

Tillaga að verkefni á nýjan vegvísi um rannsóknarinnviði 2025

Titill verkefnis: “Róbótagarður” - Icelandic Robot Interaction Laboratory

Heiti stofnunar: Háskólinn í Reykjavík ehf. (Reykjavik University)

Vinsamlegast hafið eftirfarandi atriði í huga við gerð tillögunnar

Umsækjandi þarf að svara öllum liðum hér að neðan. Þar sem stendur „Texti“ er hægt að skrifa texta, setja inn myndir eða töflur.

Tillögum að innviðum á vegvísi um rannsóknarinnviði skal skilað á þar til gerðu eyðublaði. Ekki er leyfilegt að eiga við uppsetningu eyðublaðsins.

Skjalið „Tillaga að innviðum á vegvísi um rannsóknarinnviði“ skal að hámarki vera þrjár blaðsíður, auk forsíðu, eða samtals fjórar blaðsíður. Nota skal leturgerð og leturstærð eins og stillt er í eyðublaðinu, þ.e. 11 punkta Calibri (body). Ekki er leyfilegt að breyta breidd spássú eða beyta fyrirsögnum í eyðublaðinu. Umsókn skal senda inn sem PDF-skjal.

Festur til að skila inn tillögum er til 12. september 2024, kl. 15.00.

Nánari upplýsingar er að finna á [heimasíðu Innviðasjóðs](#) og hjá sérfræðingum Innviðasjóðs hjá Rannís í gegnum tölvupóstfangið innvidasjodur@rannis.is

Lýsing á tillögu til birtingar á heimasíðu Innviðasjóðs

1. Samantekt: Stutt lýsing innviðum

The Icelandic Robot Interaction Laboratory (*“Róbótagarður”*) is an interdisciplinary research and development infrastructure established by universities and industry. The laboratory will support research in robotics, human-robot interaction (HRI), machine learning, vision, speech, and neuromorphic computing. The lab will feature a variety of robots equipped with multimodal sensing, including vision, speech, and tactile systems, focusing on manipulation, context adaptation, and human collaboration. Neuromorphic hardware will enable real-time, energy-efficient processing for advanced AI and robotics research. The lab will foster collaboration between academia and industry, promoting the development of practical applications and solutions in various sectors. In the first phase, the laboratory will grow to encompass the following infrastructure:

Compliant Robot Manipulators: Robotic arms with dexterous end-effectors and tactile sensing, enabling fine manipulation of objects. These manipulators will offer high levels of compliance, allowing safe interaction with humans and delicate objects.

Bipedal and Quadrupedal Robots: Legged robots capable of navigating complex environments, which will serve as a platform for locomotion research and HRI studies.

Multimodal Sensing: Robots will be outfitted with advanced vision systems for object recognition, navigation, and contextual understanding. Auditory systems will facilitate speech recognition, synthesis, and natural language processing.

Human-Robot Interaction Platforms: These platforms will enable the study of how humans and robots can collaborate in shared environments, focusing on both physical and verbal interactions.

Neuromorphic Computing Hardware: A key feature of this laboratory will be the incorporation of neuromorphic hardware, which mimics the architecture of biological brains to improve efficiency in tasks such as perception, decision-making, and adaptation.

Real-Time Computing Resources: The laboratory will house computational resources, supporting the development of real-time machine learning algorithms. These systems will be crucial for recording, storing, and processing the large volumes of data generated by the robots' sensors and interactions.

2. Meginmarkmið með uppbyggingu innviða?

The primary aim of the Robot Interaction Laboratory is to provide the physical means to address critical challenges in AI and robotics, including how robots recognize context, manipulate unfamiliar objects, communicate and work effectively with humans. The lab will integrate advanced locomotion, manipulation, and non-verbal and verbal communication capabilities to explore human-robot collaboration in real-world environments. A key focus will be leveraging neuromorphic computing to enhance robotic systems' adaptability and efficiency. The lab will also drive societal and industrial innovation by working with institutions

and industry partners on developing robotic solutions for diverse fields such as welfare services, healthcare, manufacturing, logistics, and creative industries.

3. Hvernig mun innviðauppyggingin stuðla að nýliðun og leiða til aukins samstarfs og betri nýtingar innviða?

The new lab will foster interdisciplinary research in robotics, vision, machine learning, behavioural science, and visual arts. By providing access to state-of-the-art infrastructure, the lab will enable new researchers and innovators to engage in advanced robotics research, fostering both innovation and new talent. Industrial partners will be involved from the outset, ensuring that the research conducted is relevant to practical, real-world needs. This collaboration will also ensure better utilisation of the infrastructure, with companies developing new robotic applications benefiting from cutting-edge developments.

4. Hverju munu innviðirnir breyta miðað við stöðuna í dag?

Currently, Iceland lacks access to advanced robotics infrastructure, particularly in the areas of advanced manipulation, human-robot interaction, and neuromorphic computing. Unlike advanced software, robot hardware cannot be downloaded. Existing industrial robots are limited by proprietary software, restricted compliance, and closed workspaces, which limits interaction with humans. The proposed laboratory will overcome these limitations by providing open-access robot platforms with sensitive tactile sensors, compliance control, multi-modal perception, and neuromorphic processing. This infrastructure will enable research into fine manipulation, human-robot interaction, and energy-efficient AI, advancing Iceland's capabilities in robotics and AI research. Industrial collaborators will benefit from the lab's ability to develop and test new robotic applications tailored to real-world challenges. Access to this advanced laboratory will lower the entry barrier for start-ups and smaller businesses, fostering a culture of innovation and opening new opportunities for robotics and artificial intelligence.

5. Framtíðarsýn uppbyggingar og reksturs

The long-term vision for the Robot Interaction Laboratory is to foster and support robotics and AI research and innovation in Iceland. The lab will continuously expand its capabilities by incorporating the latest advancements in sensing, actuation, machine learning, and computing. It will provide a foundation for ongoing collaboration with both academic researchers and industrial partners, ensuring that it remains at the forefront of robotics innovation. The consortium, currently counting Reykjavík University, University of Iceland, Iceland University of the Arts, and Marel hf., will be grown to include further members, and the scope expanded to include additional fields such as autonomous robots, teleoperation, and assisted living. The laboratory will expand its infrastructure to support a continuous development of cutting-edge research projects and maintain its competitive edge in global robotics and AI research.

6. Áætluð fjármögnunarþörf næstu ár

To establish and maintain the Robot Interaction Laboratory, funding will be required for the acquisition of robotic hardware, including dextrous compliant manipulators, bipedal and

quadrupedal robots, neuromorphic computing systems, and necessary support equipment. Costs will cover the purchase of equipment, setup, and the integration of advanced sensing and computation resources. Additional funding will be sourced for the maintenance of equipment, staffing, research activities, and collaborations with industry partners.

Estimated annual procurement costs	Y1	Y2	Y3	Y4
Compliant Robot Manipulators	20	20	5	5
Bipedal and Quadrupedal Robots	20	20	40	40
Multimodal Sensing	10	10	5	5
Human-Robot Interaction Platforms	10	10	10	10
Neuromorphic Computing Hardware	5	5	10	10
Real-Time Computing Resources	10	10	5	5
Total	75	75	75	75