Université catholique de Louvain UCL

SECTEUR DES SCIENCES ET TECHNOLOGIES

INSTITUTE OF MECHANICS, MATERIALS AND CIVIL ENGINEERING

Invitation à la soutenance publique de thèse

Pour l'obtention du grade de Docteur en Sciences de l'Ingénieur

Monsieur Gabriel ABEDRABBO ODE

Master ingénieur civil mécanicien

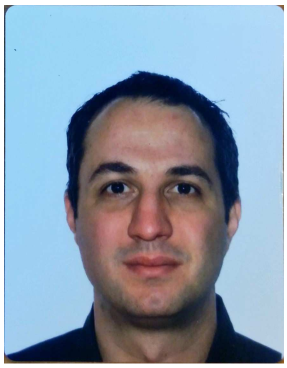
Quantification of intervertebral efforts using a multibody dynamics approach: application to scoliosis

Spine surgery planning involves many decisions for which the surgeon has not enough information, and for which biomechanical models might be helpful. Research studies show a high variability in decision making in the planning of scoliosis surgery by experienced groups of surgeons. That variability is problematic because it may cause complications for the patient, such as revision surgery or an increased limitation in spine mobility. Therefore, a biomechanical model for spine surgery planning may be useful in providing the surgeon the information needed to propose the best treatment. In this context, intervertebral efforts represent an essential input in assisting diagnosis and subsequently guiding the surgical planning of scoliosis.
The long-term motivation of this thesis consists in assisting surgeons in obtaining quantitative - kinematic and dynamical - information that will allow them to improve the surgical planning of scoliosis, by specifying the set of vertebrae to be fused, while preserving the spinal mobility.

In regards to this final motivation, the thesis seeks to develop a clinical protocol based on experimental data and on a multibody model of the upper body, to quantify the intervertebral efforts for idiopathic scoliotic adolescents in standing up position (statics) and during moderate gait (dynamics). The estimation of intervertebral efforts is based upon four interwoven topics: patient physiology, spine geometry, spine and pelvis kinematics, as well as muscular forces. In line with this, if this work's final objective is to be met, three targeted contributions must be achieved:
-The elaboration of a clinical protocol focusing on assessment of the scoliotic patient's parameters: necessary anthropomorphic data, spine shape and kinematics, and muscle force calibration;
-The development of a physiologically-based multibody model of the upper body, able to predict the spine's kinematics and dynamics during gait;
-In terms of internal efforts, using the multibody model and experimental input conjointly should allow exploration and discussion of plausible solutions, thanks to the high potentials offered by both models and computer simulations.

Mardi 31 janvier 2017 à 16h00

Auditoire BARB 94
Place Sainte Barbe, 1
1348 Louvain-la-Neuve



Membres du jury :

Prof. Paul Fisette (UCL), promoteur
Prof. Olivier Cartiaux (UCL), promoteur
Prof. Thomas Pardoen (UCL), président
Prof. Christine Detrembleur (UCL), secrétaire
Prof. Philippe Mahaudens (UCL)
Prof. Maryline Mousny (UCL)
Prof. Christophe Glorion (APHP, France)
Prof. David Mitton (IFSTTAR, France)