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## Smart CATheterization

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### Duration:

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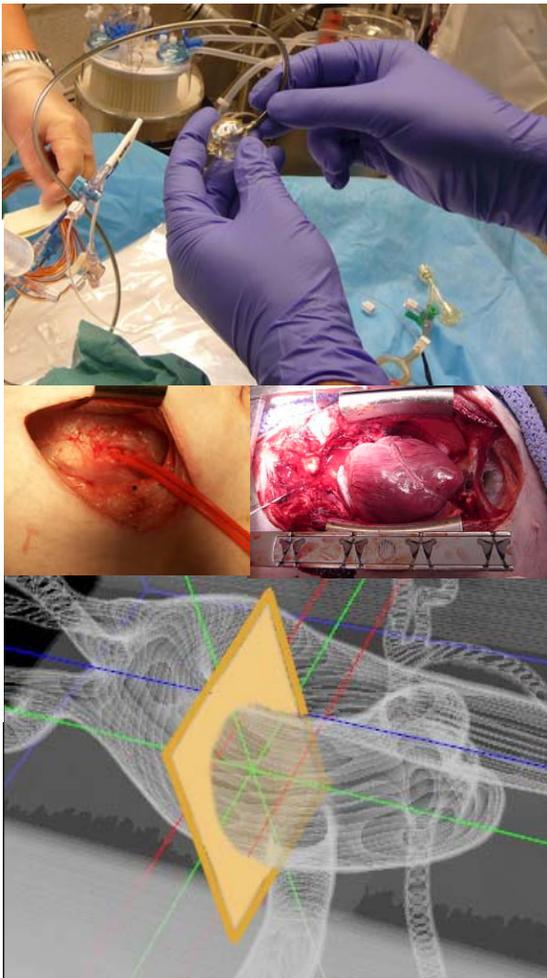
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## Catheterization procedures

**Cardiovascular disease (CVD)** is the **single most common cause of death in the EU**. In February 2008, the yearly European CVD statistics reported that CVD caused over 4.3 million deaths in Europe, which accounted for 42% of all mortality. Because of CVD the European health care system incurs a significant cost (**€192 billion** in 2006). For CVD healing, **minimally invasive surgery (MIS) and catheter-based approaches are the treatment of choice**, leading to reduced pain for the patient and shorter hospitalization.



Experiments on catheter procedures (up and middle) - Aorta's model (down)

## Surgical risks

The **downside** of catheterization procedures lies at the **increased complexity of minimally invasive procedures**, which is mainly caused by the loss of direct access to and sight upon the area of treatment. This can result in:

- blood vessel rupture,
- wrong sizing of selected implantable device,
- incorrect positioning,
- renal failure due to contrast dye,
- tamponade,
- failure of the surgical procedure.

## Research issues & Key innovations

**Improved processing of pre-operative data:**

- automatic **segmentation** of the aorta and the left heart atrial's wall and detection of diseased abnormalities,
- **anatomical model** parameterization for real-time adaptive registration,
- automatic derivation of **mechanical patient-specific models**,
- calculation of mechanical, geometrical and physiological based **safety- indices** to monitor during the surgery.

**Reduced dependency on intra-operative radiation-based imaging modalities** (decreasing radiation to less than 1 Gy):

- navigation **based on pre-operative models**,
- **Simultaneous Localization And Mapping (SLAM)** in the vascular system,
- **real-time anatomical modelling**, based on parameterized anatomical model and real-time adaptability.

**Visualization and control**

- **intuitive visualisation** and interaction with multiscale models, for faster interpretation by the interventionalist,
- manual control **under augmented reality**,
- immersive **teleoperation** control,
- robust and safe **autonomous control**.

## SCATH - Project's goals

The main objective of SCATH is the creation of an **ICT platform** that closes the existing gap between the reality of the catheter inside the cardiovascular system and the manner in which this reality is presented and made accessible to the interventionalist.



Surgeon during experiments

Robotic catheter driver

## SCATH - Foreseen Impact

**Improved patient safety in surgery:**

- **reduced risks** for patient and surgeon due to reduced or zero exposure to ionizing radiation,
- ability to develop **realistic training** tools for surgeons,
- **lower complication ratio** during interventional procedures due to improved patient-specific pre-operative planning,
- **advanced support** to the surgeon during the procedure through monitoring and control.

**Industrial and economical impact:**

- decrease the gap between U.S. and EU in the medical device market,
- **lowering the costs** associated with health care,
- strengthen **SME's as innovation leaders**.