SELF REPAIRING CITIES

ROBOTIC CHALLENGE 2020
ROBOTS FOR RESILIENT INFRASTRUCTURE

23 - 24 June 2020, Weetwood Hall Estate, Leeds, UK

Submission guidelines

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Contents

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Submission guidelines for robotic challenge entries

Please read the following guidelines before submitting an entry to the robotic challenge.

Outline of the robotic challenge

The event seeks to showcase cutting-edge robots and autonomous systems to create, inspect, repair and maintain our critical infrastructure. The main challenge themes are outlined below.

Successful entries will be invited to demonstrate their robotic system at the Robotic Challenge 2020 event on 23-24 June 2020 in Leeds. As outdoor demonstrations may be affected by weather, robotic challenge teams will be requested to attend the full two day event, to allow the schedule to remain flexible depending on weather conditions.

Challenge teams will be given 15 minutes at the Robotic Challenge 2020 event to demonstrate their robotic system. They will also receive a 7 minute talk slot to introduce their system prior to the demonstration.

It is expected that entries will be physically demonstrated at the event, however, where this not appropriate or possible then entries are permitted as short videos. Video-only entries will be limited to 3 minutes.

Prizes

Demonstrations will be judged by a panel of leading academics and industrialists. Cash prizes totalling £5,000 are offered, generously supported by sponsorship from Anglian Water and Highways England. They will be awarded in the following categories:

- Best technical innovation. £1,500 first prize, £600 runner-up
- Greatest potential for impact. £1,500 first prize, £600 runner-up
- Best video. £500 first prize, £300 runner-up

Challenge themes

The event aims to bring together robotic and autonomous systems with the potential to address the challenges facing future infrastructure. These may fall under, but are not limited to, the following technological challenges:

i) **Perceive and patch:** Vehicles for autonomous inspection, diagnostics, repair and prevention of defects (e.g. potholes).

ii) **Perch and repair:** Remote inspection and maintenance of structures at height (e.g. bridge inspection).

iii) **Plunge and protect:** Autonomous robots with the ability to perform underwater or underground infrastructure inspection repair, and preventive defect maintenance.

iv) **Fire and forget:** Robots designed to operate indefinitely performing inspection, repair, metering and reporting tasks (e.g. robotics operating in live water mains).

v) **Construct and confirm:** Coordination of robot teams to build/print, finish and certify infrastructure from CAD models, using environmentally friendly building materials.

vi) **Dismantle and dispose:** Advanced manipulation in extreme environments to manipulate, cut, separate and unfasten structures (e.g. infrastructure de-commissioning such as nuclear or wind).

vii) **Data and Decisions**: Create, process and interpret data securely for effective, verifiable and trustworthy operation of robots (e.g. robots to remotely augment building information models).

Submission process

The competition is free to enter and we encourage entries from around the world. Challenge competitors will receive free meeting registration and accommodation.

The challenge will operate as a two stage process:

I. **Pre-selection**:

    a. ***Deadline extended*** Expressions of interest requested by 7 February 2020. Entries assessed on technical innovation, potential for impact, and alignment to infrastructure challenges.

    b. Applicants who fulfil the initial assessment criteria will be invited to submit a short preview video of their robotic system in action by 15 March. Entries will be further assessed on technical innovation, potential for impact, alignment to infrastructure challenges, and quality and feasibility of proposed demonstration.

II. **Demonstration**: Successful entries will be invited to demonstrate their robotic system at Robotic Challenge 2020 (23-24 June). The judging panel will announce the challenge winners at the end.

Key dates

Date	Activity	Description
Deadline extended to 7 February 2020	Expression of interest due.	Please submit your expression of interest via the Robotic Challenge 2020 EasyChair. Abstracts from accepted challenge teams will be included in the event programme.
14 February 2020	Teams invited to submit a preview video.	Teams whose submissions fulfil the initial assessment criteria will be invited to submit a preview video up to 3 minutes long.
15 March 2020	Preview video due.	Submission due for 3 minute preview videos.
31 March 2020	Challenge teams notified of selection results.	Challenge teams will be notified if they have been successful.
22 April 2020	Registration of all challenge team members.	Participants will be invited to register for the meeting for free. Registrations should be received no later than 22 April, after which the event organisers reserve the right to charge for registration.
14 June 2020	Final videos for video-only entries due.	Submission for final edited videos for entries into best video category. 3 minutes maximum.
23-24 June 2020	Robotic Challenge 2020.	See the event webpage for up-to-date information including programme information and venue details

Support for demonstrations

Appropriate demonstration environments will be created by the event team and they will ensure, as far as possible, that correct support systems are available to operate your robots. Please contact Juliet Jopson if you have any questions prior to submitting your expression of interest.

Expressions of interest

Deadline extended Please submit expressions of interest by 23.59 hrs on 7 February 2020.

Expressions of interest should be submitted via the [Robotic Challenge 2020 EasyChair](#).

You will be requested to supply the following information.

Team name
Please select a short team name that we can use to identify your entry in correspondence.

Team member details
Please supply details for all team members who, if the submission is successful, will attend the event in order to give the demonstration. All team members listed would be expected to attend the full two-day event. For guidance, teams are anticipated to be no larger than 3 members. Larger teams will be permitted where there is a reasonable justification and event capacity permits, but the event organisers reserve the right to limit teams to 3 free registration places.

If you wish to credit people involved in the development of the technology who will not be attending the event, please list them as an author in the abstract rather than adding them as a team member.

Please supply contact details for each team member, including name, organisation, research group (if applicable), job title, and email. You will be requested to identify a team leader who will be the main contact for the group for organisation matters. A telephone number is also required for the team leader.

Title for your robotic challenge demonstration
Please provide a title for your robotic challenge demonstration. This is how your challenge entry will appear in the programme. Maximum 10 words.

Abstract for robotic challenge demonstration
Please supply a short abstract for your demonstration, up to a maximum of 500 words.

The abstracts should cover:

- Author list – this does not count within the 500 word limit and can include people who are not attending the event but have contributed to development of the technology to be demonstrated. Please include name (first name / surname) and organisation for each author.
- An introduction to the technology and what it does
- The motivation behind it – what problem does it seek to address?
- What is the technical innovation – how does this advance the field of infrastructure robotics?
- What potential for impact does it have – how will it change the way things are done in the future?

Should your entry be successful then this abstract will be included in the event programme.

Short description of the demonstration
Please give a short description (50 words maximum) of what participants could expect to see if you are selected to demonstrate your technology at the event. This will be further assessed if you are invited to submit a preview video.

Keywords
Please supply up to a maximum of 5 keywords

Challenge theme

Please identify which of the event challenge themes your demonstration aligns to. If your demonstration does not align to any of the individual identified themes, please answer 'other' and indicate what other area of infrastructure robotics your demonstration addresses.

Demonstration requirements

Please briefly outline any technical requirement you may have to support your demonstration at the event e.g. do you requires an indoor or exterior space, how much space is required, is your demonstration weather sensitive, will you require any technical equipment to be provided by the event team? This will help assess whether the entry can be supported at the event or would better in the video-only category. Full technical requirements will be gathered from teams once they have been accepted for the challenge.

Preview video

Teams whose submissions fulfil the initial assessment criteria will be invited to submit a preview video up to 3 minutes long.

Please upload your preview videos by 23:59 hrs on 15 March 2020 to the Robotic Challenge 2020 EasyChair.

If preferred, videos can also be shared by uploading onto an open-access video platform such as YouTube or Vimeo, either as public or private video, and the URL submitted to the Robotic Challenge 2020 EasyChair.

Preview videos should be a maximum of 3 minutes long. They should cover the following:

- Introduce the technology and the motivation behind it.
- Indicate how your technology aligns with infrastructure robotic challenges (see challenge themes)
- Give some idea of what your demonstration will show at the event
- Highlight the technical innovation of your technology
- Highlight the potential impact of the technology

Video only-entries

Where it is judged that physically demonstrating the robotic system at the event is not appropriate or possible then entries may be submitted as video only, to be judged in the 'Best Video' category.

Teams will be permitted to update their preview video prior to the challenge event. Final videos should be a maximum of 3 minutes long.

Please submit your final video by 23:59 hrs on 14 June 2020 to Juliet Jopson s.j.jopson@leeds.ac.uk.

The expectation is that all challenge videos will be shared publicly at the event. Challenge teams can either upload their video onto their own open-access video platform, in which case videos should be made public no later than 12:00 hrs on 22 June 2020. Alternatively, the event team can arrange to upload the video to the Self-Repairing Cities YouTube channel.

If there is are substantial reasons why the video cannot be shared publically then it will be possible to restrict the video to only being shown at the event. In this eventuality, the event team would encourage the submission of two versions of the video, a restricted version for the event and also a publically accessible version to be shared more widely.

Submission guidelines for posters and showcase stands

Outline of poster and showcase displays

The event seeks to showcase cutting-edge robots and autonomous systems to create, inspect, repair and maintain our critical infrastructure. To this effect, we invite submissions for poster displays and showcase stands.

Priority will be given to submissions describing research and innovation within the challenge areas outlined below. In addition, priority will be given to showcase stands bringing physical robots (robots can be presented on showcase stands without participating in the challenge demonstrations) or interactive displays.

Selected poster and showcase stand attendees will receive free meeting registration and accommodation. As opportunities to engage with the displays will be spread over the two days of the event, preference will be given to participants who will be able to commit to attending the full event.

Prizes

Posters and showcase stands will be judged by a panel of leading academics and industrialists. Cash prizes have been generously sponsored by Synthotech and will be awarded in the following categories:

- Best poster. £125 first prize, £75 runner-up
- Best showcase stand. £200 first prize, £100 runner-up

Challenge themes

The event aims to bring together robotic and autonomous systems with the potential to address the challenges facing future infrastructure. These may fall under, but are not limited to, the following technological challenges:

i) **Perceive and patch:** Vehicles for autonomous inspection, diagnostics, repair and prevention of defects (e.g. potholes).

ii) **Perch and repair:** Remote inspection and maintenance of structures at height (e.g. bridge inspection).

iii) **Plunge and protect:** Autonomous robots with the ability to perform underwater or underground infrastructure inspection repair, and preventive defect maintenance.

iv) **Fire and forget:** Robots designed to operate indefinitely performing inspection, repair, metering and reporting tasks (e.g. robotics operating in live water mains).

v) **Construct and confirm:** Coordination of robot teams to build/print, finish and certify infrastructure from CAD models, using environmentally friendly building materials.

vi) **Dismantle and dispose:** Advanced manipulation in extreme environments to manipulate, cut, separate and unfasten structures (e.g. infrastructure de-commissioning such as nuclear or wind).

vii) **Data and Decisions**: Create, process and interpret data securely for effective, verifiable and trustworthy operation of robots (e.g. robots to remotely augment building information models).

We will also seek to understand how these technologies will integrate into our lives through the challenge:

viii) **City and society**: Building the case for the use of infrastructure robotics, with particular reference to the environment, society, policy and regulation, and future infrastructure needs.

Poster displays

Posters should be A1 landscape (h 594mm x w 841mm) or A0 portrait (w 841mm x h 1189mm) in size. They should be able to be attached to poster display boards using Velcro or drawing pins.

Showcase stands

For indication, it is anticipated that showcase displays will fit into a 2x2m space, which can be supplied with a table and poster board if required. Reasonable requests to bring additional equipment (e.g. TV monitors) or space will be accommodated where possible.

Submission process

The poster and showcase stands are free and we encourage entries from around the world. One participant per poster and two per showcase stand will receive free meeting registration.

Abstracts for both poster and showcase stands should be submitted by 15 March, with successful entries being notified by 31 March.

Abstracts from successful poster and showcase stands will be published in the event programme, which will be made publicly available on the event webpage.

Key dates

Date	Activity	Description
15 March 2020	Poster and showcase stand submissions due	Please submit an abstracts via the Robotic Challenge 2020 EasyChair. Abstracts from accepted poster and showcase stands will be included in the event programme.
31 March 2020	Confirmation of successful posters and showcase stand entries	Poster and showcase display entries will be notified if they have been successful.
22 April 2020	Registration of participants for poster/ showcase displays.	Participants will be invited to register for the meeting for free. Registrations should be received no later than 22 April, after which the event organisers reserve the right to charge for registration.
23-24 June 2020	Robotic Challenge 2020.	See the event webpage for up-to-date information including programme information and venue details

Poster and showcase stand abstracts

Please submit abstracts for poster and showcase stands by 23.59 hrs on 15 March 2020.

Abstracts should be submitted via the Robotic Challenge 2020 EasyChair.

You will be requested to supply the following information.

Participant details

Please supply details for all participants who, if the submission is successful, will attend the event in order to present the poster / showcase stand. One participant per poster and two per showcase stand will receive free meeting registration as standard. If necessary, it would be permitted for different people to attend on the individual days to ensure that displays are staffed for both days.

If you would like to credit people involved in the research and innovation work who will not be attending the event, please list them as an author in the abstract rather than adding them as a participant.

Please supply contact details for each participant, including name, organisation, research group (if applicable), job title, and email.

Title for your poster / showcase stand

Please provide a title for your poster / showcase stand. This is how your entry will appear in the programme. Maximum 10 words.

Abstract for poster / showcase stand

Please supply a short abstract for your demonstration, to a maximum of 500 words.

The abstracts should cover:

- Author list – this does not count within the 500 word limit and can include people who are not attending the event but have contributed to development of the technology to be demonstrated. Please include name (first name / surname) and organisation for each author.
- Outline of the research and innovation that you will present.

Should your entry be successful then this abstract will be included in the event programme.

Keywords

Please supply up to a maximum of 5 keywords

Challenge theme

Please identify which of the event challenge themes your poster / showcase stand aligns to. If your entry does not align to any of the individual identified themes, please answer 'other' and indicate what other area of infrastructure robotics your poster / showcase stand addresses.

Showcase stand requirements

Please give an indication of what people will see when visiting your showcase stand e.g. interactive elements, robots etc. Please briefly outline any requirement you may have to support your showcase stand at the event.

Any questions

For full up-to-date programme information please see the Robotic Challenge 2020 event webpage.

If you have any questions or wish to discuss your ideas prior to submitting an entry, please feel free to get in touch with the Robotic Challenge 2020 Coordinator - Juliet Jopson, University of Leeds. Email: s.j.jopson@leeds.ac.uk Tel: +44 (0)113 34 32325

For queries regarding submitting entries via the EasyChair facility, please contact the Faculty of Engineering CPD events team. Email: cpd@engineering.leeds.ac.uk Tel: +44 (0)113 343 2494 / 8104

The challenge is supported by the Engineering and Physical Science Research Council (EPSRC) through the Grand Challenge of "Balancing the Impact of City Infrastructure Engineering on Natural Systems using Robots" (Self-Repairing Cities). Self-Repairing Cities is a five year project running from 2016-2021, led by the University of Leeds in partnership with the University of Birmingham, UCL and University of Southampton.