Table of contents

Volume 1

Foreword XV
Members of the International Program Committee XVIII
Members of the International Paper Review Panel XIX

1. INVITED PAPERS

Virtual engineering at work: The challenges for designing intelligent products 3
Herman Van der Auweraer (B)

The changing nature of industrial design: Towards product-service systems 19
Cees J.P.M. de Bont (NL)

Visualizing information during early design 27
Filippo A. Salustri (CA)

The upcoming and proliferation of ubiquitous technologies in products and processes 47
Bart Gerritsen, Imre Horváth (NL)

Advanced force-feedback solutions and their applications 65
Jérôme Perret, Pierre Vercruysee (F)

Digital human models: An overview of development and applications in product and workspace design 73
Niels C.C.M. Moes (NL)

Methodology of improving the organization of the textile and clothing manufacturing process 85
Darko Ujević, Dubravko Rogale, Slavenka Petrak, Blaženka Brlobašić Šajatović, Ksenija Doležal (HR)

2. INDUSTRIAL DESIGN ENGINEERING

Content and context mapping

Linguistic analysis of natural language engineering requirement statements 97
Carl Lamar, Gregory M. Mocko (USA)

Formalizations of functions within the DOLCE ontology 113
Stefano Borgo, Massimiliano Carrara (I), Pawel Garbacz (PL), Pieter E. Vermaas (NL)

Grammars based product modelling and computing in CAD systems 127
Egon Ostrosi, Sebastien Roth, Didier Klein (D) (USA)

Design in nature and engineering: Knowledge transfer through a data-base of biological solutions 143
Francesco Rosa, Edoardo Rovida, Roberto Viganó, Edoardo Razzetti (I))

Investigations of technical functions

Formalization of technical functions: Why is that so difficult? 155
Peter Kroes (NL)

Towards a formal representation of the functional basis verbs 167
Chiradeep Sen, Joshua D. Summers, Gregory M. Mocko (USA)

Technical functions: Towards accepting different engineering meanings with one overall account 183
Pieter E. Vermaas (NL)

Implementation and representation of creativity enhanced FBS model based on quotient space theory 195
Yu-Xin Wang, Zhi-Juan Liu, Xu-Guang Zhang (CN), Alex Duffy (UK)

Modeling humans and behaviors

Parametric modeling of the human body shape by statistical model 211
Ya-Tien Tsai, Chih-Hsing Chu (TW), Charlie C. L. Wang (HK)

A constraint based human model for simulating and predicting postures 221
Baljinder Singh, Ben Hicks, Tony Medland, Glen Mullineux (UK), Johan F.M. Molenbroek (NL)

Parametric human body modeling system for virtual garment fitting 231
Seung-Yeob Baek, Kunwoo Lee (KR)

3D modeling of prosthesis socket with a knowledge based approach 243
Giorgio Colombo, Giancarlo Facoetti, Stella Gabbiadini, Caterina Rizzi (I)

Facilitating informed design

The Chinese face: A 3D anthropometric analysis 255
Yan Luximon, Roger Ball, Lorraine Justice (HK)

Evaluating user interfaces for engineering tasks with biometric logging 267
Zoe Kosmadoudi, Raymond C. W. Sung, Ying Liu, Theodore Lim, James Ritchie (UK)

A representation of artefacts and interactions to supplement function 277
Benjamin W. Caldwell, Gregory M. Mocko, Georges M. Fadel (USA)

Challenges for shape modeling

The framework of a feature based freeform shape indexing system 291
Yu Song, Joris S. M. Vergeest, Imre Horváth, Tjamme Wiegers, Adrie Kooijman (NL)

Direct modification of finite element meshes preserving group information 303
Ruding Lou (F), Franca Giannini, Bianca Falcidieno (I), Jean-Philippe Pernot (F), Philippe Véron (F), Alexei Mikchevitch, Raphaël Marc (F)

Improving quality of freeform surfaces using genetic algorithm and highlight lines 317
György Gyurecz, Gábor Renner (H)

Fast hierarchical discretization of parametric boundary representations 331
Mikhail Frank, Horea T. Ilies (USA)

Product development methodologies

Five hypotheses and a meta model of engineering design processes 343
Albert Albers (D)

Experiences of set based concurrent engineering in four product developing companies 357
Dag Raudberget, Staffan Sunnersjö (S)

The use of methods by advanced beginner and expert industrial designers in non-routine situations: A quasi-experiment 371
Jaap Daalhuizen, Petra Badke-Schaub (NL)

Preservation of design knowledge by capture and use of constraints evolution 383
Lian Ding, Jason Matthews, Glen Mullineux (UK)

3. VIRTUAL DESIGN ENVIRONMENTS

Aspects of integration in design

A C++-Lisp-CAD interface for virtual 2-D gear prototyping 399
Vasilios Spitas (GR), Christos Spitas (NL)

Change management, modularity and design for X: A design supporting tool based on an integrated approach 407
Roberto Raffaeli, Maura Mengoni, Michele Germani (I)

Adding a material and process selection to the systematic engineering design process 421
Jörg Feldhusen, Martin J. Benders, Benedikt Günther (D)

Method, models, and tools for computer aided design and computer aided engineering integration 433
Okba Hamri, Jean-Claude Léon (F), Franca Giannini, Bianca Falcidieno (I)

Virtual teams and collaboration

A tabletop-based collaborative environment to enhance direct interactions between designers 447
Christophe Merlo, Nadine Couture (F)

A novel knowledge-based approach to support virtual teamwork in collaborative design 461
Maura Mengoni, Michele Germani, Margherita Peruzzini, Marco Mandolini (I)

Leveraging design rationale to improve collaborative co-design CAD environments 475
Jordan D. Ryskamp, C. Greg Jensen, Kenneth Mix, Edward Red (USA)

Multidisciplinary research on trust in interorganizational virtual product development cooperation 487
Reiner Anderl, Diana Völz, Daniel Spieβ, Christian Schilcher, Brigitte Petendra (D)

Virtual reality environments

What makes an augmented reality design review for automotive development successful? 499
Rafael Radkowski (D)

Mixed reality seating buck system for ergonomic evaluation 511
Giandomenico Caruso, Leonardo Tedioli (I)

Fraud detection in virtual worlds 525
Wai-Sze Leung, Elizabeth M. Ehlers (SA))

A new principle for controlling contact forces in interactive grasping simulation 541
Zoltán Rusák (NL), Csaba Antonya (RO), Imre Horváth (NL)

Virtual reality techniques

A conceptual structure for heterogeneous remote product data visualization 551
Eliab Z. Opiyo, Imre Horváth (NL)

Approach to a semi-immersive tool for rider simulation training with an application for road sign perception 565
Roberto Viganó, Edoardo Rovida, Riccardo Vincenti, Marco Ramondino (I)

Virtual prototyping of mechanisms using customized haptic feedback 577
Doru Talabă, Hunor Erdélyi (RO)

Capturing engineering intention

Using global communication trends for automated design rationale capture 585
Kenneth Mix, C. Greg Jensen, Jordan Ryskamp (USA)

Sensorial profile anticipation by engineering objective methods for competitiveness in textile field 597
Giuseppe Salvia, Valentina Rognoli, Marinella Levi (I)

3-D shapes out of 2-D freehand sketches: Creative spatial interpretation of sketches 609
Sabine Roth-Koch, Engelbert Westkaemper (D)

A spatial tracked touch screen for computer aided sketching 621
Alfredo Liverani, Alessandro Ceruti, Gianni Caligiana (I)

Situated design education

Development of a ubiquitous learning prototype to address vehicle telematics 631
Jouke Verlinden (NL), Eero Korhonen (FL), David Peck, Imre Horváth (NL)

Computer graphics instruction for virtual engineering in a native Windows environment 641
Roger Mayne (USA)

'Products in action': Designer-friendly teaching of fundamental engineering topics 653
Wilhelm F. van der Vegte, Ernest J. J. Breemen, Marius G. van de Ruijtenbeek, Gerald Wisse, Emiel M. van Elderen (NL)

Educating industrial design engineers in injection moulding and mould construction 667
Erik Tempelman, Jan L. Spoormaker (NL)

Volume 2

4. VIRTUAL ENGINEERING APPROACHES

Engineering analysis and optimization

Modelling and simulation of a novel worm gear drive having point-like contact 685
László Dudás (H)

Topology optimization: Hybridization of partial solutions versus traditional multi-goal methods 699
Alessandro Cardillo, Gaetano Cascini, Francesco Saverio Frillici, Federico Rotini (I)

Design optimization and analysis of a new rear underrun protective device for truck 713
Tommaso Ingrassia, Vincenzo Nigrelli (I)

Investigation of an approach for in-line testing of food packs 727
Amanda Park, Jason Matthews, Glen Mullineux (UK)

Simulations in virtual environments

Integrated metal forming, vibration analysis, and thickness optimization of sheet metal parts 737
Raghu Echempati, Andrew O. Fox (USA)

A virtual reality approach for usability evaluation of a wheelchair-mounted robot manipulator 749
Giuseppe Di Gironimo, Giovanna Matrone, Andrea Tarallo, Mariangela Trotta, Antonio Lanzotti (I)

Functional behaviour simulation of industrial products in virtual reality 763
Fabio Bruno, Agostino Angilica, Francesco Cosco, Maurizio Muzzupappa (I)

Design of computer experiments applied to modeling compliant mechanisms 775
David Restrepo Arango, Diego A. Acosta, Sebastián Durango, Oscar E. Ruiz (CO)

Applications of virtual engineering

Development of contact-theory for analysis of wire rope strand using p-version finite element method 789
Róbert Beleznai, István Páczelt (H)

Virtual engineering in the strength design of power transmission gears 803
Katsumi Inoue (J)

Complexity of the gear cutter: A focused discussion of competitive gear manufacturing techno-economics 817
Christos Spitas (NL), Vasilios Spitas (GR)

Support structure optimization for freeform architectural design 829
Leon Kos, Simon Kulovec, Jože Duhovnik (SI)

Application of agent technologies

Cloud computing for synergised emotional model evolution in multi-agent learning systems 841
Tristan D. Barnett, Elizabeth M. Ehlers (SA)

Agentes - Agent-based engineering of mechatronic products 855
Ralf Stetter, Holger Voos (D)

Collaboration coordination via cellular automata 867
Duncan A. Coulter, Elizabeth M. Ehlers (SA)

Product service systems

Designing the real-time resource allocation process of an air taxi company like Air France/KLM's BlueJet from a value-processing perspective 879
Rayhaneh Farhoudi, Wouter W. A. Beelaerts van Blokland, Sicco C. Santema, Ricky Curran (NL)

Adaptive change management for industrial product-service systems 891
Michael Abramovici, Fahmi Bellalouna, Jens Christian Göbel (D)

Coping with the knowledge sharing barriers in product service systems design 903
Marco Bertoni, Andreas Larsson (S)

Frequentist approach to optimization of life test sampling plans 915
Nicholas A. Nechval, Konstantin N. Nechval, Maris Purgailis, Vadim Danovich, Philip Lipman, Vladimir Strelchonok (LV)

Drivers for competitive engineering

Supply driven design 929
Wim Poelman (NL)

Tool based support of collaborative design from specification development to CAD modelling 941
Estelle Frey, Egon Ostrosi, Samuel Gomes, Lionel Roucoules (F)

Assembly sequences definition through hierarchical subassembly approach 951
Gilberto Osorio Gómez (CO), Roberto Viganó (I)

Development of an information model for a virtual surgical environment 961
Joe Cecil, Miguel Pirela-Cruz (USA)

5. SOCIAL AND ECOLOGICAL SUSTAINABILITY

Innovative product development

Design customisation in multi-project environments: Using process simulation to explore the issues 975
Claudia Eckert, David Wynn, John Clarkson (UK)

A STEP-based framework to combine creativity, project management, and technical development in industrial innovation 989
Davide Polverini, Serena Graziosi, Ferruccio Mandorli (I)

Geometry robustness evaluation for common parts in platform architecture 1003
Peter Edholm, Lars Lindkvist, Rikard Söderberg (S))

Towards defining technical failure for integrated product development 1013
Luca Del Frate, Maarten Franssen, Pieter E. Vermaas (NL)

Knowledge management in conceptualization

Integration of validation activities in ontology development processes 1027
Albert Albers, Quentin Lohmeyer, Hannes Schmalenbach (D)

A user study of interpretability of engineering design representations 1041
Rachel Hannah, Shraddha Joshi, Joshua D. Summers (USA)

A framework of describing and managing engineering analysis modeling knowledge for design validation 1055
Yutaka Nomaguchi, Tomohiro Taguchi, Kikuo Fujita (J)

Design relevance in an industrial design engineering WIKI 1069
Regine W. Vroom, Alexander M. Olieman (NL)

Industrial knowledge management

Occupational health and safety improvement throughout knowledge management 1085
Mario Fargnoli, Margherita De Minicis, Giulio Di Gravio (I)

A knowledge network evaluation system for casual product knowledge integration 1097
Yun Seon Kim, Kyoung-Yun Kim (USA)

Knowledge management in topology optimization of automotive components 1109
Maurizio Muzzupappa, Loris Barbieri, Fabio Bruno, Maria Laura Luchi, Giorgio Malito (I)

Systematic aggregation of dependency models - Principles and forms of aggregating several domains 1121
Matthias Kreimeyer, Nikolas Bradford, Stefan Langer, Wieland Biedermann, Udo Lindemann (D)

Sustainability assessment systems

Assessment of ecological profile of industrial products according to environmental legislation 1135
Mario Fargnoli, Simona Bisillo, Francesco Costantino, Massimo Tronci (I)

Critical review of smart energy saving in household electronics 1147
Els Du Bois (B), Imre Horváth (NL), Karine van Doorsselaer (B)

Guiding concept generation based on ontology for customer preference modeling 1161
Dongxing Cao, Karthik Ramani, Zhanjun Li (USA)

Enhancing sustainability of products

A methodological approach for noise reduction in household appliances 1175
Davide Russo, Tiziano Montecchi (I)

The design development and trial testing of Microcab 1189
Michael Tovey, John Jostins (UK)

Enabling an efficient SLCA by interfacing selected PLM LCI parameters 1199
Alessandro Morbidoni, Marco Recchioni, Harald E. Otto, Ferruccio Mandorli (I)

Artifact design and simulation system for sustainable product design 1211
Kazuhiro Sakita (J)

Strategies and policies for sustainability

Design for material hygiene - An ecodesign strategy for improved recycling of polymers 1223
Conrad Luttropp, Jan Johansson, Francisca Vilaplana, Emma Strönberg, Sigbritt Karlsson (S)

Understanding and modelling user behaviour in relation to sustainable innovations: The living lab method 1233
Conny Bakker, Daan van Eijk, Sacha Silvester, Miriam Reitenbach, Annalise de Jong, David Keyson, Kakkee Scott (NL)

In-sync with stakeholders: Corporate social responsibility on local and sub-regional level 1245
György Ádám Horváth, János Szlávik (H)

Ontology-based system for supporting the control of uncertainty in the product lifecycle 1259
Reiner Anderl, Kai Mecke, Andre Sprenger, Oliver Weitzmann (D))

6. EXECUTIVE SUMMARIES OF FORUM PAPERS

Issues of shape representation

Optimizations for Bernstein-based solvers using domain reduction 1275
Christoph Fünfzig, Dominique Michelucci, Sebti Foufou (F)

Interactive wavelet simplification of 2D sketches for CAD curve styling 1277
Loredana Chieppa, Michele Fiorentino, Antonio Emmanuele Uva, Giuseppe Monno (I)

Functional segmentation of strokes for product sketch understanding 1279
Prasad S. Onkar, Dibakar Sen (IN)

Assigning parameter sets to shapes 1281
Tjamme Wiegers, Yu Song, Joris S. M. Vergeest (NL)

Can videogame devices assist CAD modeling? An experimental investigation 1283
Michele Fiorentino, Antonio Emmanuele Uva, Giuseppe Monno (I)

User orientated approaches

A survey of tools for understanding and exploiting the link between shape and emotion in product design 1285
Franca Giannini, Marina Monti (I)

Meanings of materials: Findings and implications 1287
Elvin Karana (NL)

The development of an industrial design engineering wiki: WIKID 1289
Regine W. Vroom, Raymond Jelierse, Alexander M. Olieman, Joris J. van 't Ende, Adrie Kooijman (NL)

Designer centered mass-customization system for swimwear design 1291
Yi Fan Zhang, Yan Luximon, Ameersing Luximon, Ajit Kumar Pattanayak, Wing Chung Wong (HK)

Porous design framework towards individualized design 1293
Yuemin Hou, Linhong Ji (CN)

Reflections on product development

The effect of visual feedback on learnability and usability of design methods 1295
Ronald Poelman, Zoltán Rusák, Alexander Verbraeck (NL), Leire Sorasu Alcubilla (E)

Effective concept exploration during conceptual design 1297
Davide Russo, Daniele Regazzoni (I)

Patterns in product development: Background, application and exemplification 1299
Albert Albers, Tobias Deigendesch (D)

A study of designer familiarity with product and user during requirement elicitation 1301
Beshoy Morkos, Gary Palmer, Joshua D. Summers (USA)

Development of systems of objectives in early activities of product development processes 1303
Albert Albers, Sabine Muschik (D)

Creativity, inspiration and optimization

Creativity, inspiration and design exploration through modification of the Juicy Salif 1305
Ameersing Luximon, Yan Luximon (HK)

Synergies between systematic innovation and interaction design for product development 1307
Stefano Filippi, Barbara Motyl (I)

Method to optimise the product development process in the automotive supply industry 1309
Jörg Feldhusen, Arun Nagarajah, Sebastian Schubert (D)

Practice of knowledge management

A model to analyse uncertainties on stakeholder's evaluations in technical systems 1311
Roland Engelhardt, Marion Wiebel, Hermann Kloberdanz, Herbert Birkhofer (D)

Supporting functional knowledge exchange between functional taxonomies by establishing function-behaviour links 1313
Dingmar van Eck (NL)

Knowledge management for new product development processes in small and medium-sized enterprises 1315
Sarah Rohaert, Rudy Martens (B), Joris S. M. Vergeest (NL)

Architecture and modules of an ISO GPS based collaborative framework for product development 1317
Ilaria Cristofolini, Stefano Filippi (I)

Application of environmental characteristic of materials in sustainable development 1319
Zbigniew Klos, Robert Lewicki, Krzysztof Koper (PL)

Benefiting from virtual reality

Participatory design and virtual concepts for postural seat system innovation 1321
Stanislao Patalano, Antonio Lanzotti, Francesca Galileo, Giovanna Matrone (I)

A mixed reality annotation tool for collaborative design 1323
Francesco Ferrise, Marco Ambrogio, Enrico Parise (I)

Through the screen 3D interaction 1325
Avinash Dawari, Dibakar Sen (IN)

Parameter settings and mixed reality perception on Holovizio 1327
Youri Tegelaers, Adrie Kooijman, Imre Horváth (NL)

Web 2.0 – Progress and regress 1329
Rutna Mangal (USA)

Information systems and ontologies

Current state of information technology applications in construction industry in the Gaza strip 1331
Adnan Enshassi, Fayez Al-Massri (PS), Bernd Kochendoerfer (D)

Uniform behavior modeling for mechatronic systems based on SYSML parametric diagram: A case study 1333
Yusheng Liu, Yue Cao, Shuming Gao (CN)

An integrated environment for design optimization: Solution and exploration 1335
Roger Mayne (USA)

Approach for mechatronic ontologies in conceptual design 1337
Peter Hehenberger (A)

A taxonomy of engineering knowledge for design automation 1339
Staffan Sunnersjo (S)

Computer aided engineering

On the kinematic optimization of Wolfrom planetary gear trains 1341
Dimitar Karaivanov (BG)

Redesign of a child carrying board 1343
Jan L. Spoormaker, Jaap Horst (NL)

Sustainable design and the law of diminishing returns 1345
Jan H. Jooste (SA), Ulrich D. Holzbaur (D)

Computer aided engineering for sheet metal forming: Definition of a springback quality function 1347
Francesca Campana, Edoardo Mancini (I)

"First time right" design of an aluminum-intensive spaceframe vehicle 1349
Anindya Deb (IN), Lau Langeveld (NL)

Scientific problems of engineering

Analytical solution of non-Fourier heat conduction in a cuboid solid under space-dependent heat flux boundary condition 1351
Seyfolah Saedodin, Mohsen Torabi (IR)

Prerequisites for integral design research 1353
Hennes de Ridder, Reza Beheshti, Sander van Nederveen (NL)

Adapting a causality model of technical systems to represent socio-technical systems: A case study from the BOP 1355
Santosh Jagtap, Prabhu Kandachar (NL)

A practical theory of versioning and status control in product lifecycle management 1357
Henk Jan Pels (NL)

Optimal stopping rules in a new product lifetime testing 1359
Nicholas A. Nechval, Konstantin N. Nechval, Maris Purgailis, Gundars Berzinsh, Vadim Danovich, Philip Lipman (LV)

Combining knowledge and technologies

Wireless lake project 1361
David Peck, Katja Leuschner, Judit Kemeny, Rens van den Brand, Steven van Campen (NL)

Retaining organisational knowledge - Methods and philosophies 1363
Lee Hall (UK)

Computational developmental mechanisms in design: Induction, gene transcription, and commitment 1365
Yuemin Hou, Linhong Ji (CN)

7. AUTHOR INDEX

Author index 1369