MEDIATE Patient-friendly medical intervention

The costs of sustaining healthcare for the world’s ageing population are rising constantly and have become a significant component of global GDP. A growing number of patients require complicated surgical interventions, which are more and more replaced by image guided minimally invasive procedures as these have shown to improve patient outcome and reduce costs. The aim of the MEDIATE ITEA 2 project was to improve these minimally invasive procedures by fully integrating all medical imaging sources and therapeutic devices into the interventional workflow including optimised UI’s and decision support.

SMOOTH AND SEAMLESS INTEGRATION
The project focused on minimally invasive procedures for three key medical fields – cardiology, oncology and orthopaedics – according to a pre-programmed workflow procedure, namely medical imaging to aid diagnosis, intervention planning, the intervention itself using image-guided navigation of therapeutic devices (like needles, catheters, artificial heart valves or endoscopic instruments) and finally evaluation and follow up. MEDIATE geared its efforts to developing a system architecture that enables the integration of multi-modal imaging systems, real-time image distribution (local and remote) and therapeutic devices. The platform-independent solutions were based on open, stable standards such as XML Web Services, Dicom and DVI to support multi-vendor interoperability. Image presentation and UI’s were optimised for the specific clinical task and devices were provided with haptic feedback for accurate manipulation.

LARGE AND GROWING MARKET
The diagnostic and interventional medical imaging market is worth almost €20 billion globally, with the USA taking about half and Europe a quarter. The market is growing steadily at an average compound annual growth rate (CAGR) about 4%. For some segments, projected growth rates are even higher. The European market for 3D imaging has a CAGR of 14% from 2004 to 2014, and the global clinical decision support system market almost doubled from €159 million in 2006 to €289 million by 2012.

The consortium combined strengths from a number of European countries and had the benefit of participation by major companies in the medical equipment industry, SMEs that focused on one particular equipment area and research institutes specialised in the design, implementation and deployment of service-oriented IT systems. The consortium also included leading academic hospitals with expertise in deploying innovative technology for the benefit of their patients and society at large. Members of the consortium were already active in several medical-imaging software segments, such as 3D medical imaging software, clinical decision support systems, navigation software and user interfaces.

REAPING THE RESULTS
The technical innovations that emerged during the course of the project have been shown in demonstrators for all three clinical domains. A nice example is the demo from a collaboration of 7 partners at the Final review of the completely aligned view of pre- and intra-interventional images from several sources for treatment of an obstruction in a cardiac artery: see picture below. It also included other aspects like real time remote image distribution and adaptive screen lay out.

Among the results being exploited in a range of healthcare IT products are:

- High-speed, high-resolution image-acquisition and processing technologies;
- Multi-modality registration and motion compensation algorithms;
- Decision-navigation-support, image analysis and reconstruction software tools;
- User-interaction models; and
- Enhanced surgical tools.

Project website: http://mediate-project.com/
Project Results

Multi-Modal Coronary Lesion Evaluation: CTA, X-Ray And OCT

Phillips, the leading player in the MEDIATE consortium, is expected to release new features in 2014 on motion compensation and metal artefact correction as well as enter the Image Guided Intervention and Therapy solutions market. This strategy and these improvements are likely to add a significant sales volume over the next five years. Another key consortium member, Barco, has more than 250 installations of its image distribution solution Nexxis to its name and some 30 people working on Nexxis. Other beneficiaries of the project results are Nucletron, with its integrated and real time Brachytherapy treatment system, and the Surgiqual Institute, which integrated a Web SDK into a set of collaborative clinical applications and whose work in MEDIATE will contribute to half its revenue by 2016.

In respect of dissemination, there have been more than 30 scientific publications and over 50 presentations at scientific and commercial conferences. In addition, ten patents have been filed and at least ten more are in the preparation phase. The project has also made important contributions to standards such as Dicom and IEC60601-2-33.

A FUTURE OF OPPORTUNITY

The future healthcare challenges being faced by society create, of course, opportunities for the kinds of innovations being generated in projects like MEDIATE, and they are not restricted only to the healthcare imaging market. Some of the techniques that have been developed in MEDIATE can be used in other domains like traffic and microscopy. Interestingly, with a mechatronics company involved in the healthcare field, using its specific expertise to develop a robotics application for precise needle placement, it is clear that there is plenty of opportunity for exploitation from other domains and in other markets.

Major project outcomes

**DISSEMINATION**
- 30 publications in leading journals like IEEE Transactions on Medical Imaging, Medical Image Analysis and Internat. Journal of Cardiovascular Imaging.
- 50 presentations at conferences, such as RSNA, Medica, SPIE Medical Imaging, MICCAI and The International Society for Magnetic Resonance in Medicine.

**EXPLOITATION (SO FAR)**
- new products: new reconstruction software for the X-ray tomography market, image grabber and compositor for integrated display of multiple sources on a single screen, new release of brachytherapy afterloader platform
- new services: a web based collaborative clinical decision tool
- new systems: image distribution solution for the Operating Room, MR system with new coil/receiver concepts

**STANDARDISATION**
- contributions to standardisation bodies: IEC60601-2-33 on MR imaging with MR conditional implants and devices, DICOM WG 24 on surgical planning and navigation and the Internat. WG for intravascular OCT Standardization and Validation

**PATENTS**
- 10 patent applications filed, a.o. on image registration, an integrated hybrid imaging system and a needle positioning device.
- 10 patent application in preparation