Application of Computational Modelling on Meeting Clinical Specifications

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Abstract

Different researchers and scientists have extensively applied computational modelling for the past few decades. It has a great application to solve complex problems in science and engineering fields. In this talk, we will demonstrate the application of computational modelling on the pre-clinical prediction of design and failure analysis of different implants (ankle, hip, knee, etc.).

We will also explain how computational modelling has been used to predict bone tissue regeneration and bone healing process in tissue engineering. Based on these applications, we assume that computational modelling will play a significant role in designing the GIOTTO device and the bone healing process's clinical prediction. GIOTTO devices focused on treating osteoporotic fractures at different locations of the human body (periprosthetic fracture in long bones, pelvic fracture, and vertebral compression fracture). The FE model of device 1 has been developed using micro CT scan data. Multiscale material modelling (micro to macro) has been done to assignment the accurate material properties of the FE model. In this talk. we will demonstrate the role of bone remodelling simulation and a mechanobiological algorithm for the prediction of bone density changes and bone ingrowth due to GIOTTO devices.

Biography

Dr Subrata's research focuses on the design and failure analysis of orthopaedic implants and computational biomechanics. He completed his PhD from the Indian Institute of Technology Mandi, India. Dr Subrata has authored 8 international peer-reviewed journal publications and 1 book chapter. He attends renowned 4 international conferences. Currently, he is working on the GIOTTO project as a postdoctoral fellow at Dublin City University.

Professor Dunne is the Executive Director of Biodesign Europe and the Medical Engineering Research Centre. Professor Dunne's research focusses on stratified approaches for the translation of drug-biomaterial combinations for musculoskeletal repair/regeneration, wound-healing and cancer regimens, which have been developed via an interdisciplinary university and industrial collaborative network. Prof Dunne has authored +190 international peer-reviewed journal publications. Prof Dunne's research has been continuously supported by Research Councils, European Union, and Charity funding bodies and also attracts significant interest from industrial partners. To date, he has secured ≈€27.5M research funding from NSF, H2020, EPSRC, MRC, Invest NI, Innovate UK, IRC, SFI, The Royal Academy of Engineering and several major multinational medical device companies. Prof

Dunne has successfully supervised to completion 35 PhD students and 24 MSc students. He is currently involved in the supervision of 17 PhD students. Additionally, he has managed and mentored of 14 postdoctoral (PD) research fellows, all of whom have remained in engineering/ science and have secured employment in industry or academia. Currently, mentoring 4 PD research fellows.