

**BSc in Reproductive & Developmental Sciences &
BSc in Surgery and Anaesthesia Project Outline 2011-2012**

Project Title: Assessment of endovascular manipulative skills through hand and instrument tracking

Academic Supervisor: Dr Fernando Bello & Mr Colin Bicknell

Division: Surgery

Section: Surgical Technology

Co-supervisor: Dr Celia Riga and Mr Przemyslaw Korzeniowski

Who will be responsible for day-to-day supervision? Dr Fernando Bello will be responsible, aided by Dr Celia Riga and Mr Przemyslaw Korzeniowski

Contact Details of Person whom Medical Student should contact for further details:

Name: Dr Fernando Bello

Email: F.Bello@imperial.ac.uk

Tel: 0203 312 1788

Group's Research Interest: The Robotics and Imaging Research Group aims to address fundamental research issues related to the future development of minimally invasive surgery and promote a synergy in the areas of Surgical Technology, Medical Image Computing, Biomedical Engineering, Robotics, Man-Machine Interfacing, Virtual Reality and Bio-Medical Simulation. Our research can be subdivided into the following major topics: Image Guided Intervention and Robotic Surgery; Video Based Tracking, Modelling and Rendering; Bio-mechanical Modelling and Simulation; Visualisation and Augmented Reality; Implantable and Wearable Sensing.

(Double click the appropriate check box to indicate your choices below)

Is this a clinical **or laboratory** **project?**

Suitable project for:

Reproductive and Development Sciences
Surgery and Anaesthesia

Yes No
Yes No

Synopsis of project (background/research question/methods to be used/relevant key references):

Background to Project:

Endovascular interventions with guidewires and catheters are used routinely in vascular surgery. Yet, apart from operative outcome, there is no generally accepted way of assessing the manipulative skill of the operating surgeon. We propose to use tracking technology to follow hand movement, as well as the distal and proximal ends of the instruments during the intervention as an assessment methodology. Hand motion analysis has been successfully used by our group to assess performance in both laparoscopic and open surgical tasks, in the laboratory and in the operating theatre.

Commercially available electromagnetic tracking systems (Aurora, Patriot) will be used to capture the full pose of the hands of the surgeon, as well as movement of the tip and proximal end of the instruments. At first, only a catheter will be tracked by the system while inserted in a vascular phantom. Video recording will be used to validate the tracking systems. By analysing movement and manipulative patterns, as well as the relationship between hand and instrument tip position, we expect to be able to discriminate between experts and novices, and define a new set of metrics that will objectively measure manipulative skill in endovascular interventions. The resulting performance metrics and improved understanding of how guidewires and catheters are successfully manipulated by experts, will be feed into the ongoing development of endovascular VR simulators.

Hypothesis Student will Investigate:

- That it is feasible to use off-the-shelf electromagnetic tracking technology to capture the full pose of the hands of the surgeon, as well as movement of the catheter, during an endovascular intervention using vascular phantoms
- That the resulting hand and instrument motion data can be used to study manipulative patterns and as an objective measure of performance able to discriminate between experts and novices

Methods/Techniques Student will use:

After familiarising her/himself with vascular surgery and the relevant anatomy, the student will work with project collaborators to set up the magnetic trackers for hand and instrument acquisition. S/he will then use the system in a silicon rubber vascular phantom to define the best set up for the experiment. A pilot with a small number of participants will be conducted to test the set up and gain an insight into data interpretation. This will be followed by a study covering participants with a range of expertise to help establish possible performance metrics. Time permitting, tracking the instrument distal and proximal ends will be conducted in the vascular phantom and data will be integrated in our virtual simulator to improve its behaviour.

Will the research involve work done under the Animals (Scientific Procedures) 1986 Act? Yes No

If YES,

Will the student be required to undergo Home Office training? Yes No

Are the appropriate project and personal licences in place? Yes No

Project licence:

Licensee
Date of issue
Number

Personal licence:

Licensee
Number

Will the research involve the use of genetically modified tissue? Yes No

If YES

Has the work been approved by the relevant GM Committee Yes No

Date approval was granted

Reference Number

Will the project involve work on human subjects, human tissue or access to confidential patient information? Yes No

If YES

has ethical approval been obtained Yes No

Date approval was granted

Reference number

Note: Approval for any of the above MUST be in place before the student begins the project.

A risk assessment form will be required.

Project Payment: I have an F account Yes No

If you have an F account please give full account code: DSBT-F36651