

# **Virtual Reality Based Assistance For Interventional Radiology ( Augmented Reality for Endoluminal Aortic Stent Placement)**

*Wildermuth S, Thonier G, Bruyns C, Montgomery K*

## **PURPOSE:**

Most patients selected for endoluminal aortic stent placements have multiple preoperative examinations. The purpose of this project is to develop and evaluate a virtual reality based assistance system in an interventional radiological environment for the preoperative planning and intraoperative assistance for endoluminal aortic stent placement.

## **MATERIALS AND METHODS**

The current system consists of a see-through, head-mounted computer display (HMD, Sony Glasstron PLM-S700), a tracking system, computer system, and tracked surgical instruments. Interaction with the system is provided through voice input (DragonSystems NaturallySpeaking) and speech synthesis (Microsoft Speech). The hardware/platform independent system uses common off-the-shelf hardware that can be easily modified to use improved head-mounted displays, trackers, and computer systems as they become available. The system produces a computer-generated image overlaid onto the real world, using virtual "hanging windows" for information display (CT/MR scans, real-time fluoroscopy, vital signs, live video (endoscopy etc), step-by-step instructions, dictation/communication screens), 3-D models of anatomy, and other information (for example the different types of implants or stent measurement results) to assist the radiologist during a procedure. In addition, different pre- and post stent 3D models of aortic aneurysm from recent procedures can be brought up within the environment for comparison or as reference. The display system captures live video sources from a framegrabber (FlashBus MV Pro, Integral Technologies) for fluoroscopic or endoscopic video acquisition or all other video sources, and displays this information within the environment. The user can also bring up patient-specific

3D reconstructions. Functionally, the system provides a reasonable and useful platform with fast response and an adequate graphics refresh rate.

### **Results**

This system provides assistance during AAA stent placement. All previous imaging series (CT- MR- and conventional angiography), stent planning data, 3D models of the aneurysm, and monitoring of the vital signs are shown on one screen (head mounted display) in “hanging windows” on request. The software provides a real-time surgical simulation system with integrated monitoring and information retrieval and a voice input/output subsystem.

### **Conclusion**

The system providing all important information on one screen (head mounted display) can be used assist various tasks for stent implantation procedures in the interventional radiological theater.