



### Modelling Biomechanics Applied Session@ ISBS 2011

#### Aim

The aim of the Modelling Biomechanics Applied Session is to discuss the use of modelling in the context of Sport Biomechanics. The participant will cover different types of modelling approaches ranging from the more simple forward and inverse dynamics applications to more complex musculoskeletal simulation, and from how to use modelling instruments to reduce errors in experimental laboratory movement capture to the use of induced acceleration to study sports performance. The discussion of the limitations of biomechanics modelling and the careful use that should be done of their results, but also of the promising and unique possibilities that models could provide answers to questions that could only be studied using biomechanical simulation.

#### The theoretical foundations

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Written by LM

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The use of biomechanical modelling approach more common in sports biomechanics than usually notice, for example, on the applied session the first talk will address the application of modelling approach to the reduction of tracking errors associated to motion capture, and how to use new optimization techniques could contribute to reduce those errors. Mass spring models can be used to study some main mechanical properties of the human body, like body natural frequency stiffness and damping properties during jumping and running and the some of the possible consequences will be studied in the session. Induced acceleration analysis being used to explain some clinical aspects of gait but was seldom applied to sports biomechanics optimization. The optimization of throwing in baseball pitching and also jumping performance in figure skating will be studied using individual moment joint moment of force contribution to power development in both sports using induced acceleration approach. The use of forward dynamics simulation has a strong potential for the optimization of sports techniques and sports performance, but some limitations should be addressed.

Finally, an uncompromising discussion on the implications that theoretical and experimental studies on muscle properties that underlie biomechanics research has, not only when biomechanics modelling is used, but also for the interpretation of experimental data in applied or laboratorial studies.

## **Programme**

**28 June 2011**

### Room 1 - 10h00 (Chairman Prof. António Veloso)



#### 1st Oral Presentation (20 min)

**W. Scott Selbie:** *The evolution of pose estimation algorithms for 3d motion capture data: coping with uncertainty*

#### 2nd Oral Presentation (20 min)

**Wangdo Kim and António Veloso:** *An inverse method for predicting the mechanics of hopping from motion data input*

#### 3rd Oral Presentation (20 min)

**Thomas Kepple:** *Application of induced acceleration analysis and computer simulation in sports*

#### 4th Oral Presentation (20 min)

**Maarten F. Bobbert and L.J. Richard Casius:** *Can forward dynamic simulation models be used to improve the performance of top athletes?*

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### 5th Oral Presentation (20 min)

**Prof. Walter Herzog:** *Muscle series elasticity: theoretical and experimental considerations*

### Presenters Biographies

Scott Selbie

Queen's University (Canada), and the University of Massachusetts (USA).

Has been the President and Director of Research at HAS-Motion (an R&D affiliate of C-Motion) since 2005.



Wangdo Kim

Biomechanics Laboratory, Faculty of Human Kinetics, Technical University of Lisbon, Portugal.

His original training was in mechanical engineering; he has a BSc from Seoul National University and a

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Tom Kepple

Currently the Chief Science Officer at C-Motion, Inc. Tom began developing innovative biomechanics s



Dr. M.F. (Maarten) Bobbert

Faculty of Human Movement Sciences of the VU University Amsterdam, The Netherlands.

Maarten F. Bobbert obtained in 1983 a M.Sc. degree in Functional Anatomy as well as a M.Sc. degree

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