



HAL
open science

Simulating the human motion under Functional Electrical Stimulation using the HuMAnS toolbox

Martine Eckert, Mitsuhiro Hayashibe, David Guiraud, Pierre-Brice Wieber,
Philippe Fraisse

► **To cite this version:**

Martine Eckert, Mitsuhiro Hayashibe, David Guiraud, Pierre-Brice Wieber, Philippe Fraisse. Simulating the human motion under Functional Electrical Stimulation using the HuMAnS toolbox. Workshop on 3D Physiological Human, Dec 2008, Zermatt, Switzerland. pp.27. lirmm-00458376

HAL Id: lirmm-00458376

<https://hal-lirmm.ccsd.cnrs.fr/lirmm-00458376>

Submitted on 21 Feb 2010

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.

Simulating the human motion under Functional Electrical Stimulation using the HuMAnS toolbox

M. Eckert ¹, M. Hayashibe ², D. Guiraud ², P-B Wieber ³, P. Fraise ²

¹IMERIR, Perpignan, France
martine.eckert@imerir.com

²DEMAR Project, INRIA - LIRMM, Montpellier, France
{mitsuhiro.hayashibe, david.guiraud, fraisse}@lirmm.fr

³BIPOP Project, INRIA Grenoble - Rhône-Alpes, Saint Ismier, France
pierre-brice.wieber@inrialpes.fr

Summary

Mathematical models of the skeletal muscle can support the development of neuroprotheses to restore functional movements in individuals with motor deficiencies by the mean of Functional Electrical Stimulation (FES).

Since many years, numerous skeletal muscle models have been proposed to express the relationship between muscle activation and generated force. One of them (Makssoud et al [2]-[3]), integrates the Hill model [5] and the physiological one based on Huxley work [4] allowing the muscle activation under FES. We propose in this paper an improvement of this model by modifying the activation part.

These improvements are highlighted through the HuMAnS toolbox [1] (Figure 1) using a 3D biomechanical model of human named Human 36 which has 36 DOF. This article describes this toolbox and the software implementation of the model. Then, we introduce the simulation results of the knee joint actuated by the muscle group (Quadriceps/Harmstring) using FES (Figure 1).

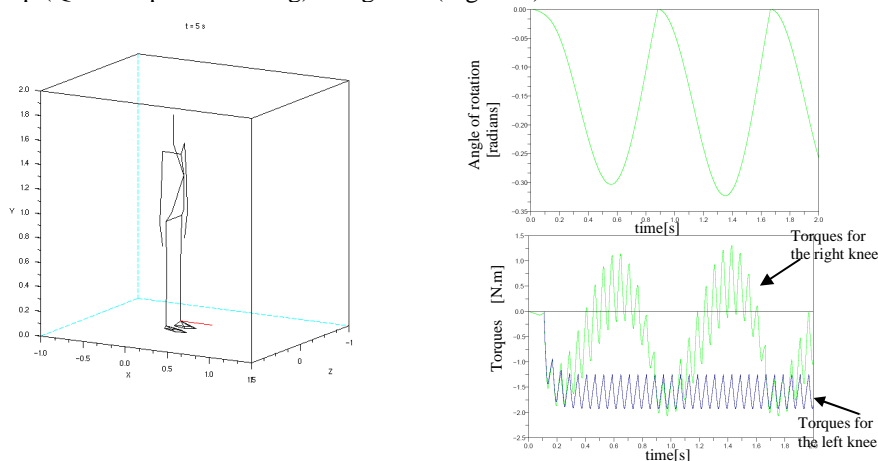


Figure 1. The Human 36 model and some results of the simulation