

ESI participates in the DeSSOS consortium to assess prosthetic joint implantation



The 'Decision Support Software for Orthopaedic Surgery' (DeSSOS) consortium aims at developing and bringing to the market a predictive technology for surgeons, involved in joint replacement procedures, to pre- and intra-operatively assess the optimal prosthetic joint implantation configuration and position. This will maximise the effectiveness of the procedure, allowing the reduction of surgeon variability, and thereby improving functional performance.

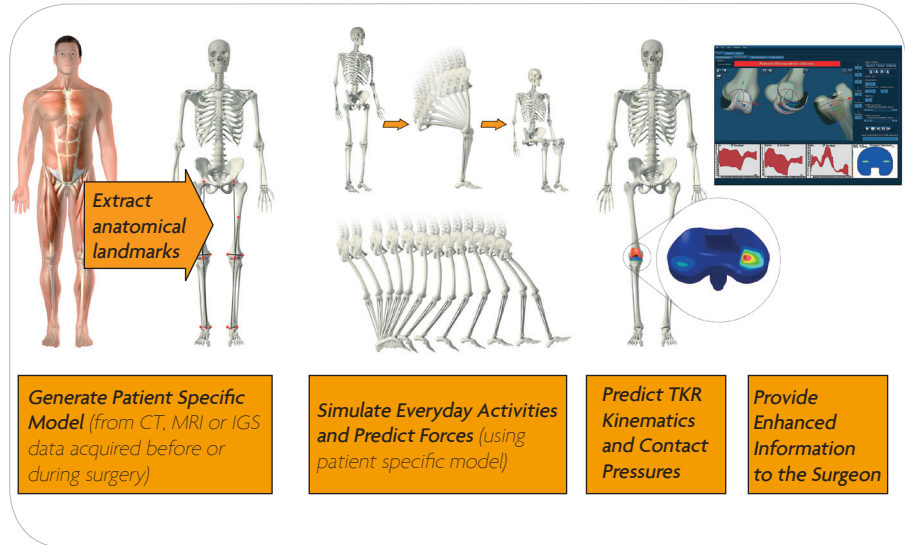
Basic concept of the project

The project combines both fundamental and applied research to support the development of knowledge-based software capable of providing surgeons with the necessary recommendations based on patient-specific anatomical data.

Generic models of the lower limb, an inverse musculoskeletal (MS) model and a corresponding Finite Element (FE) model, are first morphed based on key anatomical landmark data such as centre of the femoral head, centre of the ankle etc. collected prior to CAT scans or MRI's or at the time of surgery (Computer-Aided Surgery).

The derived patient-specific MS model is then used to calculate the appropriate muscle and joint contact forces. In order to drive the MS model, global lower limb kinematics are interpolated from a pre-existing kinematics library.

Once the MS model forces have been obtained, they are applied to the corresponding FE model in order to calculate the kinematics of the knee joint replacement and the associated polyethylene stresses. Probabilistic techniques are used



to predict an envelope of performance rather than a single deterministic solution.

These results can finally be provided to the surgeon to enhance his/her decision making process. Alternatively, in combination with optimization techniques, they can be used from the start thus improving the initial plan.

The DeSSOS consortium counts several academic members such as Charité, University of Leiden Medical Centre, University of Zaragoza, Zuse Institute Berlin, and University of Southampton as the Project Coordinator. It also affiliates industrial partners such as ESI Group, Pera Innovation, DePuy International Ltd, and Finsbury Ltd for the development phase.

ESI's Role in the DeSSOS project

ESI's expertise, in terms of FE Analysis (FEA) and computational engineering skills, pro-

vides DeSSOS with the Information and Communications Technologies (ICT) capable of modelling this complex problematic. The technical support of the other partners is essential in the FEA solver, which is a core part of the DeSSOS consortium's development phase.

The work to be done as part of the project includes tasks such as the implementation of complex ligament modelling, specific ligament material and Zaragoza's Natural Element meshless Method (NEM), as well as optimization development.

► for more information:
www.esi-group.com/dessos