

## INFORMATION ABOUT THE EXPERT

ORGANISATION	Multibody & Mechatronic Systems Laboratory, University of Liège
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TYPE OF PARTNER	University
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POSITION	Professor

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## EXPERTISE OVERVIEW

### **TOPIC(S) OF INTEREST:**

Kinematics and dynamics, flexible mechanical systems, numerical methods

### **HEADLINE:**

Modelling tools and numerical methods for the analysis, control and optimization of mechanical systems

### **POTENTIAL CONTRIBUTION:**

We develop modelling tools for the analysis, control and optimization of mechanical systems, with applications in the fields of robotics, deployable space structures and biomechanics. These modelling tools are implemented in finite element software packages.

We focus on the modelling of nonlinear phenomena in system-level models, which can be attributed to highly flexible nonlinear components (cables, rods, shells), nonsmooth contact interactions, nonlinear kinematics, or non-mechanical components (actuators, sensors and control units). The following fundamental research topics are covered

- geometric modelling methods for systems of rigid bodies, beams, shells, kinematic joints and superelements,
- numerical methods in nonsmooth contact dynamics,
- modelling and simulation of mechatronic and multiphysics systems,
- optimization methods and sensitivity analysis for structural and control design.

More specifically, our current research activities encompass

- the numerical simulation of highly flexible structures such as cables and compliant mechanisms,
- the numerical simulation of dynamic mechanical systems with frictional contact (systems of rigid and/or flexible bodies, mechanical transmissions,
- the development of motion and vibration control methods for robotic systems,
- the development of planning methods for robot grasping and robot manipulation.

Experimental studies can be performed either at the Robotics and Automation Laboratory or at the Laboratory for Human Motion Analysis. Our lab is also part of the TRAIL (Trusted AI Labs) Initiative gathering up to 600 researchers on AI bringing together the expertise of five universities and four research centers focusing on manufacturing, media, medicine, mobility, and energy, working in close collaborations with key industrial players.