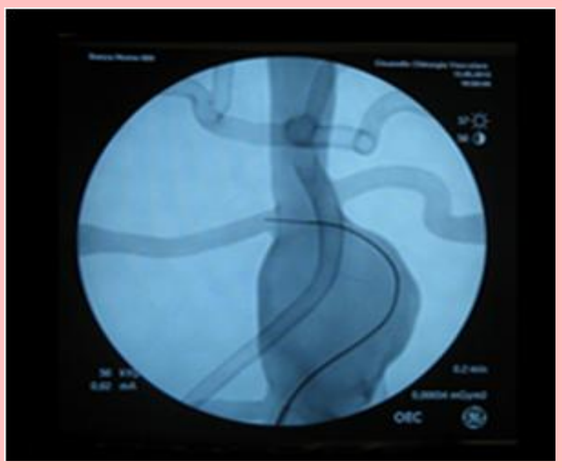
# STUDY AND DEVELOPMENT OF INNOVATIVE TECHNOLOGIES FOR ENDOVASCULAR NAVIGATION

**Parrini S.**


## ABSTRACT

The aim of my research project is to overcome the static nature of current endovascular navigators, based on preoperative static images of the vasculature, in order to account for the various sources of vessels movements during the surgical intervention. The goal is the development of a system able to integrate various sources of intraoperative information to update preoperative virtual models of the vasculature in real-time during the surgical procedure.

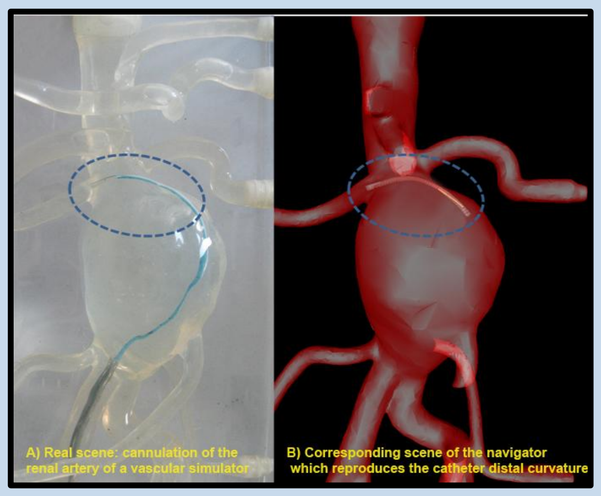
## ENDOVASCULAR SURGERY

Endovascular surgery, based on the fusion of real-time 2D projection of endovascular tools and real-time 2D projection of the arterial tree (after contrast medium injection) has several drawbacks:

- There is radiation exposure for both patient and clinical staff.
- The contrast medium can be nephrotoxic.
- Instrument positioning and orientation by 2D fluoroscopy can be challenging.

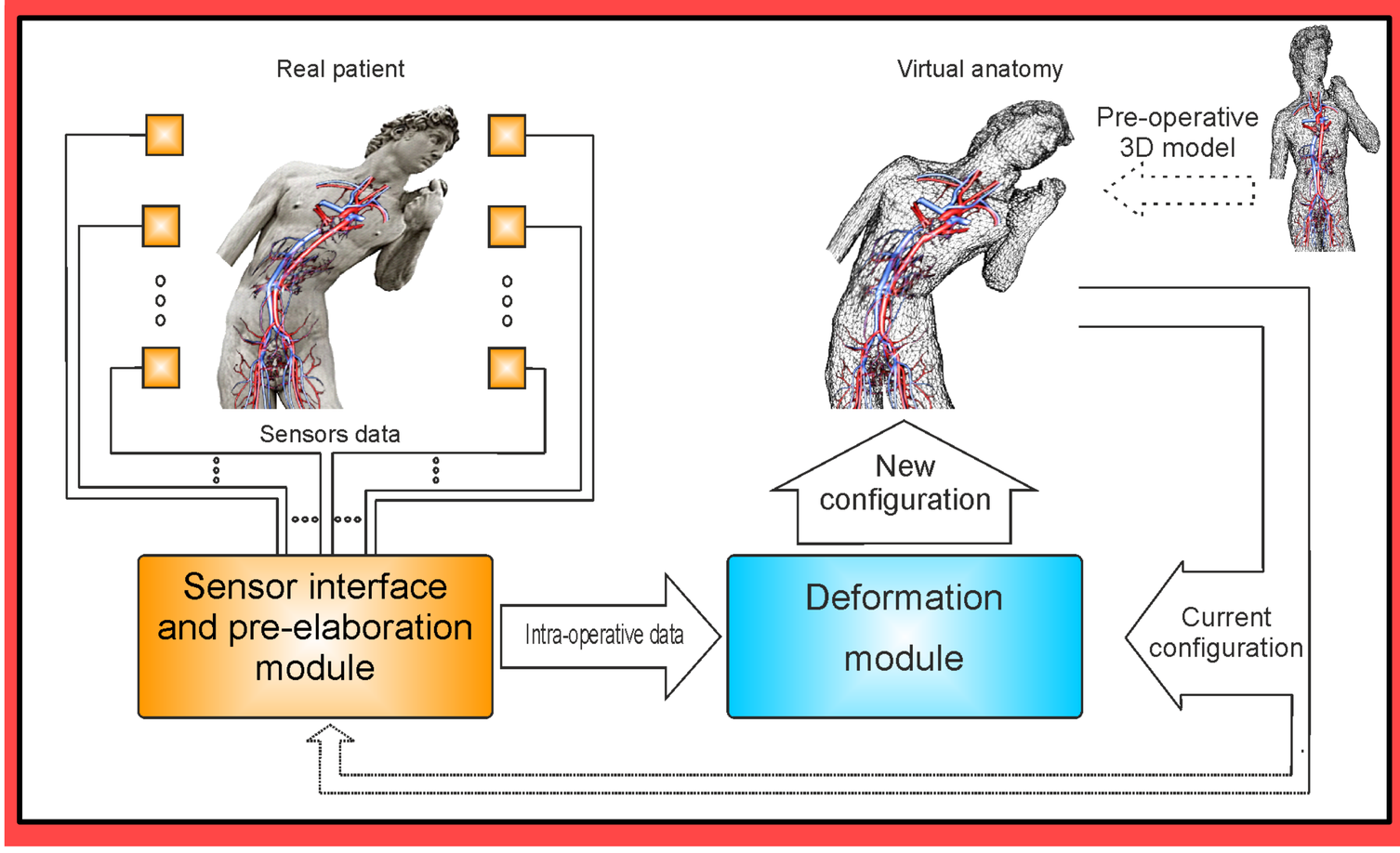
## ENDOVASCULAR NAVIGATORS

To overcome these drawbacks, endovascular navigators have been proposed. They are based on the fusion of real-time 3D localization of sensorized endovascular tools and the 3D model of the vasculature obtained using preoperative angio CT or 3D rotational angiography. Exploiting the real-time localization and tracking of surgical tools, the surgeon can better orientate himself to reach the target site and therefore to complete the procedure in a more efficient way.




## AIM OF THE WORK

The major limitation of these systems is that they are all based upon static images of the anatomy, whereas the intra-abdominal vessels are in constant motion due to organ movement (cardiac cycle, breathing, gastrointestinal contractility among others); even when these movements can be ignored, the interaction between surgical instruments and vessel wall causes motions that cannot be compensated by static models.




**The goal of my work is therefore to overcome the static nature of endovascular navigators, developing a software platform able to integrate several information sources (2D or 3D ultrasound probes, 3D Rotational Angiograph, spirometers, pulsimeters, tracked surgical instruments, and sensors able to acquire patient skin surface information) to determine a motion/deformation model for abdominal vessels whereby it is possible to update the position/shape of preoperative virtual models in real-time during the surgical procedure.**


Università di Pisa

Info: www.endocas.org Contact: simone.parrini@endocas.org Phone: +39 050 995689