Semantic Infostructure interlinking an open source Finite Element tool and libraries with a model repository for the multi-scale Modelling and 3d visualization of the inner-ear

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Objective

The clinical evidence indicates that the number of people with all levels of hearing impairment and hearing loss is rising mainly due to a growing global population and longer life expectancies. Hearing loss caused by pathology in the cochlea or the cochlear nerve is classified as sensorineural hearing loss. The study of the normal function and pathology of the inner ear has unique difficulties as it is inaccessible during life and so, conventional techniques of pathologic studies such as biopsy and surgical excision are not feasible.

SIFEM focuses on the development of a Semantic Infostructure interlinking an open source Finite Element Tool with existing data, models and new knowledge for the multi-scale modelling of the inner-ear with regard to the sensorineural hearing loss. The experts will have access to both the data (micro-CT images, histological data) and inner ear models, while the open-source developed tools and the SIFEM Conceptual Model will be contributed to the VPH toolkit enhancing their reusability. These SIFEM open source tools and services enhance and accelerate the delivery of validated and robust multi-scale models by focusing on: (i) Finite Element Models manipulation and development, (ii) cochlea reconstruction and (iii) 3D inner ear models visualization.

The final outcome is the development of a functional, 3D, multi-scale and validated inner-ear model that includes details of the micromechanics, cochlea geometry, supporting structures, surrounding fluid environment and vibration patterns. In the open context that the project addresses the results can be used to better identify the mechanisms that are responsible for the highly sensitive and dynamic properties of hearing loss. These result to the description of alterations that are connected to diverse cochlear disorders and assist the experts to better assess each patient's condition leading to more efficient treatment and rehabilitation planning and, in long-term, to personalized healthcare.

Related information
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