Fakultät für Informatik

Autor(en) des Beitrags:
Glasauer, Markus Huber AND
Aleksandra Kupferberg AND Claus
Lenz AND Alois Knoll AND Thomas
Brandt AND Stefan

Titel des Beitrags:
Spatiotemporal Movement Planning
and Rapid Adaptation for Manual
Interaction

Abstract:
Many everyday tasks require the
ability of two or more individuals to
coordinate their actions with others to
increase efficiency. Such an increase
in efficiency can often be observed
even after only very few trials.
Previous work suggests that such
behavioral adaptation can be
explained within a probabilistic
framework that integrates sensory
input and prior experience. Even
though higher cognitive abilities such
as intention recognition have been
described as probabilistic estimation
depending on an internal model of the
other agent, it is not clear whether
much simpler daily interaction is
consistent with a probabilistic
framework. Here, we investigate
whether the mechanisms underlying
efficient coordination during manual
interactions can be understood as
probabilistic optimization. For this
purpose we studied in several
experiments a simple manual
handover task concentrating on the
action of the receiver. We found that
the duration until the receiver reacts
to the handover decreases over trials,
but strongly depends on the position
of the handover. We then replaced
the human deliverer by different types
of robots to further investigate the
influence of the delivering movement
on the reaction of the receiver.
Durations were found to depend on
movement kinematics and the robot’ s
joint configuration. Modeling the task
was based on the assumption that the
receiver’ s decision to act is based on
the accumulated evidence for a
specific handover position. The
evidence for this handover position is collected from observing the hand movement of the deliverer over time and, if appropriate, by integrating this sensory likelihood with prior expectation that is updated over trials. The close match of model simulations and experimental results shows that the efficiency of handover coordination can be explained by an adaptive probabilistic fusion of a-priori expectation and online estimation.

Stichworte: jahir, baja, cotesys

Zeitschriftentitel: PLoS ONE

Jahr: 2013

Band: 8

Heft / Issue: 5

Seiten: e64982

Volltext / DOI: http://doi.org/10.1371/journal.pone.0064982

Verlag / Institution: Public Library of Science

Occurences:

· Einrichtungen > Fakultäten > Fakultät für Informatik > Lehrstühle der Informatik > Informatik 6 - Lehrstuhl für Echtzeitsysteme und Robotik (Prof. Knoll) > 2013