2017

Editorial: Special issue on modeling in endurance sports

Chris Abbiss
c.abbiss@ecu.edu.au

Dietmar Saupe

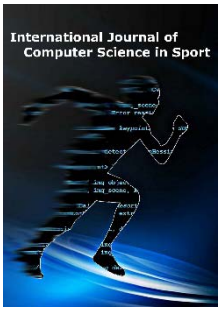
10.1515/ijcss-2017-0006
Abbis, C. and Saupe, D. Editorial : Special issue on modeling in Endurance Sports. International Journal of Computer Science in Sport, Volume 16, Issue 2, Pages 76–77. Available here

International Journal of Computer Science in Sport

Volume 16, Issue 2 (Special Edition), 2017

Journal homepage: http://iacss.org/index.php?id=30

DOI: 10.1515/ijcss-2017-0006



Editorial: Special Issue on Modeling in Endurance Sports

Chris R. Abbiss[1] and Dietmar Saupe[2]

[1]School of Medical and Health Science, Edith Cowan University, Australia

[2]Department of Computer and Information Science, University of Konstanz, Germany

Analysing and predicting sports performance to optimise training and competition is a wide and complex field. To date, most methods heavily rely on the subjective experience of trainers and athletes. Nevertheless, objective mathematical methods and computer-based solutions have become increasingly popular over recent years and offer a wide range of research topics. This research is by nature interdisciplinary, involving sport and exercise science together with computational science and engineering.

One major challenge of this research is handling the non-linear processes occurring in real-world settings. Additionally, most models are abstract and parameters cannot be measured directly. For instance, the capacity of individual energy stores within whole body physiological models can only be determined implicitly by external measurements. In designing training programs the major difficulty is the appropriate application of load and recovery phases to obtain an optimal adaptation process and reach peak performance. Unfortunately, to date there is limited research which has directly aimed to solve this problem using mathematical methods.

In September 2016, a workshop, entitled *Modeling in Endurance Sports,* was held at the University of Konstanz, Germany. It aimed at mathematical, physiological, and computer science related approaches to analyse performance and physiological processes in endurance sports, such as running, cycling, rowing, skiing, and swimming. The topics addressed included data acquisition and visualisation, analysis and optimization of endurance training, modeling and simulation of performance, optimization of performance parameters, and modeling of physiological processes, including $\dot{V}O_2$ kinetics, fatigue, and critical power. The workshop brought together experts, student researchers, and practitioners in sport science, exercise physiology, applied mathematics, and computer science. It was supported by the German Society of Sport Science (DVS) Section Sport Informatics, by the German National Science Foundation (DFG), and by the University of Konstanz.

Following the workshop topics, a call for this special issue of the International Journal of Computer Science in Sport (IJCSS) was published. The submissions were reviewed by several experts in the corresponding fields. Five submissions were accepted for the special IJCSS

issue.

The papers collected here broadly address methods for prediction of performance in endurance sports. The methods used originate from a wide spectrum of computer science, mathematics, and engineering, and include multiple linear regression, nonlinear artificial neural networks like multilayer perceptrons, optimal control, and Kalman filters.

Collecting large volumes of data from various sensors within sport is becoming increasingly common among elite as well as hobby athletes. Such data is being wirelessly communicated to devices that process the data and forward it via the internet to custom platforms for collection, analysis, comparison, and visualization. Physiological and mathematical models for the underlying bodily processes and physical models of the sports equipment and the environment will play important key roles in understanding performance, especially in endurance sports. Without doubt, we can expect to see much further progress as witnessed by these five examples of this special issue.

Chris Abbiss, Perth, Australia
Dietmar Saupe, Konstanz, Germany

November, 2017