HYBRID SOCIETIES

How Can Hierarchical Representations of Chemical Processes Facilitate the Conducive Design of Human Machine Interfaces?

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Presenter

Nazanin Hamedi

Affiliation

Research Training Group 2323: Conducive Design of Cyber-Physical Production Systems, Technische Universität Dresden.

ABSTRACT

My poster consists of two sub posters: at first the conducive design concept is explained, and then a short structure of my thesis is presented.

Conducive design: Traditional engineering design methodologies did not consider the human working with the technology and focused on the technical part. The conducive design; on the other hand, aims at involving the human factors from the beginning of the design phase. In this section, the conducive design and its importance will be explained; and then, the projects in the RTG related to that, and also, the interdisciplinary approach towards conducive design will be discussed.

Task-oriented Navigation Hierarchies in Changeable Modular Plants: When it comes to complex structures, hierarchies are of considerable importance. The aim is to investigate if the description of phenomena happening in process systems in a hierarchical, computer understandable way would help operators making decision in difficult situations. To this end, a knowledge graph is considered which not only considers the process topology, but also the phenomena hierarchy. Afterwards, different queries are considered to examine the ability of this approach to predict the effect of one decision on the subsequent process steps.

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How do Conducive Forms of Interaction Contribute to the Mastery of Abrupt Reallocation Situations in Operating Highly-automated Agricultural Machines?

Date

Wednesday,
July 20, 2022

Time

11:20 - 13:15

Presenter

Sebastian Lorenz

Affiliation

Research Training Group 2323: Conducive Design of Cyber-Physical Production Systems, Technische Universität Dresden.

ABSTRACT

My poster consists of two sub posters: Part 1 provides insights into the Feldschwarm. This system is a highly automated field robot for tillage missions, that demonstrates technological capabilities and allows for a versatile anticipation of new work profiles in highly automated agriculture in the future. Part 2 is dedicated to my doctoral research that aims to provide insights into conducive forms of interaction that contribute to the mastery of CPPS requirements in this context.

Part 1: The Feldschwarm - Introduction of highly automated field robots in agriculture

Smaller, highly automated and swarm-organized machine systems increase flexibility and efficiency in agricultural production. Today's process optimization focuses heavily on improved machine orchestration strategies via swarm management systems and advanced farm management and information systems (FMIS). The “Feldschwarm” demonstrates the technological capabilities of such systems as they rely on reliable environmental detection and intelligent control systems. With these, the “Feldschwarm” demonstrator is able to perform field operations largely without operator intervention, leading to fundamental changes in work profiles. Abrupt control redistributions (ACRs) challenge operator’s competences and mastery experience and confront them with unbalanced workloads in demanding shifts of awareness. New, more complex, and less transparent technologies also make it more difficult to acquire the competences needed to successfully supervise and complement automation. Also,

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the parallelization of monitoring different machine configurations and processes on-site and off-site complicates situational awareness.

Part 2: How do Conducive Forms of Interaction Contribute to the Mastery of CPPS Requirements?

Shared control in highly automated CPPS leads to changing work profiles. Abrupt control reallocation challenge operators to provide and apply the right competencies to cope with new tasks and situations. Human-machine interfaces (HMIs) can help operators develop competencies with conducively designed information and interaction strategies. However, a comprehensive consideration of operator competencies in user- and work-context-sensitive HMIs, as well as a work analysis that combines technical features of CPPS and cognitive factors is missing so far. My research addresses this issue by identifying, describing, and ranking core competencies based on task analysis and expert interviews with the “Feldschwarm” demonstrator. Furthermore, an experimental study investigates whether and how self-efficacy influences operators' willingness to engage in abrupt control reallocation situations. Based on a developed conducive HMI that presents information about system behaviour and automation capabilities in a conducive manner, a second experimental study will examine the effects of the facilitative HMI on operators' self-efficacy, competencies, and willingness to engage in ACRs.

HYBRID SOCIETIES

Development of a method for the prospective ergonomic design of the physical reconfiguration of modular plants considering the “Safety Demonstrator”

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Presenter

Jonas Miesner

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ABSTRACT

This poster consists of two parts: The first part provides a presentation of the "Safety Demonstrator", a modular test facility, which the second part uses to develop an ergonomic method.

The Safety Demonstrator: The first part of this poster focuses on one reference context of GRK 2323, which is the modular process plants. In this context, the so-called "safety demonstrator" functions as an experimental modular plant for interdisciplinary research. A characteristic feature of this demonstrator is its realization according to the state of the art (VDI 2776-1), which enables cross-disciplinary research. For this purpose, theoretical principles are combined with the practical interpretation of this guideline.

Ergonomic reconfiguration of modular process plants: Additionally, this poster focuses on an inherent consequence of modularity in this regard. Modularization of process plants implies the adaptation of the system taking into account the human being as a part of the system. Consequently, the reconfiguration of this system must be considered from an ergonomic point of view (human-machine interaction). For this purpose, the development of a method for predictive planning of the human-machine interaction is approached in this second part, with the goal of planning reconfiguration of modular process plants in advance via simulation on open-source basis.

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Understanding Visualizations in Augmented Reality: Towards Conducive AR Systems

Date

Thursday,
July 21, 2022

Time

11:20 - 13:15

Presenter

Marc Satkowski

Affiliation

Research Training Group 2323: Conducive Design of Cyber-Physical Production Systems, Technische Universität Dresden.

ABSTRACT

With a growing availability of data and the associated information need, generating insights from visualizations becomes more and more commonplace in our everyday lives. In addition, the growing number of devices which enable the presentation and work with visualization leads to various combination of users, tasks, systems, and environments. One such device class are augmented reality (AR) head-mounted displays which enable users to analyze visualizations in arbitrary real-world environments, such as industrial settings. In my work, I focus on generating a better understanding on how such AR visualizations should be created while keeping the needs of the users in mind. For that, I examine (i) characteristics of users including their visualization literacy, (ii) properties of environments, such as the background, and (iii) authoring and development of systems. Based on qualitative and quantitative user studies in combination with technical prototypes and concepts, my research generates insights and guidelines which tackle timely challenges and will help to better design future AR visualization systems.

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