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Scientific Seminar

Optimization, sampling in multibody modeling and computer aided surgery

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Information

Date: Thursday, **February 22**
2:00 PM, room Léonard de Vinci
Université Gustave Eiffel, Campus de Lyon
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Presentation in **English**

Abstract

Optimization and random sampling play a crucial role in many current applications in both biomechanics and computer aided surgery. In this field, metaheuristic algorithms, capable of effectively exploring the solution space, are a very attractive option. With Genetic Algorithm, or its real-coded variant, being a common choice. The first part of the seminar will focus on utilizing these methods to tackle common problems in computer aided surgery, namely – path planning for medical tools in surgical procedures. Following that, the seminar will delve into the application of the methods in multibody modeling of biomechanical joints, focusing on the ankle. This will include testing the model with its random variants and uncertainty quantification.

Short biography

The applications of optimization in modeling of biomechanical joints have been my major interest in science for years. My preferred choice are the metaheuristic methods, with primary focus on Genetic Algorithm and its many variants (Real-Coded GA, structured GA; hybrid RC-GA with local methods). I have used it for structure optimization, uncertainty quantification and more. Apart from multibody modeling, I have applied the methods to selected problems computer aided surgery – my second interest in science. In this field, my main focus is on surgical path planning, which includes the analysis and classification of medical images, mainly using classical approaches in Computer Vision and Machine Learning. Recently, my interest shifts towards sampling methods as they provide a convenient framework for a data-driven approach to difficult problems. I am currently employed as an Assistant Professor in the Department of Applied Mechanics and Biomechanics at Cracow University of Technology, where I obtained my PhD and authored three courses on multibody modeling of joints, programming in Python and Arduino.

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