HYBRID SOCIETIES

Object weights can be predicted from movement kinematics in a replacement task

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Projects

A01/E01

Presenters

Lena Kopnarski,
Laura Lippert

ABSTRACT

When grasping and replacing an object, grasp pattern, grip and load force are adjusted using an internal forward model (Hermsdörfer et al., 2011). More accurate predictions of object properties (e.g. weight) allow more precise forward control (e.g. anticipatory grip force scaling). When receiving an object in a handover precise forward models are important for a smooth tranfer. Observation of the giver's kinematics when transporting the object may transmit information (e.g. weight) and therefore may be used for the formation of forward models on the receiver side. Machine learning (ML) allows the systemetic extraction of specific kinematic patterns of a movement (Balaji et al., 2020). Therefore, ML is a suitable tool to investigate how different object properties change movement patterns as a function of varying object properties. The aim of our study was to investigate wether the object weight in an object replacement task can be classified by time-profiles of joint angles using a discrete cosine transform for data reduction and a support vector machine (SVM) for classification.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

An attention-guided vergence control model

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Project

A02

Presenter

Torsten Fietzek

ABSTRACT

An important part of human vision is the stereo vision capability, which is essential for depth perception and thus for motor navigation. In stereo vision, the eyes are controlled through vergence which ensures that the eye focus in the correct depth plane. Gibaldi et al., 2017 set up a biologically motivated neurocomputational model for vergence control using the iCub humanoid robot. To further improve the focus selection especially for small or task specific objects. We propose to combine vergence control with attentional selection using a neurocomputational model for object localization (Beuth, 2020). These mechanisms will be used to guide the vergence control at a specific object instead of an extended depth plane.

TECHNISCHE UNIVERSITÄT CHEMNITZ

DFG

HYBRID SOCIETIES

A preliminary sensory smart glove design for the evaluation of human grasp key features

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Project

A03

Presenters

Chintan Malani,
Giuseppe
Sanseverino

ABSTRACT

Grasp is a common topic in the field of robotics and many researchers focused on the improvement of robots grasping skills. A lot of research has also been done from the perspective of human grasping. However, the literature still lacks a robust direct link between human and machine grasp. The success of communication between humans and robots is highly dependent on the correct interpretation of each other's actions. Therefore, a thorough understanding of the human action execution mechanism and the way humans grasp objects is essential. After an initial review of the state of the art, this work aims to propose a preliminary design for a smart sensory glove to be used for further investigation of human grasp key features. To this end, a Body-Attached Sensor Network (BASN) comprised of eight pressure sensors and a wireless datalogger was developed. The pressure sensors were attached to specific locations on a glove, these were defined using information from the literature. This first smart glove prototype is meant to serve as a tool for the analysis of precision grasp, the future design of the proposed BASN will enable an analysis of a different kind of grasp.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

Virtual-reality-based evaluation of a helmet display for hazard warning and localization.

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Project

A04

Presenters

Sascha Feder,
Aline Püschel

ABSTRACT

One of the major challenges in firefighting is determining the source of the fire. In rooms sight-restricted by smoke, a hand-held thermal imaging camera is conventionally used for this purpose. A new approach proposes the use of an LED bar integrated into the firefighter's helmet to display the direction of heat. To be able to compare both systems (thermal imaging camera and helmet display) safely and efficiently, we extended our previously established virtual office building to include a realistic heat distribution caused by simulated fire and visual degradation by smoke. In this simulation, we measured the fire detection and localization performance of 24 participants using the two different thermal systems. We found a significant advantage for the thermal imaging camera in terms of faster general detection that there is fire in a (simulated) room. In contrast, the time between detection and fire localization was slightly shorter during the use of the helmet display. Moreover, the fire source localization error was significantly smaller using the helmet display. Continuous recording of eye and head movements during the experiment showed that participants tended to scan the room from left to right after entering, therefore it took them longer to find fire sources further to the right. This effect is also known from image viewing studies. Our findings provide a promising baseline for further development of the novel helmet display.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

Eerie by displaying emotions - exploring EDT's emotional capacity

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Project

B01

Presenters

Katharina Jahn,
Oliver Rehren,
Sebastian Jansen

ABSTRACT

This studies aim at investigating the proposed dynamic (de-)anthropomorphism process towards EDTs. Three groups of participants engage in a conversational scenario with an EDT that either contains no emotional features, is able to express its emotions properly but does not show any further emotional capacities, or indicates a profound emotional architecture in addition to a proper emotional expressiveness. We assume that participants will indicate higher levels of anthropomorphism (H1), eeriness and creepiness (H2a & b), as well as de-anthropomorphism (H3) with EDTs displaying increasingly elaborated emotional features.

The student sample will be presented with a scenario similar to Stein and Ohler (2018). The EDT asks various questions about the changed living conditions caused by the Corona-Pandemic. The conversation is presented to the test participants either as a chat, video or as an interaction in which the test persons can answer the questions of the EDT themselves. In the process, each subject goes through all the emotional skills of the EDT. After being introduced to one of the versions of an EDT participants will read, watch or interact direkt with the EDT. Afterwards, participants rate the respective EDT in terms of anthropomorphism and de-anthropomorphism by asking participants how much they attribute uniquely human characteristics to it (Ruijten et al., 2019). Participants' emotional feelings will be assessed in two ways: (1) via self-report (eeriness subscale by Ho & MacDorman, 2017; creepiness by Langer & König, 2018) and (2) via cardiovascular activity (similar to Stein & Ohler, 2018). Also partici

pants' technophobia and technophilia via self-report (Martinez-Corcoles et al., 2017) as control variable will be measured. As this study is currently in the survey phase, results will be presented as soon as the survey is completed.

HYBRID SOCIETIES

A Mean Pose Based Approach for Walking Style Transfer

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Project

B02

Presenters

Sabrina Bräuer,
Samer Salamah,
Tom Uhlmann

ABSTRACT

The main goal of this project is to develop a parametric motion generator which can control the movements of an avatar so that the resulting motions will be perceived as natural human motions without any special personal movement and individual characteristics. Such a motion generator might be advantageous to disguise certain personal characteristics such as gender, age, or a physical disability, for instance, in a job interview involving avatars as representatives.

We developed a walking motion generator which is able to generate walking motions comparable to captured ones. This could be demonstrated by an online user study which showed that the synthesized motions are perceived almost as natural as the captured ones. The developed generator can synthesize walking motions using different human models and varied stride length as well as different speeds. However, it would generate motions of the same style as the motions used to create the underlying motion model. Thus, in order to extend the generator so that it can generate motions of different styles without the need to create a new model for each style, we analyzed and compared motion capture data of 12 subjects captured by us additionally to emotional walking data available on the internet. The analysis showed that normal walking motions of different subjects have different mean poses and that each subject can be re-identified based on his mean pose. The analysis of emotional stylized walking motions from single subjects showed also that motions from the same style have similar mean poses which differs clearly from the mean poses of other styles. Furthermore, the mean

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

pose of female motions differs from the mean pose of male motions.

Based on this information we developed a style transfer approach which adapts an input motion to a given style by modifying this motion so that its mean pose becomes similar to the mean pose of the given style. To facilitate the evaluation of the generated stylized motions and to be able to compare them with captured ones, we integrated the motion generator in the visualization software and extended it so that more than one avatar can be visualized simultaneously in real time. We will utilize this visualization to conduct a second user study to evaluate the results of the proposed style transfer approach.

The presented poster shows an overview of the whole project as well as the outcomes of the conducted user study for evaluating the naturalness of the synthesized motions. It also shows a brief description of the proposed style transfer approach together with the developed visualization framework.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

TechnoSapiens: Merging Humans with Technology in Augmented Reality

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Project

B03

Presenters

Carsten Rudolph,
Amin Dadgar,
Maximilian Bretschneider

ABSTRACT

We present a marker-less AR/DR system that can replace the arm of the user with a virtual bionic prosthesis in real-time including finger tracking. For this we use a mixed reality HMD that provides the user with a stereo image based on video-see-through (VST). We apply chroma-keying to remove the user's arm from each captured image and input reconstructed background information into the removed pixels. Before rendering the prosthesis model into the image we re-target motion capture data of the user's hand to the kinematic skeleton of the prosthesis to match the current hand pose. This system opens new research possibilities on self- and otherperception of bionic bodies. In a first evaluation study of the system, we propose that users perceive the virtual prosthesis model as a part of their body (i.e., that they experience a sense of ownership). We tested this assumption in a laboratory study with 27 individuals who used the system to perform a series of simple tasks in AR with their prosthesis. We measured body ownership and other measures with self-reports. In support of the hypothesis, users experienced a sense of body ownership. Also, a feeling of self-presence is induced during the task, and participants rated the overall experience as positive.

TECHNISCHE UNIVERSITÄT CHEMNITZ

DFG

HYBRID SOCIETIES

Dimensions of gaze in interaction settings

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Project

C01

Presenter

Inka Schmitz

ABSTRACT

Humans draw inferences about attentional targets based on gaze directions. Thus, the gaze is a means to express intentions or can act as a cue to understand intentions. When interacting by the means of technical aids or directly with artificial partners, the number of dimensions needed for gaze recognition or gaze representation depends on the use case: A minimal gaze display in the form of black and white cartoon eyes allows a 1D gaze direction distinction between right and left. In contrast, in a VR environment, eye-trackers built into HMDs allow capturing gaze targets as true 3D coordinates. Human gaze direction perception is notably complex, as it is physically based on two 2D projections onto the eyes retinas, but can still lead to concrete gaze target estimations in 3D space. The dimensionality of a represented gaze (e.g., robot head vs. eyes on 2D monitor) and that of the gaze capture system (e.g., eyes vs. webcam) often do not match, leading to a variety of dimensional combinations. Consequently, there are many specifics that should be considered when investigating and implementing gaze interaction capabilities. In this contribution, I will illustrate these differences with results from my recent work.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

Spatial orientation in telepresence – support of remote perception

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Project

C02

Presenters

Jennifer Brade,
Sven Winkler,
Xie Ning

ABSTRACT

When people move in reality, successful spatial orientation is usually enabled through continuous updating of egocentric spatial relations to the surrounding environment. However, in synthetic and remote environments like telepresence, cues from one's own movement are rarely provided, which typically impairs spatial orientation. Specifically, the user is not physically located in the mediated environment and thus interacts in an environment that does not correspond to the body-based cues generated by posture and self-motion in the real environment. This results in a conflict that leads to impaired spatial orientation. Especially with applications in which the user has to orient himself immediately or quickly. In this case, the user must be assisted in orientation (e.g., using teleoperated vehicles). Therefore, various factors are examined through both virtual reality studies and telepresence studies to help support remote orientation.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

Learning-based Adaptive Sampling for Manipulator Motion Planning

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Project

C03

Presenter

Carl Gäbert

ABSTRACT

Fast generation of optimized robot motions is crucial for achieving fluent cooperation in shared workspaces. Established sampling-based motion planning algorithms are guaranteed to converge to an optimal solution but often deliver low-quality initial results. To this end, learning-based methods reduce planning time delays and increase motion quality. Existing methods show promising results for low-dimensional and simulated problems. In the real world, sensor noise or a change of the robot's tool can cause a distributional shift to the training data. An adaptive sampling strategy is thus required to cope with possibly suboptimal samples and ensure fast motion planning in human-robot collaboration. In this work, we present a sampling strategy for fast and efficient manipulator motion planning which is based on a conditional variational autoen- coder. We test our model for three optimization objectives: path length in configuration space and workspace, as well as joint limit distances. In contrast to other works, we not only condition our model on the planning problem but also on motion progress. This allows for generating samples in the growth direction of the tree. Using our method, we obtain high-quality initial paths within less than one second of planning time.

TECHNISCHE UNIVERSITÄT CHEMNITZ

DFG

HYBRID SOCIETIES

Compliant and Interactive Telemanipulation

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Project

C04

Presenter

Stephan Schwarz

ABSTRACT

The safety regulations for robots participating in the everyday life are very high. The same applies to remote controlled, teleoperated robots interacting with humans. Especially when a physical manipulation is desired, these contacts have to be safe at all times.

For this reason, we purpose a telemanipulation system that combines stiff manipulation with a safety mechanism that adapts compliance when required. We introduce three system modes: operation, safety and recovery mode. If the external forces exceed a defined force threshold, the system switches to the compliant safety mode. A user input triggers the recovery process that increases the stiffness back to its nominal value. We suggest an energy tank, which limits the change of stiffness to ensure stability during recovering phase.

Furthermore, we introduce a camera-based assistance system to reduce the workload of complex tasks. The data from a RGBD camera are used to locate the desired orientation of the robot end effector relative to the target object. Position dependent virtual forces are applied to a shared autonomy algorithm which drags the telemanipulated robot to the desired orientation. This reduces the complexity of the task and by that the stress of the operator.

We are currently implementing this approach into a medical swab sampling scenario to prove its functionality, precision and reliability.

TECHNISCHE UNIVERSITÄT CHEMNITZ

DFG

HYBRID SOCIETIES

Grounded language learning: socio-pragmatic approach

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Project

D01

Presenter

Akira Charoensit

ABSTRACT

Young infants have always fascinated researchers by their ability to learn their first language. They effortlessly ground verbal concepts in the public, physical world around them. It has been shown that to do so they rely both on statistical learning and intention reading. The social aspects of language learning is however rarely explored in current literature on language grounding. This project is designed to fill this gap and simulate the mechanisms infants used in acquiring words and harnessing the power of these mechanisms to accelerate the lexical acquisition of artificial language learners. This is done by working with sequential data containing actual interaction between parents and infants and comparing various methods used to integrate different modalities of signals. The findings will make a basis for comparing artificial intelligence and developmental psychology and hopefully will inform both areas. A more advanced grounded language learning will also contribute to the performance of embodied technology in physical, public space which is essential to the CRC.

HYBRID SOCIETIES

Implicit driving cues and gap selection: A driving simulator study

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Project

D02

Presenters

Konstantin Felbel,
Ann-Christin Hensch

ABSTRACT

Automated driving aims to increase road safety, traffic efficiency and driving comfort. To support smooth interactions in mixed traffic, including manual traffic participants and automated vehicles (AVs), the communication and anticipation of prospective movements is required. In addition, understanding human drivers' preferences for AVs behaviour is important for the acceptance of automated driving. One approach to enable AVs to interact smoothly and acceptably is to study manual driving behaviour in various driving scenarios and derive specific parameters that could be implemented in AVs. Therefore, we conducted a driving stimulator study with N = 41 participants, varying different implicit driving cues during lane change manoeuvres in highway scenarios and gap sizes and speed limits in urban intersection scenarios. We recorded driving parameters and speech protocols to capture participants' decision making in these scenarios. In our poster presentation, we will present the study design, preliminary results for both scenarios, and implications for future studies in closer detail.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

Computer agents with non-native English as a credible compromise between solidarity and professionality: university communication in national cultural accents exemplified by Italian English

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Project

D03

Presenters

Sven Albrecht,
Rewa Tamboli,
Stefan Taubert

ABSTRACT

English is the dominant language in academia, with twice as many non-native speakers as native speakers. Therefore, a pedagogical agent speaking a non-native variety of English could improve the learning outcomes of university students speaking the same non-native variety. In a pre-study in Italy we evaluated our hypothesis that increased perceived credibility of an agent speaking non-native English could improve the learning outcomes of undergraduates. Preliminary results indicate that participants who listened to non-native speech exhibited better recall performance than the control group who listened to Standard American English.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

Accountable AI: (Ro-)bots in Algorithmic Situations

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Project

D04

Presenter

Sabrina Tietz

ABSTRACT

The project addresses the research gap of combining robots and bots as a shared research subject by comparing the robot *Alice* and the chatbot *Replika*. The research focus lies on the design strategies for anticipating and framing social situations between human and machine. The corresponding research questions asks which design elements are used that make the machine – in its interaction-relevant or cooperative properties, skills or limitations – assessable. For addressing the relevance of (ro-)bots as reality participants of the everyday world, we draw on the concept of "social displays" (Müller, 2022b) and outline the co-designing processes for the interaction with the machines. The diverse interaction designs will be discussed in terms of what we like to refer to as *algorithmic situations* – situations that are mediated and modified by AI technologies.

TECHNISCHE UNIVERSITÄT CHEMNITZ

DFG

HYBRID SOCIETIES

Certain Preprocessing and Time Series Analysis Techniques

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Project

E01

Presenters

Tobias Hofmann,
Paul Dommel

ABSTRACT

We present specific mathematical methods which are designed to handle time series data. We present preprocessing ideas, graph based approaches to identify states as well as classical time series analysis tools. Furthermore, we report on current work with A03. We invite you to discuss the potential and limitations of the proposed ideas.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG

HYBRID SOCIETIES

Social, Moral Machines: Perception of Embodied Digital Technologies

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Project

E02

Presenter

Sarah Mandl

ABSTRACT

To achieve functioning Hybrid Societies, the frictionless integration of Embodied Digital Technologies (EDTs) requires prior investigation of capacities and attributions of artificial actors. We started by identifying the necessary capacities for attributions of moral and legal responsibility, stating that currently only human beings could be held morally and legally responsible. Next, we investigated social perception of robots: Members of societies are attributed different qualities depending on how they are perceived. We found that social dimensions used for human beings are not sufficient for robots, which led us to develop and validate the Social Perception of Robots Scale (SPRS). The SPRS includes three factors, anthropomorphism, morality/sociability, and activity/cooperation, along which robots can be assessed. The assessment can for example take place in work settings prior to their implementation, or twofold pre- and post-implementation in order to identify possible pitfalls and implications for the design. In subsequent studies, we apply this instrument, extending it from robots to telepresence systems. Lastly, we focused on a rather overlooked aspect of EDTs, namely gender perception: Traditional psychological research has shown an association between the perceived gender of a person and stereotypic expectations. This is not exclusive to human beings, but also the case for robots. We investigated the extent of this phenomenon and discuss benefits against the background of problematic reiterations of gender stereotypes. The presented studies allow insights in sections which are important for the implementation of robots in different settings, i.e., work or private areas, and raise questions of design choices and possible implications thereof.

TECHNISCHE UNIVERSITÄT CHEMNITZ

DFG

HYBRID SOCIETIES

Managing Research Data Workflows with Micro-Frontends

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Project

INF

Presenters

Christoph Göpfert,
Jan Ingo Haas

ABSTRACT

Research data management activities are often presented in the Research Data Management Lifecycle. The individual activities provide researchers with guidelines on how to proceed in each individual phase of the lifecycle. However, the characteristics of the individual data differ depending on the research area. When describing the data, appropriate, domain-specific metadata profiles should be used for annotation in view of the FAIR (Findable, Accessible, Interoperable, Reusable) principles. In addition to the sometimes complex data annotation, another problem is that early career researchers in particular are not yet familiar with the common, established practices and standards.

Our objective is to represent the processes of the research data workflow described in the modelling language BPMN (Business Process Model and Notation) with the help of microfrontends. Workflows represented in BPMN describe arbitrary processes such as creating or publishing a paper or research data. In our approach, BPMN models are represented in the form of several components, with individual activities being mapped to microfrontends. The flexible and modular architecture created by combining microfrontends and BPMN models makes it easy to define approaches and workflows that help annotate research data from a wide range of fields and support early career researchers in implementing standards and established practices.

TECHNISCHE UNIVERSITÄT
CHEMNITZ

DFG