC support. Then the user performs an exercise on the machine. After each move of the weight blocks in the exercise machine the device sends data to the server. The server then processes received data and unites repeats to sets based on the time intervals between them.

After a period of time the server detects the end of the exercise and makes the exercise record available for downloading. The user can get it via the NFC interface of the device on the exercise machine or via Internet connection with the server. Also the user can see same information via the web interface of the server at the personal page.

At the demo section we demonstrate a part of the use case — we show how server collects exercise data and composes it into the exercise record. We developed the prototype of the device on gym apparatus, the model of an exercise machine and the prototype of the server application that demonstrates data processing.

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