Tom Dowrick
UCL Tech Social
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- What is WEISS?
- Software development at WEISS
- Projects
  - Augmented Reality for Davinci Robotic Surgery System
  - GUI development for specific surgical applications
  - Surgical Navigation with Python (SNAPPY)

The WEISS Centre

The WEISS centre brings together world-leading scientific, clinical and translation research expertise with strong industry and NHS engagement, to bring new surgical technologies into the clinic.

“WEISS provides an exciting opportunity to advance innovative biomedical engineering research at UCL and to deliver effective interventions that will have real patient benefit. The cutting-edge interdisciplinary facilities at Charles Bell House allow us to work alongside colleagues in surgery and radiology to accelerate our impact.“

Professor David Hawkes, Director of WEISS

The WEISS Centre

Eight research platforms:

- Surgical and Interventional Robotic Assistants (SIERRA)
- All Optical Ultrasound
- Endoscopic Imaging and Vision (EndoVI)
- Miniature Sensors and Nanoengineered Coatings
- Photoacoustic Imaging Instrumentation
- Simulation Platform for the dEvElopment of new surgical Devices and Optimisation of Personalised Clinical Procedures (SPEEDOP)
- Advanced Ultrasound Imaging Modes for Interventional Applications (ADVUSIMIA)
- Surgical Navigation Platform with Python (SNAPPY)

The WEISS Centre

Strong links with:

- Department of Medical Physics
- Institute of Healthcare Engineering
- Centre for Medical Image Computing (CMIC)
- NHS hospitals (UCLH, Queen's Square, Great Ormond Street etc.)

UCL Institute of Healthcare Engineering

UCL EPSRC CDT in Medical Imaging

cmic Centre for Medical Image Computing

Software Development at WEISS

High quality software is essential for clinical deployment of new technologies.

Software must:

a)Work safely & efficiently

b)Be easy to use within a surgical setting, with minimal disruption to existing clinical workflows

c)Handle patient data securely and confidentially

d)Work well for final clinical deployment, but also during initial pilot studies.

Some software developed to push new technologies out to researchers, other in response to a clinical need.

Software Development at WEISS

2-3 people working as software developers, with 5-10 more contributing as part of their research. Sysadmin due to start soon(ish), assisting with some of the centre's infrastructure.

- GitLab servers for version control, testing, CI, documentation etc.
- Template projects provided in C++ and Python (cookiecutter).
- Hardware & software specifications for deployment in Operating Theatres (e.g. High performance workstation, laptop)

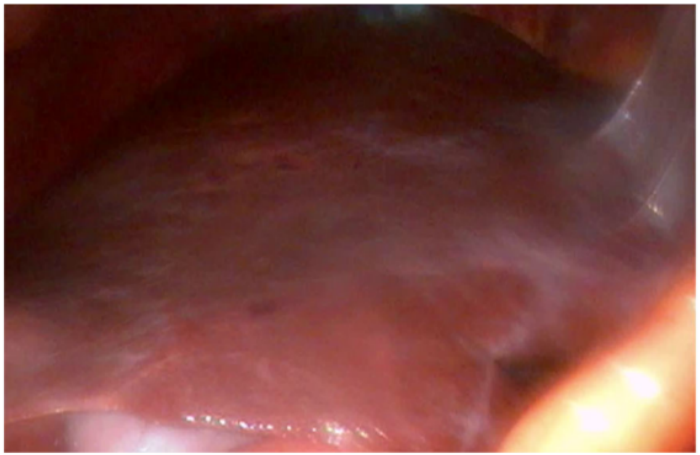
Surgical Augmented Reality

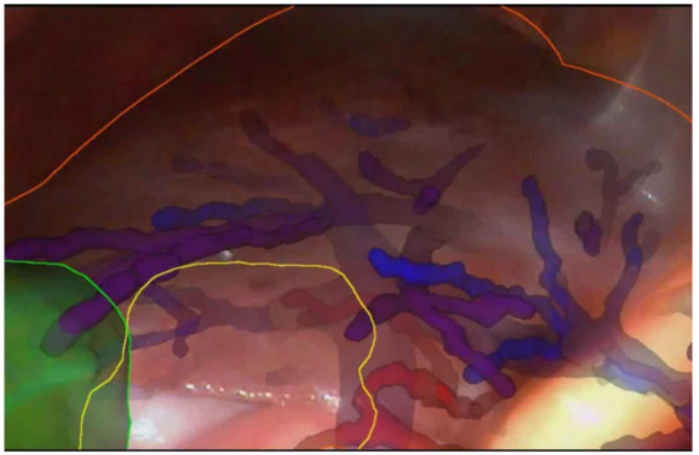
Minimally invasive surgery has major benefits for patients in terms of recovery time, lower risk of complications, and reduced scarring.

At the same time, there is a greater challenge for the surgical team due to a lack of mobility and visibility within the body, which limits the range of procedures for which it is a viable approach.

By overlaying relevant pre clinical data directly onto the laparoscope feed, more information is provided to the surgeon, allowing for better decision making.

Surgical Augmented Reality





In vivo estimation of target registration errors during augmented reality laparoscopic surgery, Steve Thompson et al, 2018

Surgical Augmented Reality

We wanted to be able to deploy this technology easily on different hardware within the centre, including the DaVinci Surgical Robot.

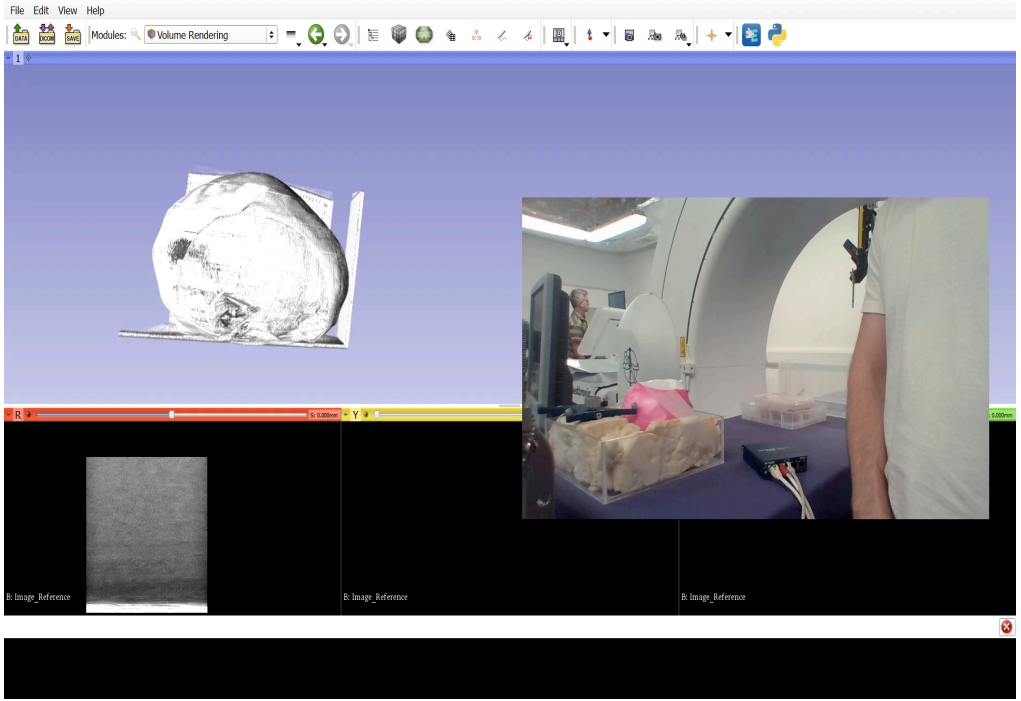
The video streams from the DaVinci can be passed through a PC, where they are modified and sent back to the viewing console.

Surgical Augmented Reality

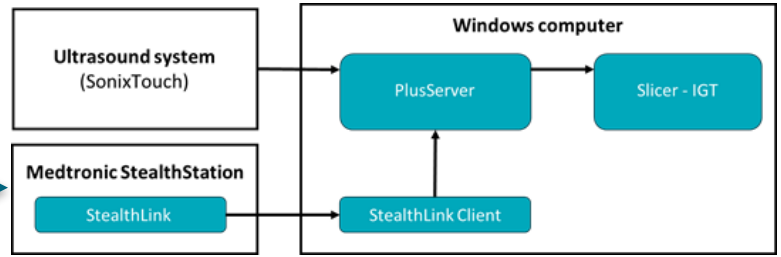
We have begun development on a python implementation – ***ardavin:***

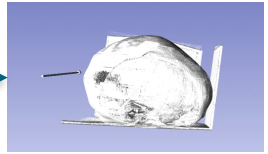
- OpenCV, VTK, qt (PySide2)
- 3D overlay on stereo video.
- Touch screen controls for model adjustment (good for OR).
- Support for automatic tool tracking.

GUI for Skull Navigation Project



GUI for Skull Navigation Project





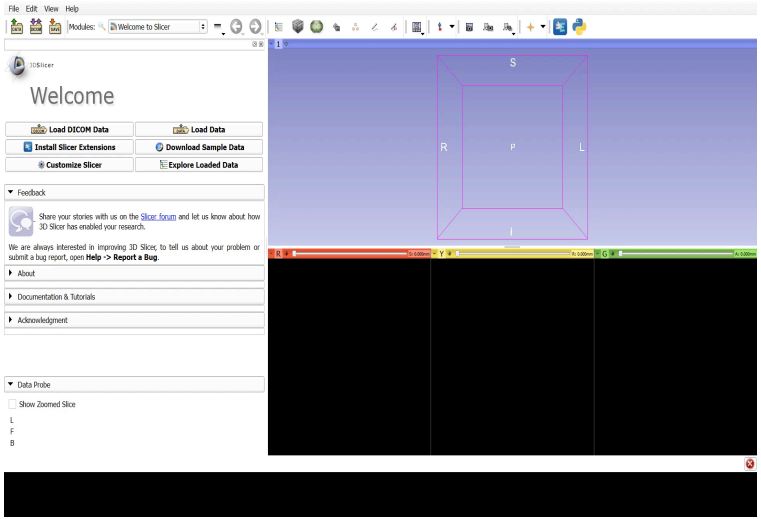
GUI for Skull Navigation Project

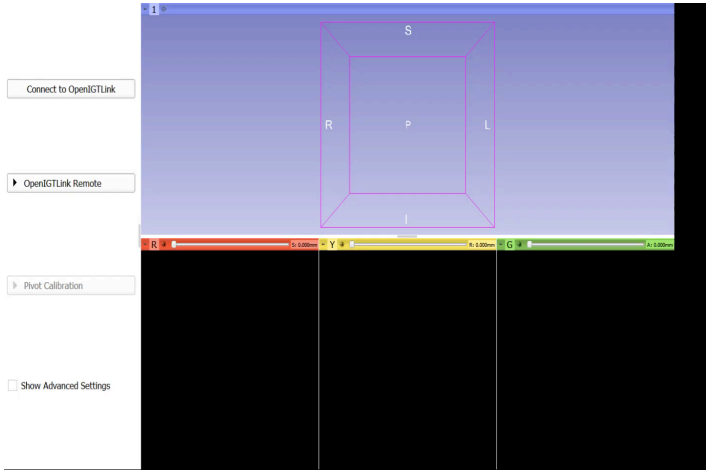
Cumbersome software configuration, combining 2 pieces of open source (PLUS, SLICER) with proprietary software (StealthLink).

Two mains aims:
•Reimplement the Slicer GUI to provide an interface more suitable for the Operating Room.
•Automate as much of the software configuration as possible.

Project ongoing with UCL RSDG.

GUI for Skull Navigation Project





Surgical Navigation Platform in Python (SNAPPY)

Several tools already exist for medical imaging (Slicer, PLUS, NifTK, MITK, IBIS, cisst……)

Most are large frameworks in C++, which can be difficult for researchers to work with and extend.

The aim of SNAPPY is develop a series of high quality Python modules which provide the required functionality, but which can also be easily adopted by researchers into new workflows.