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F O R S C H U N G S P R A X I S

for

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Mat.-Nr. , field of study

Online Iterative Learning Control for Capture Point based Walking Control

Problem description:

Based on simplified dynamics models[1], bipedal walking pattern can be generated online flexibly. Several approaches have been proposed in recently years, such as preview controller based on zero-moment point dynamics[2] and capture point (CP) controller[3]. These online approaches have a comment drawback that the tracking performance of the reference trajectory is decreased due to the model inconsistency. Recently an online iterative learning control (ILC) approach has been proposed to resolve this problem, which has addition advantages, such as model free, online adaptivity[4]. In this Forschungspraxis the student is going to transfer the ILC control to the CP controller.

Work schedule:

- Study the related literature (1 week).
- Implement the ILC algorithm in simulation (7 weeks).
- Documentation (1 week)

Bibliography:

- [1] Kajita, Shuuji and Kanehiro, Fumio and Kaneko, Kenji and Yokoi, Kazuhito and Hirukawa, Hirohisa. The 3D Linear Inverted Pendulum Mode: A simple modeling for a biped walking pattern generation In *Proceedings 2001 IEEE/RSJ International Conference on Intelligent Robots and Systems*
- [2] Kajita, Shuuji and Kanehiro, Fumio and Kaneko, Kenji and Fujiwara, Kiyoshi and Harada, Kensuke and Yokoi, Kazuhito and Hirukawa, Hirohisa. Biped walking pattern generation by using preview control of zero-moment point In *Proceedings 2003 IEEE/RAS International Conference on Robotics and Automation*
- [3] Engelsberger, Johannes and Ott, Christian and Roa, Maximo and Albu-Schäffer, Alin and Hirzinger, Gerhard and others. Biped walking pattern generation by using preview control of zero-moment point In *Proceedings 2011 IEEE/RSJ International Conference on Intelligent Robots and Systems*
- [4] Kai Hu, Christian Ott, Dongheui Lee. Online Iterative Learning Control for Biped Walking Stabilization. In *IEEE Int. Conf. on Robotics and Automation (ICRA), 2015.*

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