

# From Medical Images to Virtual Surgery: Combining Geometrical, Physical and Physiological Modeling

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**Abstract.** There is an extraordinary number of imaging modalities providing information on the anatomy and functions of the human body. Existing modalities have continuously increasing spatial and temporal resolution, while new imaging modalities are emerging regularly. In parallel, new therapeutic techniques are being introduced which rely very much on medical imaging, either for their planning, simulation, control or evaluation. In this talk, I will describe some of the past and current work done at INRIA within our Epidaure research team on the quantitative analysis of medical images to help diagnosis, and on the construction of virtual models of patients to better prepare, simulate or control various forms of therapies, including image-guided surgery for brain surgery, surgical simulation for liver surgery, and a dynamic model of the heart which can be used for diagnosis or simulation of cardiovascular diseases. I will indicate a number of promising directions, including the impressive development of cellular imagery, which offers new possibilities for diagnosis and therapy.

Nicholas Ayache, iEpidaure, a Research Project in Medical Image Analysis, Simulation and Robotics at INRIAi, Invited Editorial, *IEEE Trans. on Medical Imaging*, Oct. 2003. (17 pages, 21 figures, 113 references); additional references available on the web site of Epidaure group: <http://www.sop.inria.fr/epidaure/BIBLIO/>

