TECHNISCHE UNIVERSITÄT MÜNCHEN
Human-centered Assistive Robotics
UNIV.-PROF. DR.-ING. DONGHEUI LEE

November 18, 2019

MASTER'S THESIS

Discriminate Human Interaction from Task Contact

Problem description:

It has been shown in literature that robots are able to discriminate if a physical contact is a desired interaction or unwanted collision [3]. This work considers only contacts with the environment but no physical contacts with a human. Instead, we want to focus on situations, where the robot can come into contact either with the environment (task contact) or with the human in order to interact with the robot (human interaction).
In detail, we want to consider different situations which benefit from a classification between human interaction and task contact. During the learning phase, task contact and unintended human interference might occur alongside kinesthetic teaching. In the execution phase, the robot gets into task contact, interacts with a human, or interferes with the human in an unintended way, which can be a collision. A combination of task contact and human interaction has already been analyzed in a preceding work [4]. Different detection schemes (model-based [2] and model free) to discriminate between task contact, intended human interaction or unintended interference shall be compared.

Tasks:

- Literature survey on contact classification in human and task context [1]
- Development of features for a context aware classification algorithm
- Implementation and comparison of classification schemes (classification based, knowledge based)
- Experimental evaluation of your results on a real robot

Bibliography:

[1] Catherina Burghart, Sadi Yigit, Oliver Kerpa, Dirk Osswald, and Heinz Woern. Concept for human robot co-operation integrating artificial haptic perception. In *Intelligent Autonomous Systems*, volume 7, pages 38–45, 2002.
[2] T. Eiband, M. Saveriano, and D. Lee. Intuitive programming of conditional tasks by demonstration of multiple solutions. *IEEE Robotics and Automation Letters*, pages 1–1, 2019.
[3] Saskia Golz, Christian Osendorfer, and Sami Haddadin. Using tactile sensation for learning contact knowledge: Discriminate collision from physical interaction. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 3788–3794. IEEE, 2015.
[4] Matthias Schoeffel. Exploiting internal and external force-sensing in human robot interaction. Technical report, Technical University Munich, 2019.

Supervisor:	M. Sc. Thomas Eiband
Start:	01.11.2019
Intermediate Report:	01.03.2020
Delivery:	30.06.2020

(D. Lee)
Univ.-Professor