



Surgical Robot Challenge 2016



Introduction

Welcome to Surgical Robot Challenge 2016. This promises to be a compelling contest between some of the leading surgical robotics groups from around the world. With the support of *Intuitive Surgical*, *KUKA* and *Applied Dexterity*, this competition aims to showcase innovative new ideas in surgical robotics across a range of surgical robot platforms. Thank you for participating.

Competition Format

The competition consists of 2 rounds. The first round involves submitting a 2-minute video of your surgical robotic technology. Entries that get through this round will be invited to the competition finals that will be held in London on Thursday 23rd, Friday 24th and Saturday 25th June 2016. Finalists will present their entry to a judging panel on Saturday 25th June. Winners will be announced at the Hamlyn Symposium Awards Ceremony on Monday 27th June.

Prizes

There is a total prize fund of 10,000 GBP consisting of multiple cash prizes and tickets to the Hamlyn Symposium 2017. The winners will be decided by an independent judging panel. All teams attending the finals will be competing for the main prizes. Teams that are unable to attend the finals will only be able to compete in the best video category.

Steering Committee

Guang-Zhong Yang, Imperial College London, UK (Chair)
Russ Taylor, Johns Hopkins University, USA
Blake Hannaford, University of Washington, USA
Simon DiMaio, Intuitive Surgical Inc, USA
Cyrill von Tiesenhausen, KUKA Robotics, Germany

Contact

Robert Merrifield (Competition Organiser), Imperial College London, UK
surgicalrobotchallenge@roboticsweek.uk

Deliverables

There are 5 deliverables for the Surgical Robot Challenge 2016:

1 Complete 1-Page Application Form

Deadline 09:00 GMT Tuesday 01 March 2016

To register your interest in taking part in the challenge, please submit the application form attached to this document by 01 March 2016.



1-page application form

2 First-Draft 2-Minute Preview Video

Deadline 09:00 BST Friday 01 April 2016

For the first round, you need to submit a 2-minute video of your surgical robotic technology. This video should introduce the motivation for your work, propose your technology, provide a demonstration of your technology in action and present its potential impact. The video should be in 16:9 1080p format. The video can be silent or have a spoken soundtrack. The first draft version will be used to decide which entries get through to the competition finals. Shortly after the submission deadline, the competition organisers will inform you whether your entry is shortlisted for the competition finals in London.

To submit, please send a link to your first draft video to surgicalrobotchallenge@roboticsweek.uk by 09:00 BST Friday 01 April 2016.



first-draft 2-minute preview video

3 Final 2-Minute Preview Video, Slideshow and 2-Page Paper

Deadline 09:00 BST Wednesday 01 June 2016

If you get through to the finals, you will have the opportunity to further improve your 2-minute preview video that will be shown in front of the judging panel. Please ensure all content is copyright-free as the video will be made available on the Surgical Robot Challenge website and social media sites.

In addition to the video, please send your final slideshow that you will show to the judging panel as a powerpoint file, keynote or pdf presentation. The slideshow should consist of 7 slides and take 7 minutes to present.

Also, please fill in the 2-page paper template attached to this document detailing your work.

Please send a link to your final video, your slideshow and your paper to surgicalrobotchallenge@roboticsweek.uk by 09:00 BST Wednesday 01 June 2016.



final 2-minute preview video



7-slide slideshow



2-page paper

4 Filmed Demonstration in London

Thursday 23, Friday 24 or Saturday 25 June 2016

You will be given a 3-hour slot during which a 1-minute video of your technology in action will be filmed. This film will be recorded and edited by a videographer and will be shown in front of the judging panel in addition to your 2-minute preview video. The judging panel will also visit your 3-hour setup period to observe your team in action and they may ask detailed technical questions.



1-minute demo video

5 12-Minute Presentation in London

Saturday 25 June 2016

You will have a total of 12 minutes to impress the judging panel. First of all, your 2-minute preview video will be shown. You should then give your 7-minute presentation. The 1-minute demo video will then be shown. There will be 2 minutes of questions.

12 minutes



Play final 2-minute preview video



Live 7-minute slideshow



Play 1-minute demo video



2-minute questions

Locations

There are 2 locations for the Surgical Robot Challenge:



Location of Surgical Robot Challenge Setup and Demonstrations

Event and Delivery Address:

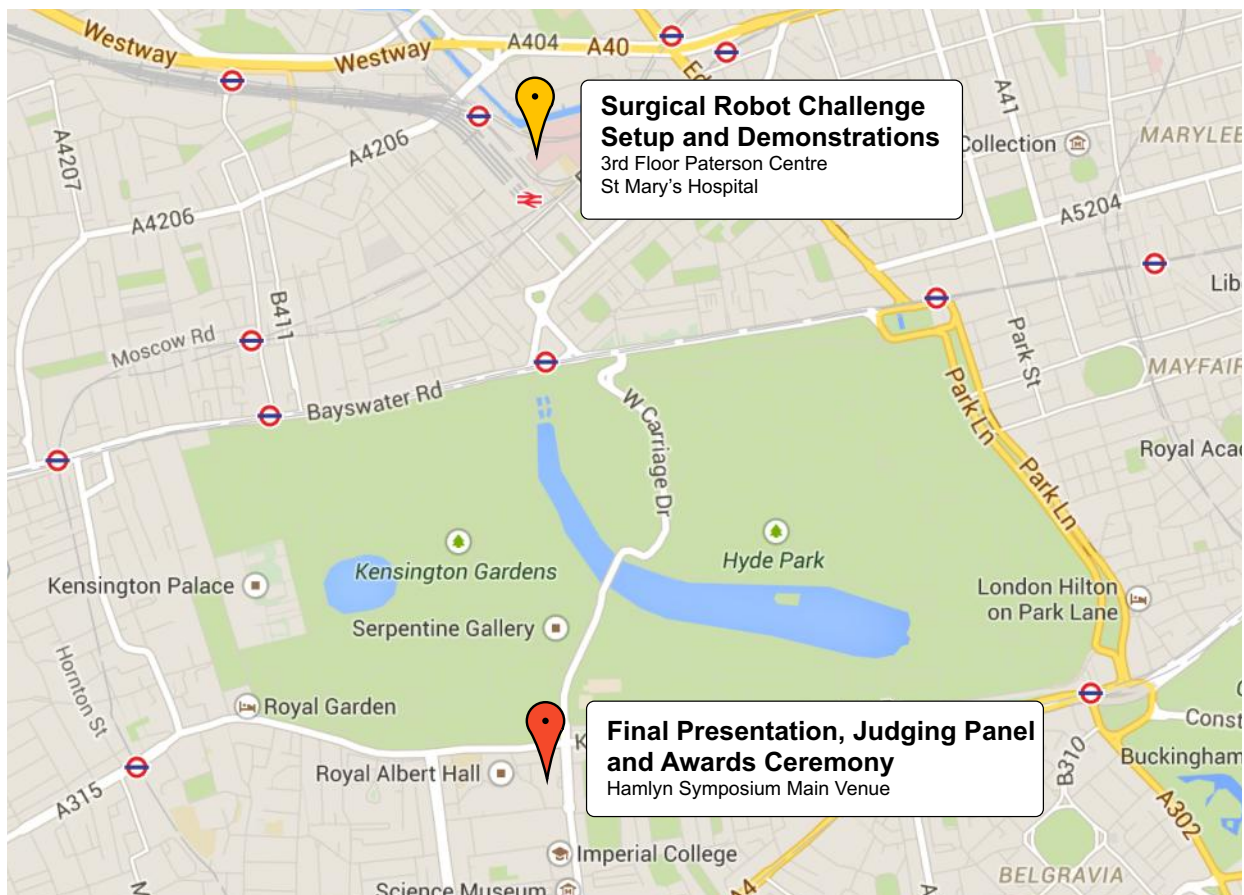
*The Hamlyn Centre
Imperial College London
3rd Floor, Paterson Building
South Wharf Road
London W2 1NY*

Deliveries should be addressed to: Dr Robert Merrifield (+44(0)7885 906770)



Location of Final Presentation, Judging Panel and Awards Ceremony

Main Hamlyn Symposium Venue, South Kensington, UK



Equipment

A dVRK system, KUKA or RAVEN II system can be provided for your demo. You will need to bring all other hardware and software that you require.

Custom Platforms

Entries are not limited to using dVRK, KUKA or RAVEN systems. You are free to base your demo on any surgical robotic platform including your own proprietary platforms.

Additional Equipment

You will need to cover the costs of transporting your team and equipment to and from the demo and cover accommodation costs. Lunches and tea/coffee will be provided.

Setting up your Equipment

In the 2 weeks before the finals, you will have the ability to set up your demo remotely with the help of a technical support team. This can involve checking software runs correctly on the dVRK, KUKA or RAVEN II system. Your demo should be made to be plug-and-play so that you are able to set-up, film a 1-minute demo and dismantle your setup in the 3-hour slot allocated to you.

RAVEN II Specification

The Raven platform provided is the standard, 2-arm Raven II system with the latest stable software release (1dc776f07a) from the UW Raven II github.

<https://github.com/uw-biorobotics/raven2>

Standard Raven II tools are provided. Teams wishing to use the daVinci adapter must bring their own adapter and tools.

The standard Intel Atom PC runs the robot. Control software can be modified by participants. In addition, a Windows PC is provided with the Raven II master software and two Geomagic Touch (ethernet, formerly Phantom Omni) devices. A Kinesis Elite Savant 3-button foot switch is attached.

Microsoft LifeCam HD is provided.

ROS Diamondback runs on the Raven PC. Other ROS versions can be interfaced via ROS messages.

KUKA Specification

Hardware

The following KUKA arms will be made available:

- 2 KUKA LWR 4+ arm/controller pairs;
- 1 KUKA iiwa 7 kg arm with its controller;
- 1 KUKA iiwa 14 kg arm with its controller.

All KUKA robots will be provided mounted on an optical table. Only the hardware listed above will be provided. Participants will be responsible for bringing all other hardware they require, including a computer to upload a program to the controller via the Sunrise Workbench (iiwa only), or to communicate with it via the connectivity package or the Fast Research Interface (FRI). Participants should bring any connectors/adaptors they need. The standard KUKA end effectors available are shown below.



KUKA iiwa



KUKA LWR 4+

Software

KUKA LWR 4+

The KUKA LWR 4+ models are equipped with the Fast Research Interface (FRI). This FRI has been tested and is expected to work with the FRI API from Andreas Stemmer (v1.17 by DLR) and Guenter Schreiber. Other APIs should be checked beforehand.

Participants must bring their own KRC files.

KUKA iiwa

Both KUKA iiwa can run applications using the standard Sunrise Workbench to either upload the program on the controller, or run it from a remote device using the connectivity package. Linux support is possible via Eclipse plug-ins.

The KUKA iiwa are also equipped with the new FRI (KUKA Sunrise Connectivity FRI 1.5). It is not compatible with the FRI of the previous models (LWR 4+), and only allows joint control.

dVRK Specification

Hardware

- Linux PC (connecting to DVRK boxes):
 - Processor - Intel® Core™ i7-3770 Processor at 3.40 GHz
 - RAM - 16 GB
 - Hard Drive - 1TB
 - Operating System - Ubuntu 14.04 (Trusty)
- DVRK Controllers:
 - Two PSMs: PSM1 and PSM2
 - Two MTMs: MTML and MTMR
 - One ECM
- Full Da Vinci system:
 - with setup joints (not supported by DVRK)
- Windows PC (connecting to stereo endoscope):
 - Intel® Core™ i7 CPU @ 3.20 GHz (4 logical CPUs)
 - RAM 6GB
 - 100GB solid state drive, 1TB data drive
 - NVIDIA Quadro SDI digital video pipeline (Driver version: 335.23)
 1. SDI Input card
 2. Quadro 5000 GPU (5371 MB memory)
 3. SDI Output card

Stereo HD-SDI SMPTE259 PAL 50i (720x576) feed from da Vinci stack (with optional black burst genlock signal)

Available surgical tools: Large Needle driver and Cardiare Forceps (more tools may be supported based on requirement)


Software

- Cisst-saw library version: <http://github.com/jhu-cisst/cisst-saw.git> master branch
SHA: 80bd740c5bc904ca737acaf533ac13c7999bae78
- `ciisst-ros`: <https://github.com/jhu-cisst/cisst-ros> master branch
SHA: 3f5789ea6774974b9833ddfd7f63c029eba4de26
- `dvrk-ros`: <https://github.com/jhu-dvrk/dvrk-ros.git> master branch
SHA: 3f5789ea6774974b9833ddfd7f63c029eba4de26
- ROS Indigo Igloo: <http://wiki.ros.org/indigo>
- Qt 5.3


Surgical Robot Challenge 2016

Competition Timeline

Step 1 Discuss your planned entry with the Competition Organiser (surgicalrobotchallenge@roboticsweek.uk)
Finalise the scope of your planned demo and hardware/software requirements.
Complete the 1-page application form.
Deadline 09:00 GMT Tuesday 01 March 2016




 1-page application form

Step 2 Submit your first-draft 2-minute movie of your surgical robot technology.
This would ideally be a video that introduces the motivation and technology, demonstrates the technology in action and discusses its potential impact.
Deadline 09:00 BST Friday 01 April 2016


 first draft 2-minute preview video

Announcement of finalists
Monday 11 April 2016

Step 3 **Deadline 09:00 BST Wednesday 01 June 2016**
Submit your final 2-minute movie of your surgical robot technology, your slideshow and your 2-page paper.

 final 2-minute preview video
  7-slide slideshow
  2-page paper

The Finals

 record 1-minute live video




	Thursday 23 June 2016	Friday 24 June 2016	Saturday 25 June 2016
8am	dVRK1	KUKA1	RAVEN1
9am			
10am			
11am	dVRK2	KUKA2	RAVEN2
12pm			
1pm			
2pm	dVRK3	KUKA3	RAVEN3
3pm			
4pm			

Your team will be given a maximum of 3 hours to set up your demo. The judges will visit each team informally during your set up with technical questions. You can rehearse the demo as many time as you wish, but your final 1-minute recorded demonstration will be used as a key element of the formal presentation to the judging panel. In the weeks leading to the competition, the organisers will provide all the technical support details to teams involved.


Timings subject to change


The winners will be announced at the Hamlyn Symposium Prize Ceremony on Monday 27 June 2016


Videos of the winning entries will be shown at the prize ceremony.


 3 minutes
  Play 2-minute preview video
  Play 1-minute live video

Format of presentation for judging panel

 Play final 2-minute preview video

 Live 7-minute slideshow

 Play 1-minute demo video

 2-minute questions

Finalists will get a 12-minute slot to present their entry to the judging panel. This will consist of your 2-minute preview video, a 7-minute talk, your 1-minute demo video recorded during the finals and 2 minutes of questions.

Surgical Robot Challenge 2016



CALL FOR PARTICIPATION

Surgical Robot Challenge 2016 is an international competition that will showcase the latest innovations in Surgical Robotics.

The challenge involves bringing your surgical robot innovation to London in June 2016 and demonstrating it to pioneers and leaders of the field. The competition follows on from a highly successful competition in 2015 that saw 20 research teams from around the world demonstrating their surgical robot innovations. We are now looking for participants for the 2016 competition. Your innovation can be in any area of surgical robotics including surgical planning, vision, navigation, mechatronics, ergonomics, surgeon-robot interfaces and automation.

How to enter:

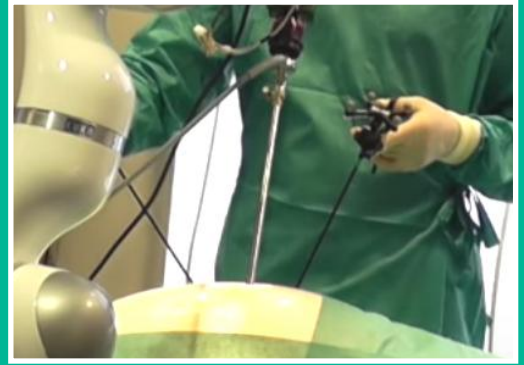
Please email the attached application form to:

SurgicalRobotChallenge@RoboticsWeek.uk

Deadline: Tuesday 01 March 2016

10,000 GBP to be won

Prizes include cash prizes and complimentary registration for Hamlyn Symposium 2017



Dates and Location

Surgical Robot Challenge 2016 will be held during the Hamlyn Symposium in London, UK on 20 - 28 June 2016

Supported by:

Intuitive Surgical, KUKA and Applied Dexterity

Steering Committee

Guang-Zhong Yang, Imperial College London, UK (Chair)
Russ Taylor, Johns Hopkins University, USA
Blake Hannaford, University of Washington, USA
Simon DiMaio, Intuitive Surgical Inc, USA
Cyrill von Tiesenhausen, Kuka Robotics, Germany

www.RoboticsWeek.uk/SurgicalRobotChallenge.htm

Surgical Robot Challenge 2016

Applicant Name

Contact Email

Undergraduate Master's Student PhD Student Post Doc

Other (please specify)

Research Group

Institution

Team Members
(names, institutions)

Tentative Project Title

Project Description

Platforms to be used dVRK RAVEN II KUKA
 Other (please specify)

Will you be bringing your own hardware? Yes No

What additional hardware/software will you require?

Please send your completed form to:
SurgicalRobotChallenge@RoboticsWeek.uk
by 01 March 2016

www.roboticsweek.uk/surgicalrobotchallenge.htm





Project Title

Authors

Institutions

Abstract

Introduction

Methods

Results

Discussion

References

Figures

Email

I confirm that copyright for this paper and competition videos is being transferred to the organisers of Surgical Robot Challenge 2016.

Name

Signature

Date