

# PEDIS – DESIGN AND DEVELOPMENT OF A PERFORMANCE DIAGNOSIS INFORMATION SYSTEM

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## **Abstract**

*We report about the outcome of a project that enables sport and training organizations to monitor and evaluate the efficiency of training methods currently used through the employment of a database backed web-based information system. The information system – which we called PeDIS – furthermore enables participating athletes to compare their personal performance with those of others of a similar age. Standardized performance tests are being carried out on a regular basis and the results will be entered into a database.*

## **1. Introduction**

Not many information systems for performance diagnosis are reported in the literature. Ong and Koh [1] developed a web-based database solution for sports performance indicators at a sports school for swimmers in Singapore. They report that “the challenge was very much in obtaining the data and processing it prior to inputting to the system. This was largely due to the fact that the data must be specific to the needs of the coaches and not the other way round.” This is an experience we considered in the setup of our project. We developed PeDIS (see Figure 1) together with a professional sport education facility, the GAK youngsters and amateurs soccer academy (“Steiermärkische Fußballakademie GAK”). It is based at the HIB, a high school in Graz-Liebenau where – amongst others – prospective soccer players grouped by their age (less than 15 years of age, less than 17, less than 19 and so called amateurs) are located. GAK is an Austrian premier league soccer club and selected members of the amateurs academy are regularly promoted to the team of professional players. The results of the data analysis carried out with PeDIS can be a future attribute in this selection process. In its current version, PeDIS has been adapted to the special needs of a soccer club, although its usage is definitely not limited to soccer. Three groups of data – which will be described in more details below – are assessed: (a) results of standardized performance tests, (b) observations of the coaches during soccer games and (c) medical information based on examinations of physicians.

## **2. Methods**

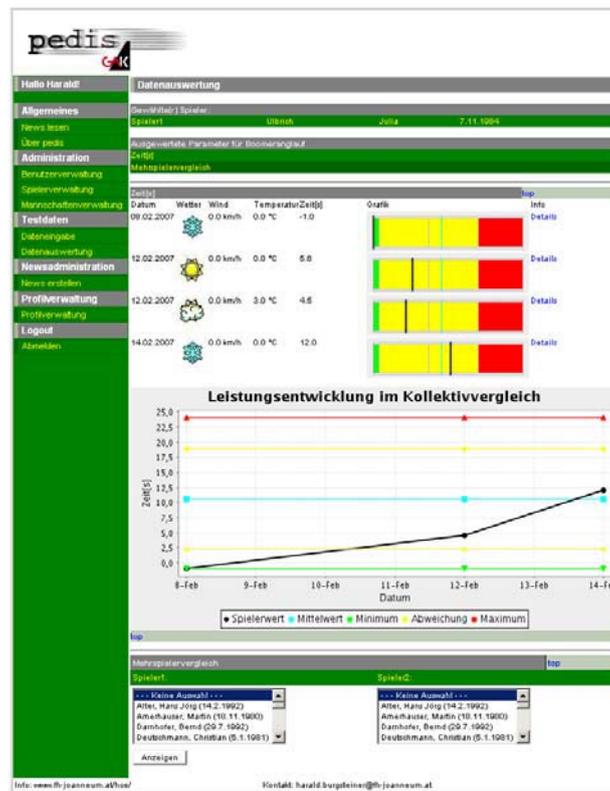
To acquire the relevant attributes of the performance of soccer players, a special test protocol has been developed [2] together with the coaches of the HIB. The tests in use are “lipometric assessment”, “boomerang run”, “dribbling test”, “30 meter sprint”, “shuttle sprint”, “grid sprint”, “drop

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jump”, “on-legged 5-hop”, “maximum muscle power and performance”, “Conconi shuttle run”, “classic Conconi test including measurement of lactate and respiratory attributes” and “functional diagnostics of muscles”.

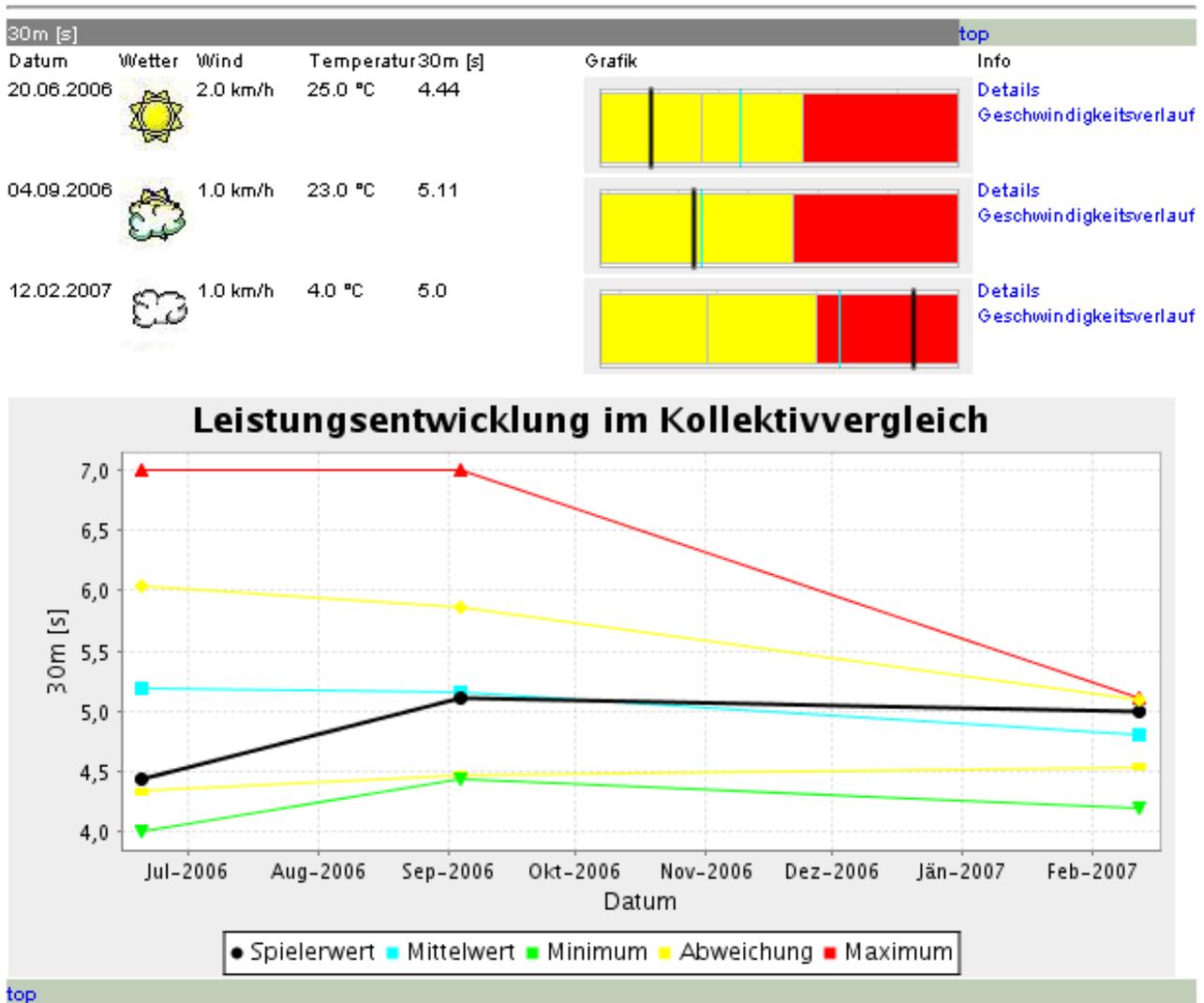


**Figure 1: A screenshot giving an overview of our performance diagnosis information system. Authorized persons are allowed to analyze the data of individual subjects in direct comparison to arbitrary other players.**

Some tests are restricted to a certain age. For more details about the tests and the accurate instructions on their implementation see [2]. The additional data that coaches can enter are based on the observations during soccer games. They include statistical data on the activities of individual players, e.g. in how many soccer games did he play, how many goals did he score, how many assists did he provide, how efficient are his penalties, etc.

Due to security reasons and to protect the privacy of the athletes, analysis of the collected data is restricted to certain access levels: Coaches and physicians get access to all available performance data, which enables them to compare individual players against each other. The retrieval of medical data is restricted to physicians only. Finally, each player has read-only access to his own data. Furthermore, players can compare their personal data with anonymous, statistical data calculated from the data of all other players with a similar age (see Figure 2 for an example of an analysis of a 30m sprint). This enables them to watch the outcomes of their personal training efforts.

To generate the statistical data for each performance attribute, we implemented a “self-learning” system which enables us to provide comparisons not with results published in the literature, but with the data collected in the information system itself. It is ensured that the performance of an athlete on a certain day is compared to those results of players that are at a similar age at this very day. Currently this similarity is defined being plus or minus half a year of age. Hence, we have an assessment system that is adaptive to local idiosyncrasies and evolves over time.



**Figure 2:** A screenshot of PeDIS during an analysis of a 30m sprint of a player. Analysis of this kind are available for all reasonable tests described in the text. In this example data from 3 test days are available and displayed in the 3 upper lines. The solid black line in the colored horizontal bars give an overview of the player's performance in comparison to a group a similar aged players. The colors indicate best, worse and average performance of the group including standard deviation on the selected test days. Below the development of the performance over time is displayed.

To limit the dependence of the project from financial and technological aspects, PeDIS is completely built upon exchangeable open-source technology. It uses a Tomcat Application Server [3] for running the business logic, MySQL [4] as the database backend and Java Server Pages for the presentation of the graphics, diagrams and results. The whole application is running on a single server operated by OpenSUSE Linux OS.

### 3. Results

PeDIS is running in its production environment for approximately 6 months now. The database currently comprises 69 users (players, trainers and physicians). Data of several test days have been collected according to the processes defined in the test handbook [2] we introduced above. Since the athletes are only doing a full check-up consisting of several of the standard tests about 3 or 4 times a year, the data pool is not very large so far. Only 7 test days have been carried out to this

date. No major problems have been reported, only some minor uncertainties concerning the usability of the interface.

We are offering a possibility for feedback for the users of the system. We are especially looking for suggestions concerning the usability, possible bugs or further features that the athletes, trainers or physicians report. We would like to implement these suggestions and our experiences gained in this first run in our second release that will be due in the summer of 2008.

#### **4. Discussion**

We presented the current state of a project that enables sport and training organizations to monitor and evaluate the efficiency of training methods currently used through the employment of a database backed web-based information system. PeDIS enables participating athletes to compare their personal performance with those of others of a similar age. Standardized performance tests are being carried out on a regular basis and the results are entered into a database. The project will be evaluated after several months of operation. It will be interesting if and how trainers and athletes could gain information about the efficiency of their current training methodology. After this time, the usability and some of the implemented processes should be reconsidered.

A hypothesis of the use of such a performance analysis tool for individual athletes is that this direct comparison to a pool of players of a similar age should also increase the motivation of this athlete for the suggested training to him. In order to assess the performance of the young athletes, the participating subjects of different ages will be closely observed over a period of several years. The test of this hypothesis will be carried out in a successive project.

#### **5. References**

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