German Research Center for Artificial Intelligence
Deutsches Forschungszentrum für Künstliche Intelligenz

In order to strengthen our dedicated team in the Robotics Innovation Center (RIC) research department in Bremen we are looking for a

Master Thesis/Internship
(full-time/part-time, 6 – 9 months)

The Robotics Innovation Center research department, headed by Prof. Dr. Dr. h.c. Kirchner, develop robot systems that are used for complex tasks on land, under water, in the air, and in space. The recently established underactuated lab at DFKI-RIC is looking for outstanding students to join us in pushing the boundaries of highly dynamic and agile robots.

Topic:

Series-parallel hybrid architecture can offer superior dynamic performance in contrast to traditional serial robots [1]. These robots are typically position controlled due to challenges in their modeling. When equipped with real time dynamic control, often a simplified inverse dynamic model of these systems is utilized. The trade-offs of this model simplification were reported in [3] for the first time by studying the inverse dynamics of a series-parallel humanoid leg which has been recently developed at DFKI-RIC. This thesis plans to extend the work in [2, 3] by studying the effect of model simplification on the forward dynamics of the system and develop methods for automatically discovering reduced order models for complex systems. The work will be applied to the analysis of complex systems such as Recupera exoskeleton and RH5 humanoid.

Our requirements:

Mathematical: Rigid body kinematics and dynamics, basic control theory.

Programming: C/C++, Python, experience with multi-body dynamics simulations software (e. g. ADAMS, RecurDyn etc)

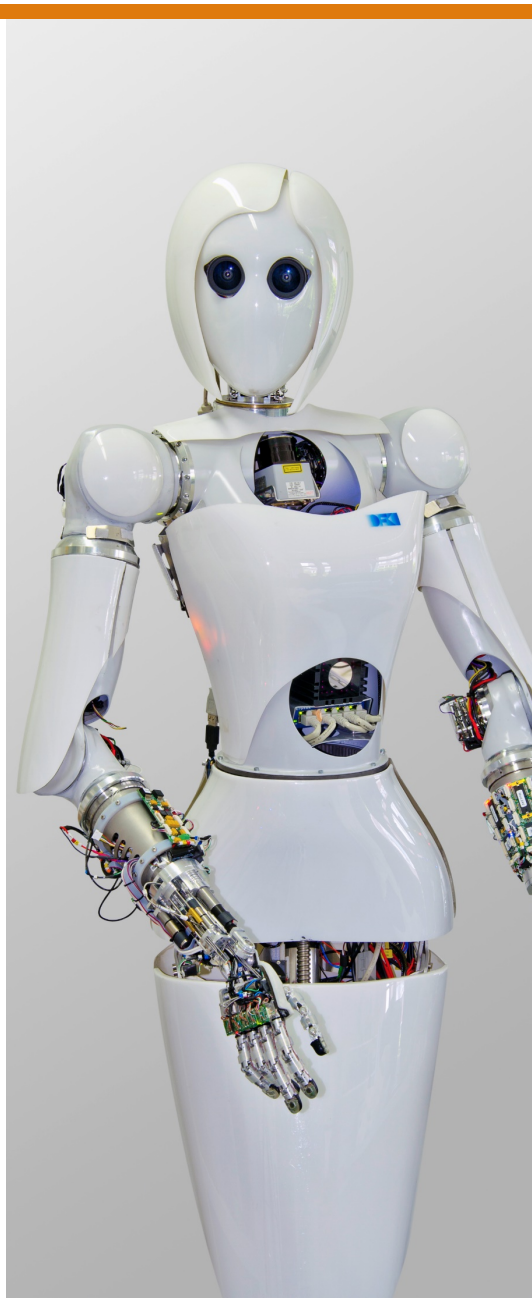
Literature:

1. Shivesh Kumar, Hendrik Wöhrle, José de Gea Fernández, Andreas Müller, Frank Kirchner, A survey on modularity and distributivity in series-parallel hybrid robots, Mechatronics, Volume 68, 2020, 102367, ISSN 0957-4158, https://doi.org/10.1016/j.mechatronics.2020.102367.
2. Kumar, S., Szadkowski, K. A. V., Mueller, A., and Kirchner, F. (February 6, 2020). "An Analytical and Modular Software Workbench for Solving Kinematics and Dynamics of Series-Parallel Hybrid Robots." ASME. J. Mechanisms Robotics. April 2020; 12(2): 021114. https://doi.org/10.1115/1.4045941
3. S. Kumar, J. Martensen, A. Mueller and F. Kirchner, "Model Simplification For Dynamic Control of Series-Parallel Hybrid Robots - A Representative Study on the Effects of Neglected Dynamics Shivesh," 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Macau, China, 2019, pp. 5701-5708, doi: 10.1109/IROS40897.2019.8967786.

Please contact us for further information and send your application via E-Mail to ric-application@dfki.de.

The German Research Center for Artificial Intelligence (DFKI) is Germany's leading business-oriented research institution in the field of innovative software technologies based on artificial intelligence methods. In the international scientific community, DFKI ranks among the most recognized “Centers of Excellence” and currently is the biggest research center worldwide in the area of Artificial Intelligence and its application in terms of number of employees and the volume of external funds. The DFKI cooperates closely with national and international companies.

Severely disabled applicants and peers are given special consideration if they are equally suitable. The DFKI intends to increase the share of women in the field of science and therefore urges women to apply.



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Curious about DFKI RIC and Bremen? For more information, visit!

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