Contact model for preoperative patient-specific dental implant simulations using Cartesian grids

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ABSTRACT

The aim of this work is to provide a tool able to simulate the interaction between the dental prosthesis and a patient-specific mandible model. We will use a 3D implementation of a Finite Element (FE) method based on the use of Cartesian grids, named FEAVox [1].

With the use of an embedded domain method the creation of the calculation mesh is straightforward. A h-adapted Cartesian mesh is created from a hierarchical set of Cartesian grids, and the ability to take into account the parametric definition of the CAD geometry allows FEAVox to overcome the usual drawbacks common to the embeded domain methods.

The information in a medical image is also structured in a Cartesian grid. This allows the automatic creation of FE models of the bone tissue using FEAvox [2], avoiding the creation of auxiliary geometrical entities.

The dental implant is held mainly by frictional contact forces during the first period after the surgery. After that a certain osseointegration is achieved, and it can be considered that the implant is completely stuck on the mandible. A stabilized Lagrangian frictional contact formulation suitable for embedded domains [3] will be used to simulate the different stages of the implant.

REFERENCES

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