Call for Participation

KUKA Innovation Award 2016

– Flexible Manufacturing Challenge –

Sponsored by KUKA AG

The Award in a nutshell

As a world-leader in robot-based automation KUKA has maintained an intense collaboration with academia and R&D partners worldwide on various scientific and technical topics for many years. To take this collaboration to the next level the

KUKA Innovation Award

was established in 2014. It comes with a substantial **financial prize of 20,000 €**. The competition leading to the Award is intended to **accelerate the pace of innovation in the field of robot-based automation** at large and improve **technology transfers from research to industry**.

Applicants for the Award have to demonstrate an **innovative robotic application** targeting flexible manufacturing. **To ensure a fair and direct comparison of the innovations**, the developed robotic application shall be demonstrated on the **KUKA LBR iiwa** and shall operate in a realistic working environment with human coworkers.

The Award application must be submitted by October 16, 2015. It needs to address the motivation for the solution developed, details regarding its realization and proof of a working system. This working system does not need to be based on KUKA robot hardware, but applicants need to present a work plan that the solution developed could be transferred to the KUKA LBR iiwa and further enhanced within 6 months – the final phase of the competition. Eventually, the finalists will present their applications to the expert public and a jury of renowned experts **at the international trade show HANNOVER MESSE in April 2016.** The public Award ceremony will also be held at the trade fair. For all finalists, accommodation and travel costs for attending these presentations and the related exhibition costs will be borne by KUKA as described further below. This is a unique chance at no cost for all finalists to experiment with a KUKA LBR iiwa for a period of six months and to present their work to an international audience with numerous possibilities for opening up opportunities for further research contracts, technology transfers and businesses – not bound to KUKA.

Objectives of the Award – Flexible Manufacturing Challenge

The overall objective of the KUKA Innovation Award 2016 is to establish the robot as an intelligent, flexible helper on the shop floor, able to support humans by virtue of its high-quality and efficient work. **Vision, manipulation and grasping, safe and intuitive human-robot collaboration, machine learning and cloud-based operations** are considered most important ingredients to turn today's hard automation solutions into flexible tools on the shop floor. The applicants for the Innovation Award

with the theme “Flexible Manufacturing Challenge” are invited to develop and integrate new stand-alone automation applications with an LBR iiwa mounted on a flexFellow and to demonstrate new key robotics technologies and components. Special care should be taken to ensure that the developed solutions solve **real world problems** and that they are useful for end users. The teams are encouraged to pay attention to the **scalability and reusability** of their solution towards other robots and application domains.

Participating in the KUKA Innovation Award

The competition is open to the robotics research community at large (including companies). This includes researchers and developers at a post-graduate level or higher as well as research teams. **Teams with or without access to an LBR iiwa** are invited to hand in applications for participating in the competition. **Up to six selected finalists** will be provided with **an LBR iiwa mounted on a flexFellow free of charge** for the implementation of their solution.

The application needs to include a general description of the targeted robot-based automation application or robotics technology (including pictures and videos of the current stage of development). The experience of the team with sensitive robots should be clearly demonstrated; transfers of experiments and results from sensitive robots other than the LBR iiwa are also encouraged. The application should further sketch the solution that is proposed on a level of detail, which allows assessing the feasibility of transferring it to an LBR iiwa. Finally, it should provide some information on the economic impact of the proposed solution. Furthermore, a short description of the team and its background should be provided. **The application for participating and getting access to a sponsored LBR iiwa mounted on a flexFellow has to be submitted to the address given below by October 16, 2015.**

The applications will be reviewed by a jury composed of experts from the robotics industry and academia. The jury will select up to six candidates based on criteria described further below.

By **October 26, 2015 KUKA will announce the selected finalists**. They will be provided with an LBR iiwa mounted on a flexFellow and an initial training on the borrowed hardware and software. During the following 6 months the teams should implement their proposed solutions. KUKA will offer continuous support and advice on industrial relevance, will promote a community and contest spirit, and will support the teams in their PR efforts. In **February 2016 on-site visits** to the finalists will be held to support the participants in the preparation of the **final presentation at HANNOVER MESSE in April 2016**.

The selected finalists will be **invited to HANNOVER MESSE 2016** to present their work and **compete for the Award**. KUKA covers accommodation and travel costs for up to three persons per team for this final event (up to the amounts specified below). During the fair the winner of the Award and the **20,000 € prize** will be announced.

Assessment Criteria for the KUKA Innovation Award

The main assessment criteria will be the level of innovation[1] paired with the quality, the level of integration and technological readiness[2] of several of the required key technologies of vision, manipulation and grasping, safe and intuitive human-robot collaboration, machine learning and cloud-based operations.

Further criteria for the selection will be the originality of the overall approach, the expected economic impact[3] of the suggested application and its competitive advantage[4]. In addition, participants are encouraged to demonstrate scalability and reusability of their components and algorithms to different kinematics, sensors, and tasks.

Already existing components should be reused and not developed from scratch as far as possible. Last but not least, components and algorithms need to be validated and presented in a realistic work environment, not just in simulation or under special conditions. Ideally, end-user requirements have to be fulfilled, which includes performing a risk assessment of the developed application and implementing safety functions according to the determined requirements[5].

Outline and Content of Award Applications

The Award application should address the following items:

1. *Cover page*
   a. Project full title and short title/acronym
   b. Applicant contact data (name and institution of project leader)
   c. Short summary of project proposal
2. *Team description (max. 1 page)*
   a. Institution / Laboratory / Group description
   b. Background in robot-based automation (experience, projects, …)
3. *Motivation and objectives*
   a. General description of industrial, societal and scientific challenges to be tackled
   b. Objectives of the proposed work with an outline of the advances in vision, manipulation and human-robot collaboration
4. *Approach and realization*
   a. Technical details of the proposed solution including a description of the background knowledge and track record the project capitalizes on and why the proposed solution is promising

[1] The term *innovation* can be defined as something original and more effective and, as a consequence, new, that "breaks into" the market or society. (http://en.wikipedia.org/wiki/Innovation)
[2] *Technological readiness* measures the technological maturity and robustness of an evolving technology on a scale from 1 to 9 (http://en.wikipedia.org/wiki/Technology_readiness_level)
[3] *Economic impact* measures the economic effect (growth) caused by proposed system or solution in a certain area (http://en.wikipedia.org/wiki/Economic_impact_analysis)
[4] *Competitive advantage* measures the uniqueness of a solution in economic terms compared to the approaches taken by competitors (http://en.wikipedia.org/wiki/Competitive_advantage)
[5] A guidance and explanation of relevant rules and standards regarding *safety in human-robot collaboration* is provided by a VDMA Position Paper accessible at http://rua.vdma.org/en/article/-/articleview/4217015

   b. Work plan for the duration of the competition (from the announcement of the finalists in October 2015 until Hannover Fair in April 2016; please list suitable milestones and expected use of resources)
   c. Used hardware (sensors) and software (libraries, licenses)
5. *Targeted results and measures of success*
   a. Results regarding the topic of the Award
   b. Assessment of technology readiness level of the proposed solution including its scalability, the reusability of used and developed components, and risk assessment
6. *Analysis of economic impact and competitive advantages*

Award applications are limited to **twelve pages** (including the cover page) addressing the items above in a balanced manner. Teams are encouraged to provide video material as part of their application. Other supportive material, e.g. publications, should be linked to the application.

Schedule

August 15, 2015	Call for participation (this document)
October 16, 2015	**Submission deadline for KUKA Innovation Award 2016 application**
October 26, 2015	Announcement of finalists
April 18, 2016	Setup of finalists' applications at HANNOVER MESSE 2016
April 28, 2016	**Presentation to the expert public and announcement of the winner**

The Jury

Prof. Dr. Oussama Khatib (Director of Robotics Lab, Stanford University)
Prof. Dr. Alin Albu-Schäffer (Director of Robotics and Mechatronics Institute, DLR)
Prof. Dr. Tobias Ortmaier (Director of Institute of Mechatronic Systems, Leibniz University Hannover)
Erico Guizzo (Senior Editor, IEEE Spectrum Magazine)
Dr. Bernd Liepert (Chief Innovation Officer, KUKA AG)

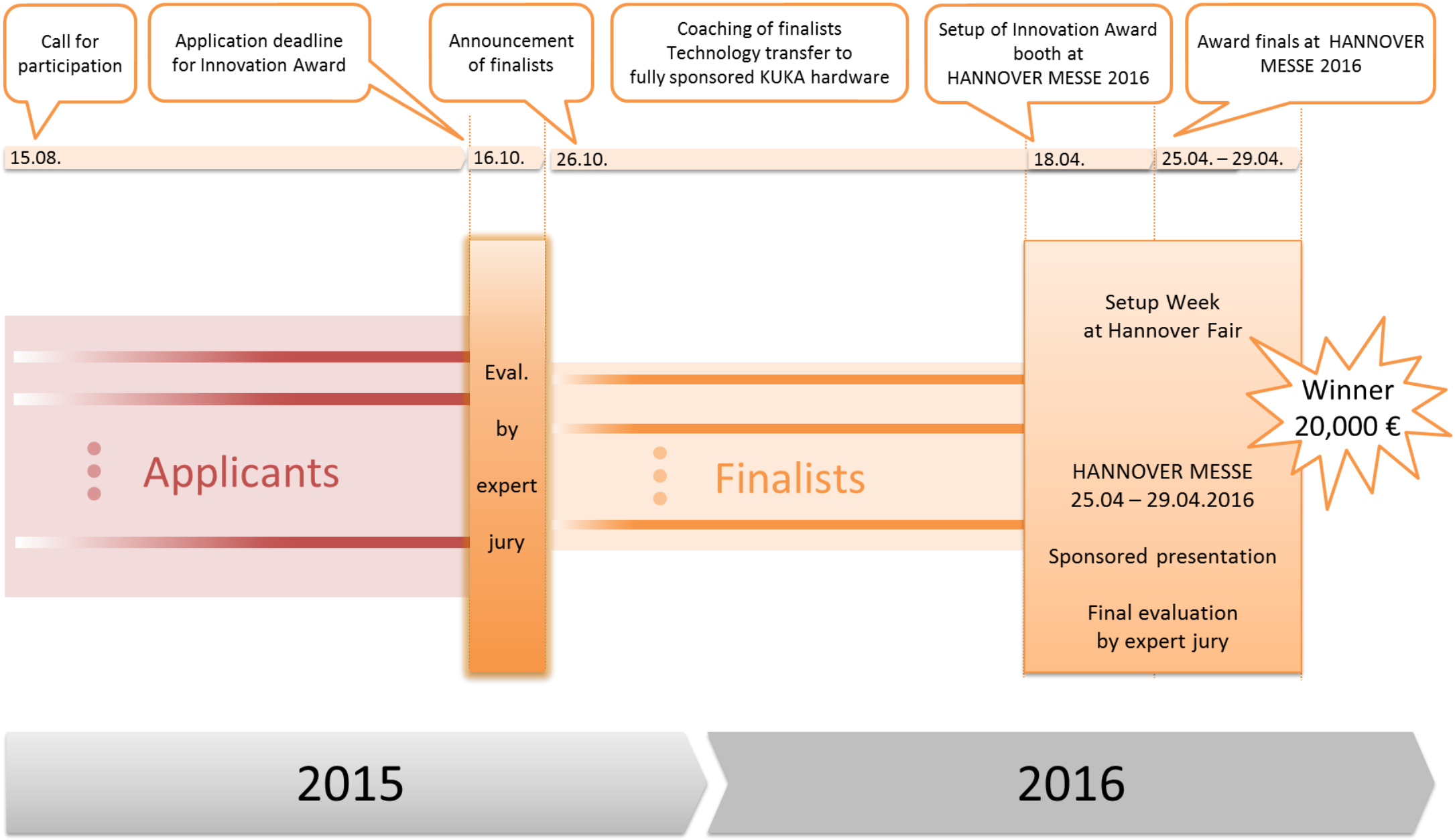
Contact and further information

Please submit your applications to:

Dr. Rainer Bischoff
Head of KUKA Corporate Research
KUKA Roboter GmbH
Zugspitzstr. 140
86165 Augsburg, Germany
E-Mail: innovationaward@kuka.com
Web: innovationaward.kuka.com

About KUKA

KUKA Aktiengesellschaft is a global group with sales of around 2.1 billion euro and a global workforce of about 12,000. As one of the world's leading suppliers of intelligent automation solutions, KUKA offers its customers everything they need from a single source: from the core component – the robot – to cells and fully automated systems. The company is headquartered in Augsburg. KUKA operates internationally for customers from the automotive industry and general industry.


Call for participation
Application deadline for Innovation Award
Announcement of finalists
Coaching of finalists
Technology transfer to
fully sponsored KUKA hardware
Setup of Innovation Award booth at HANNOVER MESSE 2016
Award finals at HANNOVER MESSE 2016
15.08.
16.10.
26.10.
18.04.
25.04. – 29.04.
Applicants
Eval.
by
expert
jury
Finalists
Setup Week
at Hannover Fair
HANNOVER MESSE
25.04 – 29.04.2016
Sponsored presentation
Final evaluation
by expert jury
Winner
20,000 €
2015
2016

Terms and Conditions

Eligibility

You are eligible to enter the competition if you meet the following requirements at time of entry:

- You are not an employee or intern of KUKA AG or their affiliated companies.
- You are not involved in any part of the execution or administration of this competition.
- You are not an immediate family member (parent, sibling, spouse, and child) or household member of a KUKA employee or an employee of KUKA affiliated companies, or a person involved in any part of the administration and execution of this competition.
- You are affiliated to a legal entity (company, university or research institute etc.), which is signing the lending agreement.

Confidentiality

KUKA, the jury, and the experts assigned will treat the submitted project material confidential. Intellectual Property (IP) generated in the competition belongs to the participants. If KUKA and a participant are interested in a technology transfer or access to IP, a separate agreement between the participant concerned and KUKA will be established.

Lending agreement

Granting of access to the KUKA LBR iiwa mounted on a flexFellow shall be conditional upon signing a lending agreement. Such lending agreement may not be signed by private individuals, but only by an authorized representative of a legal entity (company, university or research institute etc.). By signing the lending agreement the lender agrees to do its utmost to fulfil the work plan described in the Award application. The costs for fulfilling the work plan as described in the Award application including personnel and additionally required hardware (e.g., cameras, grippers) and software (e.g., licenses) have to be borne by the finalists.

Prize

No transfer, substitution or cash equivalent for travel and accommodation grants, sponsored access to hardware and prizes is allowed, except at KUKA's sole discretion. KUKA reserves the right to substitute a prize, in whole or in part, of equal or greater monetary value if a prize cannot be awarded, in whole or in part, as described for any reason.

Copyright

Applications shall only include material that you own or where permission has been granted by the copyright/trademark owner. Applications and robot programs may not include copyrighted materials (such as source code, user interface, background music, images or video) unless you own or have

permission to use the materials. The team has to provide a list of non-proprietary tools, libraries and source codes used.

Travel and exhibition expenses

Applicants bear their own costs with the exception of costs explicitly listed here.

KUKA will cover all costs related to lending, servicing, and supporting the KUKA LBR iiwa in the context of the KUKA Innovation Award.

KUKA offers a travel and accommodation grant to reduce the financial burden of finalist teams in the context of the demonstrations at HANNOVER MESSE 2016 covering the following items:

- Accommodation in Hannover for up to three members per finalist team (arranged by KUKA).
- Incurred travel expenses up to 1,200 € for German teams, 1,900 € for European teams and up to 3,300 € for non-European teams.
- Transportation costs for equipment (arranged by KUKA).

On accepting the invitation for participating in the Award finals at HANNOVER MESSE, the teams agree to set up and present their solutions to the expert public at HANNOVER MESSE. The costs for presentations at HANNOVER MESSE relating to exhibition space, designing a representative booth and supporting the setup and dismantling of booths and equipment will be borne by KUKA.

KUKA reserves the right to reclaim any surplus payment or money paid in error. Furthermore, KUKA may cancel the accommodation and travel grant and demand payment repayment, if the financial support was obtained under false pretenses, if not used for the intended purpose, if any obligation regarding the final is not fulfilled, or for any other sound reason.

KUKA does not provide any kind of insurance. Finalists shall insure themselves and their own equipment against any possible costs and consequences caused by loss, theft, illness, accident, personal liability, etc.

Data privacy

To process applications and to provide continuous support, KUKA collects and electronically stores the data submitted by applicants. These data include personal information (name, address, date of birth, nationality, phone numbers and e-mail addresses and organization of the applicants) as well as information on the project and the support granted.

KUKA may publish the names of the participating teams, their project titles, project videos and project abstracts on KUKA websites, via social media, in press releases and in printed publications.

FAQ

Where can I get more information on KUKA, the KUKA LBR iiwa and the KUKA flexFellow?
http://www.kuka.com/
http://www.kuka-lbr-iiwa.com/
http://www.kuka-robotics.com/germany/en/products/industrial_robots/sensitiv/start.htm
http://www.kuka-systems.com/en/products/industrial_assembly/flexFellow/start.htm

Where can I get more information on HANNOVER MESSE 2016?
http://www.hannovermesse.de/en/exhibition/facts-figures/

Can other robots than the KUKA LBR iiwa be used in this competition?

As the KUKA Innovation Award 2016 targets robotic solutions with an LBR iiwa mounted on a flexFellow other robots could only be used for side-tasks. Applications are encouraged to focus on the key objectives and the development of a standalone solution. Applications (deadline October 16, 2015) may be submitted using other robots.

Does KUKA offer other competitions? Are these open to other robots?

You may be interested in participating in RoboCup or RoCKIn competitions, in particular @Home and @Work contests:
http://www.robocupathome.org/
http://www.robocupatwork.org/
http://rockinrobotchallenge.eu/

Who can participate?

Teams and individuals from legal entities (companies, universities or research institutes etc.).

Why should I participate?

The competition leading to the KUKA Innovation Award may allow you

- to access KUKA's latest robot hardware free of charge
- to present your solutions to the expert public at one of the world's most important industrial trade shows
- to engage in a closer collaboration and technology transfer of your innovative technology to one of the world leaders in robot-based automation (subject to a separate license agreement)
- to travel to HANNOVER MESSE 2016 for presenting your work at KUKA's expense (within the limits of the Terms)
- to use this opportunity to meet and engage with other parties interested in your work
- to win 20,000 €!

What are the evaluation criteria for obtaining a sponsored LBR iiwa mounted on a flexFellow?

The main criteria for evaluation are outlined above (section „Applications for the KUKA Innovation Award"). Furthermore, please address the following aspects in your application:

- scalability and reusability of components and algorithms
- validation of proposed solution in a realistic work environment
- risk assessment of the developed application and implemented safety functions according to the determined requirements

What are the deadlines?

- The max. 12-pages final Award application is due on **October 16, 2015** (see section "Outline and Content of Award Applications" for details)
- Setup of the finalists' applications at HANNOVER MESSE 2016 will start on **April 18, 2016**
- The finalists' applications should be ready for presentation from **April 25-29, 2016**