

Call for Participation

KUKA Innovation Award 2017

– Advanced Mechatronics 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

has been established in 2014 under the patronage of Dr. Bernd Liepert, Chief Innovation Officer of the KUKA group. 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**.

KUKA offers the finalist teams **a free-of-charge LBR iiwa mounted on a flexFellow carrier as well as an optional stereo vision sensor** for the duration of the competition. KUKA is partnering with Roboception for providing the vision sensor. The sensor is not yet available as a product so that participants gain early access to an innovative technology.

Applicants for the Award have to demonstrate an **innovative robotic application** targeting the topic **Advanced Mechatronics**. Demonstrations should make use of the provided mechatronic systems and enhance them e.g. with new mechatronic solutions for peripherals such as grippers, new algorithms for control, e.g., vision-based grasping, new types of human-robot interaction and collaboration as well as new ways of robot-robot cooperation. The focus is on a versatile system design which contains innovative software and hardware components applicable beyond one specific use case.

Proposals for the award must be submitted by October 21, 2016. They need to address the motivation for the solution to be developed, details regarding its realization and an already established proof of concept in a working system. The proposals will be reviewed and invite the top-ranked teams to present their proposals to an **international jury from research and industry** in an online session for the selection of **5 finalist teams**. Following this selection, each finalist team will sign an agreement to implement its ideas on the provided hardware. Teams will receive an initial training on the hardware and will be continuously supported and coached by KUKA to be more effective in the implementation phase. Finally, they present the developed solutions to the expert public, the jury and both KUKA top management and senior developers at the international trade show **HANNOVER MESSE in April 2017**, where the winner will be selected and the Award ceremony will be held.

All intellectual property generated in the competition belongs to the participants. The participants are encouraged to use their KUKA-sponsored exhibition at **HANNOVER MESSE** to engage also with third parties to initiate technology transfers and new cooperation projects.

Objectives of the Award – Advanced Mechatronics

The overall objective of the KUKA Innovation Award 2017 is taking mechatronic systems in robotics to the next level as new and innovative robotic applications call for more advanced mechatronic components and a versatile but robust system design. Applicants should clearly show the versatility of their approach beyond specific application engineering.

Applicants for the Innovation Award are invited to select a use-case where robotic automation is challenging nowadays and has a promising economic and societal impact, e.g., in the fields of 3C (Computer, Communication, Consumer), logistics, medical and SME manufacturing, and to propose a solution involving innovative advanced mechatronic components or systems. These solutions should ideally benefit from direct human-robot collaboration at minimum one stage of the developed application. Bringing in ideas stemming from the digitization of the manufacturing industry are particularly encouraged.

In order to kick-start the development, KUKA offers the selected finalists an LBR iiwa mounted on a flexFellow carrier and a stereo vision sensor from Roboception. While using the LBR iiwa and flexFellow is mandatory for the applicants, the vision system and further components are optional. Proposed applications may include additional hardware such as sensors or other mechatronic components to be developed and provided by the applicants. Newly introduced components should provide a clear vision how they can easily blend in with the hardware provided by KUKA. For all components KUKA offers consulting and integration support.

The clear focus of the KUKA Innovation Award „Advanced Mechatronics“ lies on the introduction and demonstration of new and innovative components (hardware and software) and a versatile system concept and not on an engineering approach for solving a specific use-case.

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. Individuals and teams have to belong to a legal entity that enters into an agreement with KUKA for the purpose of the competition.

The first step in participating in the KUKA Innovation Award is the creation of a proposal. This proposal includes a general description of the intended application, an initial concept for the system design, and ideally, a proof of concept by an already working robotic application. Transferring experiments and results from legacy components to the hardware provided by KUKA is particularly encouraged. A realistic implementation plan and a description of the team's experience should also be provided. **The proposal for participating and getting access the sponsored hardware has to be submitted electronically by October 21, 2016.**

An international jury will review and rate the proposals based on the assessment criteria listed below. A selection of potential finalist teams will be invited to present their proposals in an online interview session with the jury and experts from KUKA. Based on the jury rating, up to five finalists will be selected. KUKA will notify the selected finalists by **November 7, 2016. These five selected**

finalists will be provided with **an LBR iiwa mounted on a flexFellow and optionally a stereo vision sensor free of charge** for the implementation and final presentations of their applications. During the implementation phase an initial training on the hardware and support will be provided by KUKA. In **February 2017, on-site visits** to the finalist teams will be held to support the teams in the preparation of the **final presentation at HANNOVER MESSE in April 2017**.

Finally, the teams will be **invited to HANNOVER MESSE 2017** to present their applications and **compete for the Award** in a final round. This will offer the participants of the Innovation Award the unique chance to present their work to the expert public, KUKA top management and KUKA senior developers and to generate valuable contacts for further studies or technology transfers. The Jury will determine the winner on-site based on the assessment criteria listed below with a particular focus on quality and robustness of the presented solutions. Presenting the solution on the fair is a mandatory activity for competing in the Innovation Award. The winner of the KUKA Innovation Award along with its 20.000 € financial prize will also be announced on the fair.

Outline and Content of Award Proposals

The Award proposal should be aligned along the following structure:

1. *Cover page*
 - a. Project full title and short title/acronym
 - b. Applicant contact data (name and institution of project leader)
 - c. Summary of project proposal
2. *Team description*
 - a. Institution / Laboratory / Group description
 - b. Background in robot-based automation (especially experience with sensitive and collaborative robots, projects, knowledge and track record the project capitalizes on)
3. *Motivation and objectives*
 - a. Description of the intended use-case, challenges and relevance to potential markets
 - b. Objectives of the proposed work with an outline of the advances focusing on the mechatronic challenges targeted
4. *Approach and realization*
 - a. Technical details of the proposed solution including a description why the proposed solution is promising as well as a pictures and videos of the current stage of development (ideally, an already established proof of concept in a working system)
 - b. Work plan for the duration of the competition (from the announcement of the finalists in October 2016 until HANNOVER MESSE in April 2017; please list suitable milestones and expected use of resources)
 - c. Initial concept for the system design and a list of to be used hardware 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
 - c. Outline of possible integration/cooperation with KUKA regarding the proposed systems/methods

6. *Analysis of economic impact and competitive advantages*
 - a. Economic impact on potential markets
 - b. Summary of transferable / licensable technology and time-to-market estimation
 - c. Competitive advantage with respect to existing solutions (research / technology / applications)

Award applications have to be written in **English** and 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.

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 the proposed solutions. 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 requirements⁵.

Schedule

September 19, 2016	Call for participation (this document)
October 21, 2016	Submission deadline for KUKA Innovation Award 2017 application
November 4, 2016	Interview session with potential finalists
November 7, 2016	Announcement of finalists
April 17, 2017	Setup of finalists' applications at HANNOVER MESSE 2017
April 24-28, 2017	Presentation to the expert public and announcement of the winner

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>

Patronage

Dr. Bernd Liepert, Chief Innovation Officer, KUKA Aktiengesellschaft

Jury

Prof. Dr. Oussama Khatib (Director of Robotics Lab, Stanford University)

Prof. Dr. Ir. Stefano Stramigioli (Director of the Robotics and Mechatronics Lab, University of Twente)

Prof. Dr. Tobias Ortmaier (Director of Institute of Mechatronic Systems, Leibniz University Hannover)

Erico Guizzo (Senior Editor, IEEE Spectrum Magazine)

Dr. Rainer Bischoff (Head of Corporate Research, KUKA Roboter GmbH)

Contact and further information

Please submit your applications to: innovationaward@kuka.com

Web: innovationaward.kuka.com

Coordination and information contact:

Andrea Herold

Junior Innovation Manager

KUKA Aktiengesellschaft

Zugspitzstr. 140

86165 Augsburg, Germany

E-Mail: Andrea.Herold@kuka.com

About KUKA

KUKA Aktiengesellschaft is an internationally active group with sales of around 3 billion euro and a workforce of 12,300 worldwide. KUKA offers its customers around the globe automation solutions ranging from components and cells to fully automated systems. The company is one of the world's leading suppliers in the fields of robotics, automation and systems engineering. The company is headquartered in Augsburg. Around 100 subsidiaries operate internationally for customers from the automotive industry and general industry.

KUKA Innovation Award 2017

Schedule



KUKA Innovation Award
2017

Terms and Conditions

Eligibility

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

- You are affiliated to a legal entity (company, university or research institute etc.), which is signing an agreement with KUKA that is handling the lending of the provided hardware and all financial issues regarding your participation.
- 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.

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.

Innovation

To accelerate the pace of innovation in the field of robot-based automation and to improve technology transfers from research to industry for the finalist teams, KUKA will organize a special confidential session at HANNOVER MESSE to bring together finalists with KUKA top management and senior developers. This is to offer finalist teams the opportunity to present technical details of their solution and to suggest to KUKA on how to possibly exploit their developments in further bilateral research and development cooperation.

Lending agreement

Granting of access to the KUKA LBR iiwa mounted on a flexFellow and the suggested stereo vision sensor 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 proposal. The costs for fulfilling the work plan as described in the proposal including personnel and additionally required hardware and software 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. The prize money can only be transferred to legal entities; transfers to individual persons cannot be made. 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.

Reimbursement of travelling 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 2017 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).

This grant can be accessed by the finalist teams' legal entity via handing in a cost claim with all necessary receipts of the costs incurred by three members per finalist team.

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, the jury and KUKA top management and senior developers 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 the provided hardware?

<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

<http://roboception.com/en/home/>

Where can I get more information on HANNOVER MESSE 2017?

<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 2017 targets advanced mechatronic systems and KUKA provides sponsored hardware it is most advisable to make use of the LBR iiwa and the other provided components where appropriate. However, using and integrating the final demonstrator with the LBR iiwa and the flexFellow is mandatory. Applications are encouraged to focus on the key objectives and the development of a standalone solution. Proposals may be submitted using other robots.

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

You may be interested in participating in the newly established European Robotics League or RoboCup competitions, in particular @Home and @Work contests:

<http://www.european-robotics-league.eu/>

<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.) may participate. Proposals can only be made in the name of the legal entity. Lending agreements and financial issues can only be handled with the participant's legal entity.

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 receive an LBR iiwa training and advanced coaching for the duration of the award
- to present your solutions to the expert public at one of the world's most important industrial trade shows
- to present your solutions to KUKA top management and senior developers

- 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 2017 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 hardware?

The main criteria for evaluation are outlined above (section „Outline and Content of Award Proposals“). Furthermore, please address the following aspects in your proposal:

- 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 21, 2016** (see section “Outline and Content of Award Applications” for details)
- Setup of the finalists' applications at HANNOVER MESSE 2017 will start on **April 17, 2017**
- The finalists' applications should be ready for presentation from **April 24-28, 2017**