



**HAL**  
open science

# Real-time Simulation for a Functional Electrical Stimulation system validation

Daniel Simon, David Andreu, Samy Lafnoune

► **To cite this version:**

Daniel Simon, David Andreu, Samy Lafnoune. Real-time Simulation for a Functional Electrical Stimulation system validation. CAR: Control Architectures of Robots, Jun 2015, Lyon, France. lirmm-01238279v2

**HAL Id: lirmm-01238279**

**<https://hal-lirmm.ccsd.cnrs.fr/lirmm-01238279v2>**

Submitted on 24 Mar 2016

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Real-time Simulation for a Functional Electrical Stimulation system validation

Daniel Simon, David Andreu and Samy Lafnoure  
DEMAR team, INRIA Sophia Antipolis - Méditerranée  
LIRMM, CNRS UMR 5506, Montpellier  
<http://www.lirmm.fr/demar>

## Abstract

Functional Electrical Stimulation (FES) is used in therapy for rehabilitation or substitution for disabled people. They are control systems using electrodes to interface a digital control system with livings. Hence the whole system gathers continuous-time (muscles and nerves) and discrete-time (controllers and links) components. During the design process, realistic simulation remains a precious tool ahead of real experiments to check without danger that the implementation matches the functional and safety requirements. The paper presents a real-time open software simulation system, dedicated to the analysis of FES systems deployed over distributed execution resources and wireless links. The simulation tool is especially devoted to the joint design and analysis of control loops and real-time features.