VSS

VIENNA young SCIENTISTS SYMPOSIUM

June 7-8, 2018

TU Wien

http://vss.tuwien.ac.at/

Edited by:

Philipp Hans

Gerald Artner
Johanna Grames
Heinz Krebs
Hamid Reza Mansouri Khosravi
Taraneh Rouhi

Cover photo by Matthias Heisler

Contents:

Introduction by Agata Ciabattoni, Hong-Linh Truong and Ezio Bartocci

IDS.1   Setareh **Zafari**
E330 - Institute of Management Science

ARTIFICIAL AGENTS IN SOCIO-TECHNICAL SYSTEM

IDS.2   Lukas **Winiwarter**
E120 - Department of Geodesy and Geoinformation

CLASSIFICATION OF 3D POINT CLOUDS USING DEEP NEURAL NETWORKS

IDS.3   Dragos-Cristian **Vasilescu**
E330 - Institute of Management Scienc

MACHINE INVENTION SYSTEMS: A NEW APPROACH TO INNOVATION

IDS.4   Lilly Maria **Treml**
E191 - Institute of Computer Engineering

SIMULATING THE HEART USING MAXELER DATAFLOW SUPER-COMPUTING AND FPGA

IDS.5   Andras **Mate**
TU Wien, Vienna, Austria

CONTROLLED AUTO-ADJUSTEMENT OF CONSTRUCTION DETAILS VIA BIM-ENVIRONMENTS AND PARAMETRIC MODELLING

IDS.6   Ulrich **Pont**
E259 - Institute of Architectural Sciences

CAN FORMAL MODELLING APPROACHES SUPPORT BUILDING PLANING AND PERFORMANCE MODELLING?

IDS.7   Lukas **Gnam**
E360 - Institute for Microelectronics

COMPARISON OF HIGH-PERFORMANCE GRAPH COLORING ALGORITHMS

IDS.8   Mahnameh **Taheri**
E259 - Institute of Architectural Sciences

A GENERAL SCHEMA FOR REPRESENTATION OF MONITORED DATA

IDS.9   Alexander **Pacha**
E193 - Institut für Visual Computing and Human-Centered Technology

SELF-LEARNING OPTICAL MUSIC RECOGNITION

Introduction by Iva Kovacic and Selim Erol

IND.1   Maria **Lara Miro**
E104 - Institute of Discrete Mathematics and Geometry

GEOMETRIC COMPUTATION TO SURFACE DESIGN

IND.2   Aryan **Shahabian**
E259 - Institute of Architectural Sciences

INTERNET OF THINGS AND THE FUTURE OF LIFE-CYCLE ASSESSMENT IN SMART WORLD

IND.3   Titanilla **Komenda**
E330 - Institute of Management Science

CYCLE TIME OPTIMISATION IN SELF-ORGANISING PRODUCTION LINES WITH HUMAN MACHINE COLLABORATION

IND.4   Philipp **Hold**
E330 - Institute of Management Science

THE CYBER PHYSICAL ASSEMBLY SYSTEM OF TU WIEN PILOT FACTORY INDUSTRY 4.0

IND.5   Sabine **Horvath**
E120 - Department of Geodesy and Geoinformation

CALIBRATION OF A ROBOT ARM USING LASER TRACKER MEASUREMENTS AND ARTIFICIAL NEURAL NETWORKS

IND.6   Nikias **Schachinger**
E260 - Institute of Urban Design and Landscape Architecture

ELEONAS ATHEN - INDUSTRY 4.0 CONCEPT

IND.7   Robert **Tomic**
E260 - Institute of Urban Design and Landscape Architecture

INDUSTRIALIZATION OF THE PROCESSES IN THE KITCHEN

IND.8   Ulrich **Pont**
E259 - Institute of Architectural Sciences

INTERFACING ARCHITECTURAL DESIGN AND INDUSTRY 4.0 CONCEPTS: A CASE STUDY

IND.9   Elahe **Ghalebi**
E191 - Institute of Computer Engineering

WAFERMAP PATTERNS CLUSTERING VIA VARIATIONAL AUTOENCODERS

IND.10   Galina **Paskaleva**
E194 - Institute of Information Systems Engineering

LOSS- AND DISTORTION-FREE TRANSLATION BETWEEN DATA MODELS IN OPEN BIM

IND.11   Martin **Koller**
E302 - Institute of Energy Systems and Thermodynamics

MODELLING METHOD FOR THE OPTIMAL OPERATION OF SENSIBLE THERMAL ENERGY STORAGES

IND.12   Mario **Potente**
E302 - Institute of Energy Systems and Thermodynamics

MULTI-SCENARIO SIMULATION AND EXERGY ANALYSIS OF A DISTRICT HEATING NETWORK FOR A CASE STUDY IN THE CITY OF VIENNA

IND.13   Aída **Santana Sosa**
E259 - Institute of Architectural Sciences

CONSTRUCTION MATTERS: INCREASING THE EFFICIENY IN DESIGN AND CONSTRUCTION PROCESS

IND.14   Julian **Kager**
E166 - Institute of Chemical, Environmental and Bioscience Engineering

ENGINEER'S PLAYGROUND: INTERFACING STUDENTS AND BIOREACTORS FOR TEACHING AND RESEARCH

IND.15   Christoph **Luckeneder**
E384 - Institute of Computer Technology
IN-FIELD SIMULATION FOR PROCESS TUNING IN INDUSTRY 4.0 APPLICATIONS

IND.16   Anna **Engedy**
E259 - Institute of Architectural Sciences

COMPUTATIONAL PREDICTION OF SOUND PROPAGATION IN URBAN CANYONS

Introduction by Thomas Konegger and Stefan Scheiner

NSM.1   Suzanne **Lancaster**
E362 - Institute of Solid State Electronics

HETEROSTRUCTURE FORMATION IN III-V NANOWIRES GROWN ON SILICON

NSM.2   Samira **Aien**
E259 - Institute of Architectural Sciences

PERFORMANCE EVALUATION OF VARIOUS FINISHING LAYERS FOR AEROGEL
PLASTER

NSM.3   Richard **Obmann**
E164 - Institute of Chemical Technologies and Analytics

POROUS POLYMER DERIVED SiCN-CERAMIC WITH DIRECTIONAL PORE
STRUCTURE OBTAINED BY FREEZE CASTING

NSM.4   Sonja **Baumgartner**
E308 – Institute of Materials Science and Technology

DIGITAL MATERIALS: A HYBRID 3D-PRINTING SYSTEM

NSM.5   Ulrich **Pont**
E259 - Institute of Architectural Sciences

EXPLORING THE TECHNICAL REQUIREMENTS OF VACUUM GLAZING FOR
CONTEMPORARY WINDOW CONSTURUCTIONS

NSM.6   Thomas **Haunold**
E165 - Institute of Materials Chemistry

LOW ENERGY ION SCATTERING (LEIS) - INTRODUCTION TO THEORY AND
PRACTICAL APPLICATION

NSM.7   Stefan **Helfert**
E163 - Institute of Applied Synthetic Chemistry

TAILOR-MADE POLYMER INTERFACES - SURFACES ON DEMAND

NSM.8   Matthias **Nebel**
E164 - Institute of Chemical Technologies and Analytics

MODIFICATION OF PRECERAMIC POLYMERS AND INVESTIGATION OF THEIR
POROSITY DEVELOPMENT

NSM.9   Johannes **Rauchenecker**
E164 - Institute of Chemical Technologies and Analytics

COATING OF TUBULAR SILICON NITRIDE SUPPORT STRUCTURES WITH POLYMER
DERIVED CERAMIC MEMBRANE LAYERS

NSM.10   Vera **Truttmann**
E165 - Institute of Materials Chemistry

FUNCTIONALIZATION OF SUPPORTED Au_{11} NANOCLUSTERS THROUGH LIGAND
EXCHANGE AND COMPARISON TO LIQUID PHASE REACTIONS

NSM.11   Tobia **Cavalli**
E165 - Institute of Materials Chemistry

DESIGN OF NON-SPHERICAL COLLOIDAL POLYMER PARTICLES FOR SELF-ASSEMBLED MATERIALS

NSM.12   Maciej **Kubeł**
AGH University of Science and Technology, Krakow, Poland

ADSORPTION OF CO_2 ON ACTIVATED LIGNITE

NSM.13   Elżbieta **Jószczuk**
AGH University of Science and Technology, Krakow, Poland

OBTAINING A LIGNITE-BASED BIOCHAR DISPLAYING ADSORPTION PROPERTIES

NSM.14   Alvaro **Peinado**
E165 - Institute of Materials Chemistry

Ag_x(SR) NANOCLUSTERS SUPPORTED ON ZEOLITES AS CATALYSTS FOR ENVIRONMENTAL PROCESSES

NSM.15   Raffael **Rameshan**
E165 - Institute of Materials Chemistry

STABILITY OF CATALYSTS IN SOLID OXIDE FUEL CELLS

NSM.16   Fatemeh **Hassanli**
E166 - Institute of Chemical, Environmental and Bioscience Engineering

INVESTIGATION AND RECOVERY OF FLARE GAS USING A MEMBRANE SEPARATION UNIT TO ENHANCE METHANOL SYNTHESIS PRODUCTION IN THE PRESENCE OF CATALYST DEACTIVATION

NSM.17   Stephan **Pollitt**
E165 - Institute of Materials Chemistry

DEVELOPMENT OF A TRULY HOMOGENEOUS AND MONODISPERSE CATALYTIC SYSTEM IN MEANS OF THIOLATE PROTECTED GOLD NANOCLUSTERS

NSM.18   Elise **Zerobin**
E163 - Institute of Applied Synthetic Chemistry

MOLECULAR DESIGN TOWARDS NOVEL PHOTO-INITIATORS WITH INCREASED TWO-PHOTON ABSORPTION CROSS SECTION

NSM.19   Patrick **Steinbauer**
E163 - Institute of Applied Synthetic Chemistry

RAFT POLYMERS AS ADHESION MOTIFS FOR BONE GLUE APPLICATIONS

NSM.20   Katharina **Ehrmann**
E163 - Institute of Applied Synthetic Chemistry
THERMOPLASTIC POLYURETHANES AND THEIR APPLICATION AS ELECTROSPUN BIODEGRADABLE SOFT TISSUE MEDICAL PROSTHESES

NSM.21   Elisabeth **Staudigl**
E325 - Institute of Mechanics and Mechatronics

MODELING ELECTRO-ACTIVE DIELECTRIC AND ELECTROSTRICTIVE ELASTOMER PLATES IN THE FRAMEWORK OF NONLINEAR STRUCTURAL ELECTRO-MECHANICS

NSM.22 Benjamin **Klebel**
E138 - Institute of Solid State Physics

ELECTRONIC TRANSPORT PROPERTIES AND FERMI SURFACE TOPOLOGY IN CUPRATE SUPERCONDUCTORS

NSM.23 Josef **Fuchs**
E166 - Institute of Chemical, Environmental and Bioscience Engineering

STATE OF RESEARCH IN THE FIELD OF DUAL FLUIDIZED BED STEAM GASIFICATION OF BIOMASS WITH IN-SITU CO_2 CAPTURE

NSM.24 Andreas **Nagl**
E165 - Institute of Materials Chemistry

SELECTIVE ETHANOL OXIDATION ON SUPPORTED BIMETALLIC GOLD CATALYSTS: BASE CHEMICALS FROM "GREEN" PROCESSES

NSM.25 Philipp **Hans**
E057 - X-ray center XRC

CRYSTALLOGRAPHY AS A VERSATILE RESEARCH TOOL

NSM.26 Noelia **Barrabes**
E165 - Institute of Materials Chemistry

$Au_n(SR)_m$ NANOCLUSTERS: TOWARD ATOMICALLY DESIGN NANOCATALYSTS

NSM.27 Christoph **Rameshan**
E165 - Institute of Materials Chemistry

ENHANCING CATALYTIC ACTIVITY BY ELECTROCHEMICALLY DRIVEN METAL NANOPARTICLE EXSOLUTION

NSM.28 Clara **Garcia**
E165 - Institute of Materials Chemistry

SUPPORTED GOLD NANOCLUSTERS: EFFECT OF CLUSTER SIZE AND OXIDE MATERIAL UNDER OXIDATION PROCESSES

NSM.29 Jia **Wang**
E165 - Institute of Materials Chemistry

MATERIAL DESIGN FOR PHOTOCATALYTIC H_2 PRODUCTION FROM WATER SPLITTING

NSM.30 Elias K. **Bumbaris**
E165 - Institute of Materials Chemistry

ENVIRONMENTALLY FRIENDLY GENERATION OF HIGH-PERFORMANCE POLYIMIDE FOAMS USING MONOMER SALTS

NSM.31 Florentyna **Sosada-Ludwikowska**
E362 - Institute of Solid State Electronics

DRY TRANSFER PROCESS OF MO_X NANOWIRES USED FOR GAS SENSING APPLICATIONS

CYCLE TIME OPTIMISATION IN SELF-ORGANISING PRODUCTION LINES WITH HUMAN MACHINE COLLABORATION

Titanilla Komenda, Wilfried Sihn

E330 - Institute of Management Science at TU Wien

INTRODUCTION

Human machine collaboration refers to humans directly working together with machines on the same workpiece and in the same workspace. In self-organising production lines, humans and machines determine their location of collaboration based on different parameters individually. Thus, cycle time estimation is not trivial, as it depends on order sequence, availability, distance to other collaboration partners, motion parameters and obstacles on the path [1]. In this sense, there is a need for a simulation model, predicting cycle time for this kind of production lines.

MAIN IDEA AND RESEARCH FIELDS

Even though, digital machine and human models already exist to do feasibility, cycle time and ergonomic analyses, they are not used for a consistent planning process in terms of cycle time estimation of collaborative tasks [2]. State-of-the-art simulation tools consider humans and machines separately when it comes to cycle time estimation [3]. One of the main reasons is the different approach regarding motion modelling [4]. As digital human models are also considered as multi-body systems, the high complexity of human motion modelling leads to a lack of performing tasks on moved objects [5]. Furthermore, models mapping malfunctions of the control system or the psychophysiology of humans are not existent and integrated in such consistent process planning tools [6].
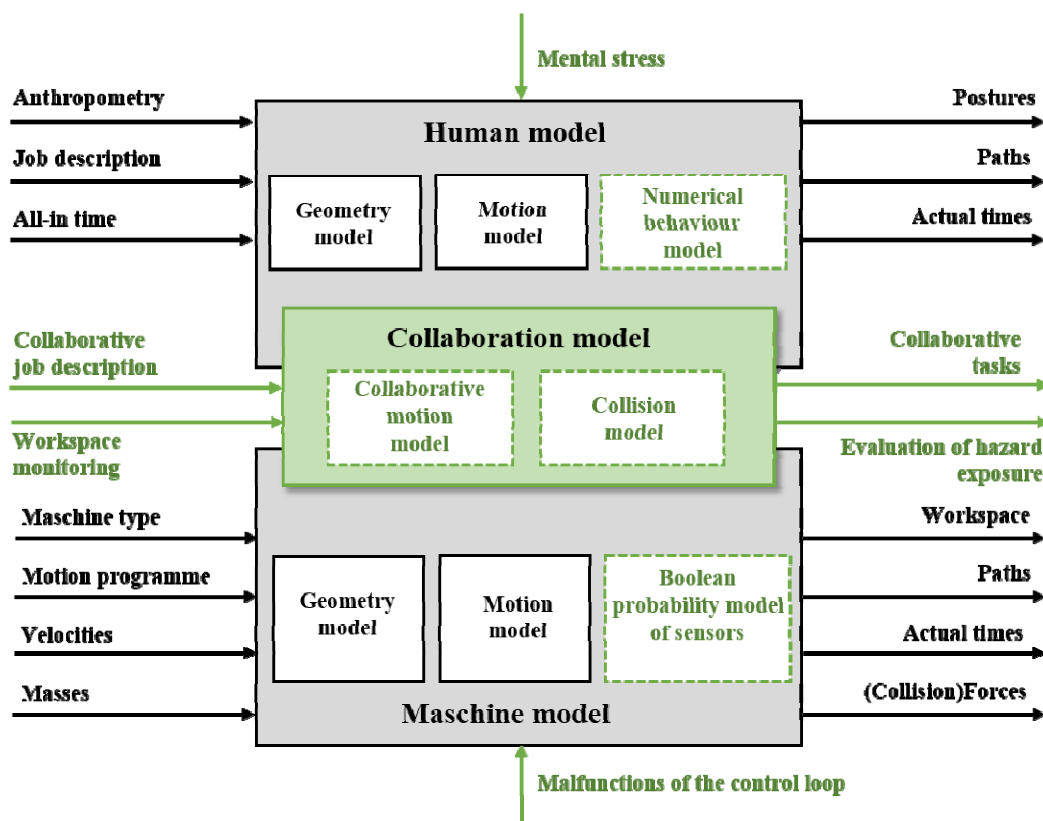
Picture 1: Extended model parameters for human machine systems

RESEARCH ACTIVITIES AND RELEVANCE

In this sense, influencing factors of cycle time in collaborative tasks are analyzed [7]. A simulation model is developed, considering not only motion models but also a logical model of the control system including malfunctions as well as a psychophysiological model of collaborative partners. Based on an analysis and classification of collaborative tasks, requirements for modelling human machine collaboration are defined. The collaborative system is then modelled as a simulation-ready hybrid model [8], which is optimised by a multi-criteria optimisation considering production requirements and constraints. Even though, design parameters for collaborative tasks are often in conflict with cycle time and productivity, there is an optimal set of collaborative parameters meeting this trade-off. Based on multi-criteria optimisation an optimal set of physical, psychophysiological and operational costs can be determined for each step of production. The application of the model is shown on different use-cases.

ACKNOWLEDGEMENT

REFERENCES

[1] Cherubini, A., Passama, R., Crosnier, A., Lasnier, A. und Fraisse, P. 2016, 'Collaborative manufacturing with physical human-robot interaction', Robotics and Computer-Integrated Manufacturing, Band 40, Ausgabe August 2016, S. 1-13.

[2] Leidholdt, W. 2014, 'Die Simulation von Mensch-Roboter-Kollaboration – unabdingbar für die Prozessgestaltung', in Produktion und Arbeitswelt 4.0. Aktuelle Konzepte für die Praxis: TBI2014 – 15. Tage des Betriebs- und Systemingenieurs, E. Müller (Hrsg.), Wissenschaftliche Schriftenreihe des Instituts für Betriebswissenschaften und Fabriksysteme, Chemnitz, S. 109-115.

[3] Komenda, T., Malisa, V. und Leidholdt, W. 2016, 'Modellierung von Arbeit an bewegten Objekten. Digitale Menschmodelle für Mensch-Maschine-Kollaboration', atp edition. Automatisierungstechnische Praxis, Band 2016, Ausgabe 12, München, S. 34-43.

[4] Komenda, T. und Leidholdt, W. 2016, 'ema – a Software Tool for Planning Human-Machine-Collaboration', SNE Simulation Notes Europe, Band 26, Ausgabe 1, Wien, S. 27-32.

[5] Komenda, T. und Breitenecker, F. 2016b, 'Modellierung von Arbeit an bewegten Objekten in kollaborativen Betriebsformen', in Proceedings of the 23rd Symposium Simulationstechnik (ASIM 2016), T. Wiedemann (Hrsg.), ARGESIM, Dresden, S. 17-23.

[6] Komenda, T. und Breitenecker, F. 2016a, 'Nonlinearity in Collaborative Applications incorporating Humans and Machines: Identification and Modelling', in Proceedings of the Vienna Young Scientists Symposium (VSS), B. Ullmann (Hrsg.), Book-of-Abstracts.com, Wien, S. 94-95.

[7] Komenda, T. 2016, 'Systematic Analysis of Collaborative Human-Machine-Scenarios: Task Execution on Moved Objects', in Proceedings of the 14th Industrial Simulation Conference (ISC'14), N. Vasiliu (Hrsg.), EUROSIS-ETI, Bucharest, S. 47-49.

[8] Deatcu, C. und Pawletta, T. 2009, 'Towards Dynamic Structure Hybrid DEVS for Scientific and Technical Computing Environments', SNE Simulation Notes Europe, Band 19, Ausgabe 3-4, S. 75-78.