SOUTENANCE DE THESE
THESIS DEFENSE

Monsieur Tan-Nhu Nguyen

Unité de Recherche : **Laboratoire BMBI, Labex MS2T**

soutiendra sa thèse de **Doctorat** sur le sujet :

Clinical decision-support system for facial mimic rehabilitation

A l'université de technologie de Compiègne

Le jeudi 19 novembre 2020 à 14h

centre Pierre Guillaumat, amphi L103

et en visioconférence sur le lien suivant *https://utc-fr.zoom.us/j/4017190556*

Devant le jury composé de :

- **Mme Valérie Burdin**, professeur des universités, examinatrice
  IMT Atlantique, école nationale supérieure Mines-Télécom Atlantique Bretagne Pays de la Loire, biomécanique, département image et traitement de l'information, Brest
- **Mme Catherine Marque,** professeur des universités, examinatrice
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- **Mme Marie-Christine Ho Ba Tho**, professeur des universités, examinatrice
  Université de technologie de Compiègne, laboratoire de biomécanique et bioingénierie BMBI - UMR CNRS 7338, Compiègne
- **M. Jos Vander Sloten**, professeur, rapporteur
  KU Leuven - Katholieke Universiteit Leuven, Biomechanic, Leuven, Belgique
- **M. Philippe Pudlo**, professeur des universités, rapporteur
  Université de Valenciennes et du Hainaut-Cambrésis, automatique-biomécanique, Valenciennes
- **M. Tien-Tuan Dao,** professeur des universités, directeur de thèse
  Centrale Lille Institut, biomécanique

Invitée :

Mme Stéphanie Dakpé, Chirurgien maxillo-facial**,** CHU Amiens

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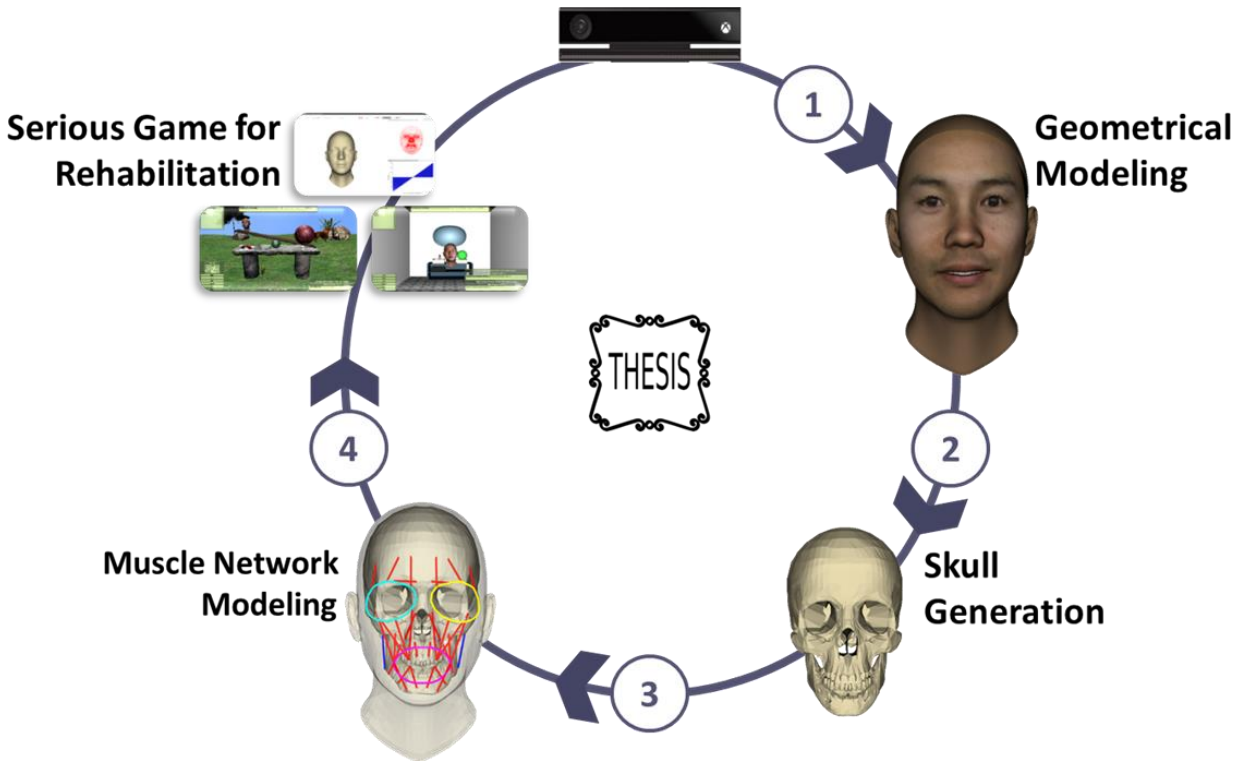
Abstract:

Facial disorders negatively affect professional, social, and personal lives of involved patients. Thus, recovery of facial mimics into normal and symmetrical conditions allows these patients to improve their life qualities. Functional rehabilitation of facial disorders is an important clinical step to improve qualities of surgical interventions and drug therapies. However, facial mimic rehabilitation currently remains a major scientific, technological, and clinical challenge. Especially, conventional rehabilitation processes lack of quantitative and objective bio-feedbacks. Moreover, rehabilitation exercises just included long-term and repetitive actions. This makes patients less ambitious for completing their training programs. Besides, numerous modeling methods, interaction devices, and system architectures have been successfully employed in clinical applications, but they have not been successfully applied for facial mimic rehabilitation. Consequently, this thesis was conducted to complement these drawbacks by designing a clinical decision-support system for facial mimic rehabilitation. Especially, patient-specific models and serious games were integrated with the system to provide quantitative and objective bio-feedbacks and training motivations.

The thesis has six main contributions: (1) a novel real-time subject-specific head generation & animation systems, (2) a novel head-to-skull prediction process, (3) a muscle-oriented patient-specific facial paralysis grading system, (4) a novel serious game system for facial mimic rehabilitation, (5) a novel clinical decision-support system for facial mimic rehabilitation, and (6) a reference guide for developing real-time soft-tissues simulation systems.

This thesis opens new avenues for new research areas relating to the automatic generation of patient specific head from visual sensor and internal structures using statistical shape modeling and real-time modeling and simulation for facial mimic rehabilitation.



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