Innovative methods and tools I

Session: D211

Oral presentations

Chairman: Amaresh Chakrabarti (IND)

Wednesday - May 17, 2006.

08:30 - 10:30 | Congress hall Ragusa

STRATEGIC DIVERSIFICATION BY NETWORK PORTFOLIO ANALYSIS

Baumberger G.C., Braun T., Lindemann U., Maurer M. - *Technical University Munich (DEU)*   177

To retain competitiveness and to ensure sustainable growth enterprises continuously have be innovative. Diversification, that means to develop new products or to enter new markets, is considered to be one strategic opportunity. Unfortunately, in practice especially small and medium-sized enterprises often do not know, which new products/markets they should focus on. To help SMEs finding new product ideas in a systematic but still comparatively short way, a new methodological approach shall be presented. By the method of network portfolio analysis new business opportunities shall be identified by analysing existing, successfully established product portfolios of competing companies.

VISUAL SPACE PERCEPTION MODEL IDENTIFICATION BY EVOLUTIONARY SEARCH

Bittermann M., Sariyildiz S., Ciftcioglu Ö. - *Delft University of Technology (NLD)*   185

Visual perception of Spaces is relevant for design. Designs, which satisfy perceptual requirements are found based on assessments of perceptual implications. For this purpose a probabilistic model of human visual space perception is used. Focus of this paper is the identification of optimal model parameters, so that the perception model matches the perception of human experimenters. This is accomplished by genetic algorithm, which is an evolutionary optimization method from the domain of computational intelligence, which is able to deal with the probabilistic and discrete nature of the perception model to be identified.

A METHOD OF VALUE CUSTOMIZATION

Sakao T., Shimomura Y., Comstock M., Sundin E. - *Darmstadt University of Technology (DEU)*   339

The paper presents a method of value customization based on the modelling and design methods of Service Engineering. This aims at increasing satisfaction levels of customers. The method is remarkably addressing what to be customized depending on the customer's desire, while many theories and practices on customization have dealt only with how. Some design operations of the method are explained using an actual redesign of an existing industrial service in a hotel industry. This will be effective for designing products or services whose value varies from one customer to another. Furthermore, the value is expected to be a more important concept to be designed according to recent servicification in industries.

OSIRIS: A TOOL TO SUPPORT REUSE OF COST SAVING IDEAS

Angéniol S., Longueville B., Chamerois R., Yannou B., Gardoni M. - *EADS (FRA)*   169

Design to Cost implementation appeals to designer's creativity to propose modifications that let expect to reach targets. In Aeronautics, support of cost saving ideas proposal through the memorizing and reuse of past ideas is identified as an underlying need linked to Design to Cost implementation. We define a tool that supports the process of cost saving ideas proposal: OSIRIS (Optimiser for Saving Idea Reuse & Information Sharing). OSIRIS is based on a conceptual model that enables the description of saving ideas with a model of the problem and a model of the solution. This model is implemented with semantic web technologies. It enables ontology based search and allows users to enrich information through inference rules definition.

A METHODOLOGY FOR VR SYSTEMS BENCHMARKING IN THE INDUSTRIAL DESIGN FIELD

Mengoni M., Germani M., Onori R., Pavani F. - *University Politecnica delle Marche (ITA)*   291

The majority of Virtual Reality applications developed today are either specific product oriented, not flexible enough to be implemented in every industrial design process to achieve complex real world tasks. In this context the adoption of VR systems, designed and customized on the need of the specific company, can be accepted only if it is possible to quantify the achievable benefits in terms of time, quality and cost. Our research focuses on how these benefits can be objectively measured. A benchmarking program and related metrics to explore advantages and disadvantages connected with the new design technology have been studied. Our main goal is to measure the performance of the VR-based design review processes by meaningful test cases.

Improved products by innovative methods
Oral presentations

Session: D224
Chairman: Mats Jackson (SWE)

Wednesday - May 17, 2006.
11:00 - 13:00 | Salon Šipun

GENERATING RULES FOR THE IMPROVED DESIGN OF PACKAGING MACHINERY

Sirkett D.M., Hicks B.J., Berry C., Mullineux G., Medland A.J. - *University of Bath (GBR)*   369

To comply with EU packaging waste regulations, manufacturers of fast-moving consumer goods are required to use lighter-weight packaging materials. This has impacted upon the convertibility of pre-folded paperboard cartons and in many cases has had an adverse effect on production capabilities. There is a fundamental need to improve the design of packaging machinery through understanding the machine-material interactions. To address this issue a computer simulation of carton conversion has been created using finite element modelling software. The model is applied here to generate design rules for the position of key machine elements with respect to the carton. Such fundamental design knowledge cannot be generated through trial and error alone. There exists an increasing need to obtain this knowledge offline through computer simulations such as that reported here.

INNOVATIVE DESIGN AUTOMATION TECHNOLOGIES FOR CORRECTIVE SHOES DEVELOPMENT

Raffaeli R., Alfaro D., Germani M., Mandorli F., Montiel E. - *Polytechnic University of*   315
Marche (ITA)

The paradigm of Mass Customisation (MC) is today fundamental for the European fashion industry. Footwear industry is still labour intensive and companies need solution to reduce costs and remain competitive in the global market. In particular, specialized companies that produce customized medical shoes prescribed for people with feet malformations deal with small batches or unique pairs. This work presents some approaches and low-cost solutions related to foot measurement and CAD data elaboration for facilitating the diffusion of "made-to-measure" products. An integrated process made of hardware devices and customized software is explored and described aiming to increase production efficiency and reduce costs.

MODELLING AND MANUFACTURING OF A DRAGONFLY WING AS BASIS FOR BIONIC RESEARCH

Deubel T., Wanke S., Weber C., Wedekind F. - *Saarland University (DEU)*   215

Working principles in nature have been optimised by evolution for millions of years. Today we try to understand these principles and to utilise them in technical applications. The dragonfly combines very light wing structures with amazing flying abilities by using the effect of rotating vortices. Future airplanes could use this effect to improve their flight dynamics and energy efficiency. In order to study the exact properties of the dragonfly wing and to understand how these properties can be achieved, it is necessary to reproduce the geometry of the wing at a larger scale. In this paper the authors describe the modelling and building of an enlarged model of a dragonfly wing as base for further bionic research.

A CASE STUDY ON CONCEPT DESIGN AND CAD MODELLING IN THE FOOTWEAR INDUSTRY

Smith G., Claustre T. - *University of the West of England (GBR)*   377

A case study on reverse engineering in the footwear design and manufacturing industry is presented. Reverse engineering tools and techniques are used to capture three-dimensional data and to convert physical models of lasts and soles into triangulated and fully surfaced CAD models. These models are used to improve the product development process and reduce concept to market lead times. A novel, semi-automatic, segmentation process for the detection of functional features, 'feather edges', on shoe lasts is also presented and evaluated.

DESIGN AND DEVELOPMENT OF A NEW HARD LOCK SYSTEM

Gerbino S., Martorelli M., Oliviero D. - *University Cassino (ITA)*   245

In the paper the design process, from the idea to the manufacturing aspects, with all the technical and technological problems, to develop a new competitive hard antitheft is described. The integrated use of the CAD/CAE and RP techniques made possible to analyse three different solutions in a very short time. The new model has completely designed, developed and patented (patent n. NA2005A000037) at the University of Naples and Cassino, Italy. It has weight and size very limited and some important features such as easiness to handle, high strength and high versatility; all this makes it an exclusive product of its type. The final product, made in AISI 1040 steel, is going to be manufactured and distributed in Europe by BULLOCK® in 2006.

Advanced methods and tools in design practice
Session: D231

Oral presentations
Chairman: Wilfried Elspass (CHE)

Wednesday - May 17, 2006.

14:00 - 15:45 | Congress hall Ragusa

AGENT-AIDED PRELIMINARY AIRCRAFT DESIGN

Welcomme J.B., Gleizes M.P., Redon R. - *EADS (FRA)*   409

Preliminary aircraft design is a multi-disciplinary optimization MDO problem. By exploiting interactions between disciplines, MDO enables to find superior design. However, including all disciplines simultaneously increases the complexity of the problem. In this paper, we show how a cooperative multi-agent framework can offer advantages to system decomposition and inter-disciplinary communications. Each agent represents a physical model, is designed separately, and has a local system view based on its neighbours relationships. Then with a cooperative reasoning, agents collaborate to find equilibrium between local optimal solutions. First experimentations find design solutions with a distributed and cooperative decision process. It offers promising perspectives by optimising simultaneously both model organisation and model parameters.

INTRODUCING MACHINE LEARNING WITHIN AN INTERACTIVE EVOLUTIONARY DESIGN ENVIRONMENT

Machwe A.T., Parmee I.C. - *University of the West of England (GBR)*   283

The present work focuses on providing machine based support to the designer within an interactive evolutionary design environment (IEDE). This improves the interactivity of the IEDE by reducing the cognitive load placed on the designer due to repetitive assessment of solutions. The background for this work is an interactive evolutionary bridge design system which takes into account rule based and subjective (i.e. designer based) aesthetic fitness along with engineering fitness of the solutions. The machine learning system attempts to learn the user's aesthetic preferences and thus takes over the subjective evaluation of solutions. Fuzzy rule based, case based and radial basis function based techniques are applied to the problem.

A SELF-TRAINING SYSTEM THAT LEARNS THROUGH EXPERIMENTATION

Braun S.C., Gero J.S. - *Technical University Munich (DEU)*   193

The paper introduces an adaptive system that, inspired by the diversity of human cognitive development processes, uses different kinds of machine learning to develop its expertise. The system combines a supervised learning recognition engine with an autonomous learning agent. Based on the system's initial knowledge novel training sets are produced through „experimental learning". Thus, the user does not have to spend time on the generation of training data. Both the conceptual basis and an exemplary implementation (recognition and substitution of hand-drawn geometrical shapes) are presented. The dependency of the system's learning success on the knowledge initially provided and the way it processes this knowledge is tested and documented.

A BOTTOM-UP APPROACH FOR AUTOMATED SYNTHESIS SUPPORT IN THE ENGINEERING DESIGN PROCESS: PROTOTYPES

Schotborgh W.O., Tragter H., Kokkeler F.G.M., van Houten F.J.A.M. - *University of Twente*   349
(NLD)

In the engineering design process without computer support, the amount of knowledge and experience of the engineers determine the design speed and ultimately the quality of the solution. The currently available CAD support focuses on analysis, leaving the critical process of finding a solution proposal to human designers. Prototypes of a new type of CAD tool are presented which automatically generate, evaluate and improve multiple solutions. It allows the designer to explore a detailed solution space, providing insight in the possibilities and constraints of a design. The paper shows the feasibility of a bottom-up approach to successfully develop design tools.

Innovative methods and tools II

Session: D311

Oral presentations

Chairman: Glen Mullineux (GBR)

Thursday - May 18, 2006.

08:30 - 10:30 | Congress hall Ragusa

THE CONCEPT OF FUNCTIONS AND INFORMATION CONVERSION IN SOFTWARE - DESIGN METHOD ADAPTATION IN AN INDUSTRIAL CONTEXT

Weigt M. - *Karlsruhe University (DEU)* 401

With regard to the increasing importance of software components in technical systems, this paper presents an adaptation of the concept of functions considering the nature of software as an abstract logical system. The method is part of a software component repository, which supports structured description of software components for internal re-use or electronic marketplaces. The repository uses the concept of functions and a life cycle-oriented hierarchy of software product characteristics to facilitate the identification of potential solutions and the evaluation of their applicability and adaptability. The application example is the field of automation technology, but the results are applicable in other domains as well.

EXPERIENCE LANDSCAPES: A SUBJECTIVE APPROACH TO EXPLORE USER-PRODUCT INTERACTION

Tomico O., Pifarré M., Lloveras J. - *Technical University of Catalonia (ESP)* 393

The paper relates to product experience gathering methods in early stages of product development. It focuses in subjective psychological exploration techniques for characterizing user experience. This procedure allows explorations from the participant idiosyncratic point of view. Therefore, it prevents interviewers from biasing studies by influencing participants. Precisely, this kind of subjective exploration allows for the acquisition of more reliable and precise information than with objective explorations (closed interviews and questionnaires), even though the amount of participants is smaller. It unveils core multimodal perception aspects to describe user experience landscapes (physical, functional and emotional mixed characteristics).

CONTRIBUTION TO MAINTAINABILITY AND SAFETY ASSESSMENT IN THE MECHANICAL PRODUCT DESIGN

Coulibaly A., Houssin R., Mutel B. - *INSA de Strasbourg (FRA)* 207

The paper presents an approach for maintainability and safety assessment using CAD model enriched with behavioral semantic data. This aims to assist designers for taking care of product behaviors that are traditionally evaluated after the design is finished by using physical tests and/or virtual reality devices. The results are limited to specific performance indicators of the product but do not show how to improve solutions. For selecting between different alternative solutions multi-criteria analysis must be done. The contextual aspects related to maintenance tooling, logistics or the role of human operators have not been considered. These aspects will be treated in future works for evaluation from different lifecycle points of view.

DESIGN STRUCTURE MATRIX USED AS KNOWLEDGE CAPTURE METHOD FOR PRODUCT CONFIGURATION

Germani M., Mengoni M., Raffaeli R. - *Polytechnic University of Marche (ITA)* 253

The present work focuses on the study of a method to acquire and formalise the design knowledge in a way usable for implementing a knowledge-based software system to support the NPC. The approach is based on the representation of corporate knowledge within a structured framework where market requirements, product specifications and functional aspects are interrelated. A hierarchical multi-level DSM structure allows representing such knowledge in a rationale manner. This paper presents the methodology to formalize the product knowledge, the used structure to define the specifications for implementing the knowledge-based product configuration system and, finally, a practical example to illustrate our proposed framework.

USING MULTIPLE DESIGN STRUCTURE MATRICES

Eichinger M., Maurer M., Lindemann U. - *Technical University Munich (DEU)* 229

In product development, multiple aspects of engineering design methodology interact with each other. In this paper, we present an approach that integrates these aspects (product design domains) into one coherent matrix representation form by combining the DSM (Design Structure Matrix) and DMM (Domain Mapping Matrix) methodologies. We developed an algorithm to calculate and visualize indirect implications of adjacent information that evolve through the integrative view onto the engineering system. Our methodology complements the DSM and DMM methodologies and is designed to help developers to identify important elements of an engineering system more quickly and to improve the process of data collection for matrix based design analysis.

Industrial applications
Session: D314

Oral presentations
Chairman: Ryszad Rohatynski (POL)

Thursday - May 18, 2006.

08:30 - 10:30 | Salon Šipun

DESIGN FOR PACKAGING LOGISTICS

Klevas J. - *Lund University (SWE)*

269

Successful new product development is a prerequisite for companies to stay competitive on an ever demanding market. Long distant suppliers and challenging customers put emphasize on an efficient and effective logistics system together with high quality products. This highlights the need for logistics, and hence packaging, considerations early in the product development process to secure a high performing supply chain as product design has a great impact on logistics activities.
The purpose of this paper is to bridge the gap between disciplines of engineering design, packaging and logistics by the Design For Packaging Logistics approach based on the product development process of IKEA.

DIMENSIONING MACHINE STRUCTURE FOR EARTHQUAKE RESISTANCE IN DESIGN STAGE

ButkoviæM., OrèiæB., TevèiæM., JokiæM. - *ALSTOM-Croatia (HRV)*

199

Designing the equipment of power plants, petrochemical or similar large plants, mechanical and electrical engineers have to consider, beside the standard load, possible earthquake load as well. Plant equipment is principally standardized products and its redesign in order to satisfy the local earthquake requirements is expensive and time consuming. In this paper the quasi-dynamic FEM method of calculation (QDM) and an optimal seismic intensity for calculation is proposed for design of equipment. The results obtained by QDM were compared with time history dynamic method. The QDM is simpler for designers use and helps them to design equipment, able to satisfy 95% earthquake conditions over the world.

DESIGN OF THE SHIP COURSE CONTROL SYSTEM

Morawski L., Pomirski J., Rak A. - *Gdyinia Maritame University (POL)*

301

The design of the ship course control system is divided into the following phases: defining target of control and requirements; developing a mathematical model - identification; analysis of the model; synthesis of the control system; validation of the control system characteristics, computer simulation; and implementation. The designed control system consists two controllers. The characteristics of the controllers are selected in such a way that the properties of the control system with the rate of turn controller are modelled by the first-order inertia, while the system with the course keeping controller is modelled by a second-order linear term. The control system was tested on the lake using physical isomorphic model of ship

STRUCTURE DESIGN OF CARGO TANKS IN RIVER LIQUEFIED GAS CARRIERS

SenjanoviæI., SenjanoviæT., Ljuština A.M., Rudan S. - *University of Zagreb (HRV)*

357

Design procedure of cargo tanks in River Liquefied Petroleum Gas Carriers is presented. The independents cylindrical tanks of type C, operating up to design vapor pressure of 20 bar, are considered. Classification Rules of Germanischer Lloyd are followed. The tank design includes determination of shell thickness (cylindrical, spherical and toroidal), check of shell stability, scantling of vacuum rings and stiffening rings which transfer tank load to the ship structure. For this purpose the finite element analysis is employed. The design procedure is illustrated in the case of a river ship equipped with eight tanks (diameter / length, 4.73 / 21 m) in two rows and it may be used as design standard.

THE COST OF INTERNAL VARIETY: A NON-LINEAR OPTIMIZATION MODEL

Nowak T., Chromniak M. - *ABB (POL)*

309

Manufacturing oriented design methodologies (e.g. Design for Manufacturing and Assembly, Design to Cost) enable engineers to create product designs which can be manufactured at low cost and with better quality. But applying such as theories only to a single product is not efficient since, the product families are usually produced. In this paper the economic aspects of internal variety in product design and manufacturing are analyzed and non-linear decision model for designing the cost effective product family is presented. The proposed calculation method enables product managers to estimate and reduce the cost of introducing differentiation into their product family by optimizing the internal product variety.

Design process experiences and innovation   Poster session
Session: D1POS1   Chairman: Dorian Marjanovi (HRV), Niels Moes (NLD)

Tuesday - May 16, 2006.   15:45 - 16:30 | poster session

NPD IN CROATIA: A CASE STUDY

Christiaans H.H.C.M., Diehl J.C., Kuipers H., Karstkarel M.C., Stanic O. - *Delft University of*   487
Technology (NLD)

In 2002, the Dutch and Croatian Ministries of Economic Affairs agreed to launch a capacity building project in Croatia to improve the competitiveness of Small and Medium-sized Enterprises. Under the umbrella of this initiative, three in-company demonstration projects with regard to New Product Development took place in Croatian SMEs. This paper describes one of these projects, conducted with the company Adriacink. At the start of the project Adriacink had arrived at a turning point in their business strategy. Due to increasing competition, rising steel prices and the prospect of Croatia joining the EU, the company had decided to shift their focus from manufacturing semi-finished products for clients to designing, manufacturing, and galvanizing their own end products.

WHEN EVERYTHING SEEMS RIGHT AND IT STILL GOES WRONG – A CASE STUDY

Hollins W.J. - *Regent's Business School (GBR)*   847

The is a case study involving three quite different companies operating at a great distance from each other and how an apparently ideal combination of partners failed in the design process. Most writings on alliances concentrate on the advantages but fail to point out the pitfalls uncovered in this real case study.   In small organisations the entire strategy is more associated with the success of individual projects than would be the case in a large organisation. Also, independent project leadership small companies in alliances is vital but can be both difficult to achieve or expensive. The author was Non Executive Director in Company A at the time that this case study took place.

SOME EXPERIENCES IN IMPROVING DESIGN PROCEDURES

Rohde D., Boj eti N., Stankovi T. - *University of Zagreb (HRV)*   331

Changes in the world market dramatically influence industrial companies. The traditional understanding of how the companies view their product and the product's role in the company business is currently being reworked. In this article empirical experience gained through practical projects that aimed to improve utilization of CAD technology in small and medium sized enterprises have been brought out. The results aimed in the presented case study have demonstrated that even small investment in three areas, namely system management, training and knowledge management and tailoring the CAD system can bring significant benefits in technology utilization.

3CS: CREATING A CULTURE OF CREATIVITY

Vint L.A. - *Griffith University (AUS)*   1275

Creativity and innovation are intrinsic to gaining advantage in the global knowledge economy of our society. So, how can we encourage and teach our students to be more creative? Since 1968, creativity tests have been administered to groups of children. The results have shown that people gradually become less creative as they age; that we learn not to be creative. Through research findings of own experiences this paper investigates ways in which to sustain creativity in the classroom and to advance, rather than degrade, the development of children's creativity. Through case studies seven methods are presented on how to create a culture of innovation and creativity within the classroom.

CO-DESIGN OF INNOVATIVE PRODUCT & NETWORK OF FIRMS: CATALYSTS FOR CO-WORKING

Zolghadri M., Girard P. - *Université de Bordeaux 1 (FRA)*   1327

Simultaneous design of collaborative innovative product and network of collaborators, called co-design paradigm, seems to be a niche of efficiency for firms. However to collaborate successfully, various constraints should be taken into account. Product design should be aware of the feasibility of the future manufacturing of products by the network of partners; this is design products to manage network. On the other hand, the network of partners' architecture and runs generate hard constraints for product design too; this is design network to adapt product design. We explore here co-design by focusing our study on mutual constraints between its two activities. Concepts proposed here allow a better understanding of their dependencies.

Usage and integration of supportive technologies Poster session
Session: D1POS3 Chairman: Dorian Marjanovi (HRV), Niels Moes (NLD)

Tuesday - May 16, 2006. 15:45 - 16:30 | poster session

THE USE OF PHYSICAL PROGRAMMING IN THE DESIGN PROCESS

Mess M., Schlattmann J. - *Hamburg University of Technology (DEU)* 937

The contribution focuses on the reuse of existing components considering sensors as an example. Using a process model containing four major steps the customisation and optimisation of existing components is discussed in detail. The concept of physical programming is used for a combined rating- and optimisation process with modifications to enable the use of qualitative rating criteria. The rating process is the basis for an optimisation potential analysis that is followed by identification of design variables. The process of component selection and customisation is shown in an example considering capacitive accelerometers.

INTEGRATING 3D-SKETCHES INTO THE DESIGN PROCESS

Diehl H., Lindemann U. - *Technical University Munich (DEU)* 221

Designers often put their conceptual sketches next to the computer monitor while remodelling their solution by means of CAD functions. During this process the designer frequently has to change his perspective from the monitor to the paper and vice versa. The translation of sketched objects into CAD representations and back again as well as the iterative change of media is exhausting and time consuming. To avoid the disadvantages described a 3D-Sketching tool has been developed at the institute for product development at the Technische Universiät. The 3D-Sketches can be imported into the CAD-System. In this paper a methodical approach for the iterative and integrative use of 3D-Sketches and CAD-Systems is described.

DIMENSIONAL TOLERANCE APPROXIMATION FOR REVERSE ENGINEERING APPLICATIONS

Jamshidi J., Mileham A.R., Owen G.W. - *University of Bath (GBR)* 855

Tolerance accommodation is normally a re-engineering process rather than the Reverse Engineering (RE) of a component. This can jeopardise the exactness of the re-designed data or increase the RE cost due to the high level of design skill required. In this paper a method for tolerance approximation in RE is introduced. The surface characteristics, including texture and roughness, are used to estimate the original tolerance of the component. The measured dimensions on the features are used as nominal. Although this may not be factual, however this is shown to be a reliable starting point for tolerancing. Further investigation of this method should lead to a more precise result, as this method is only an approximation. Experimental results of the method on a mounting bracket of a car break assembly are presented.

REPRESENTATION OF ELASTIC DEFORMATIONS AS DEVIATION ZONE AND ITS CONNECTION WITH STATISTICAL TOLERANCE ZONES

Lustig R., Meerkamm H. - *University Erlangen (DEU)* 921

In this paper a new method is presented which allows the interconnection of tolerances with elasticity information and the combined simulation of both. First the elastic deformations are calculated. Then the displacement results are transferred into substitution elements known from the description of tolerance zones. In this way a deviation value can be calculated and processed in the "language of tolerances" Afterwards a manufacturing deviation value is either generated from known statistical process data or can be entered manually. Thereafter, those two values are coupled in a statistical way to show the impact of both values. The concept has been realized as an add-on for the ProENGINEER CAD system.

TOWARDS A CONCEPTUAL FRAMEWORK FOR MOBILE 'KNOWLEDGE MANAGEMENT' SUPPORT

Spiteri C.L., Borg J.C. - *University of Malta (MLT)* 1259

Design is a problem solving activity, and engineering designers tend to solve problems based on available knowledge. Hence knowledge must be presented timely and in the right format during the design process. However, since designers are frequently away from their usual working place, there is a need that designers in mobile work are supported with a mobile knowledge management tool which manages the complex design work environment. This paper proposes the concept of providing modular, just-in-time knowledge support to engineering designers engaged in mobile design situations through the use of portable devices. The paper contributes a conceptual framework that supports knowledge communication between designers in mobile design situations.

Methods and tools in design practice

Session: D3POS3

Poster session

Chairman: Ahmed Kova evi (GBR), Roman Žavbi (SLO)

Thursday - May 18, 2006.

15:45 - 16:30 | Roster session

ICROS-THE SELECTIVE APPROACH TO HIGH-TECH POLYMER PRODUCT DESIGN-MODELLING AND EXPERIMENTAL VERIFICATION

Alber B., Hackenschmidt R., Dolsak B., Rieg F. - *University of Bayreuth (DEU)*　　　417

A concept for the simulation-based design of polymer parts with the ICROS method is presented. The order of simulation changes the results and the number of iterations, but there are no definitions for the exact proceedings. The engineering by intelligent cross-linked simulations (ICROS) is a guideline for the intelligent utilisation and the visualisation of possible simulation tools. A case study involving a flexible elastomer polymer coupling is presented. The durability performance of the finished part was checked in plentiful trials and the developed prototype withstood all tests. The new polymeric coupling is more than 62% lighter than the substituted aluminium coupling and transmits 315% of the desired transmittable moment of torque.

THE DESIGN AND THE OPTIMIZATION OF THE FORK-PIN COMPRESSION JOINTS IN FRONT MOTORBIKE SUSPENSIONS

Croccolo D., Cuppini R., Vincenzi N. - *University of Bologna (ITA)*　　　807

The design of the fork-pin compression-fit joints of front motorbike suspensions is uncertain mainly because of the poor knowledge about the starting friction coefficient µll and about the mean coupling pressure p. The axial releasing force Fll=µll∙p∙A, which is the fundamental design parameter, depends on the mentioned two factors, usually unknown, and on the coupling surface dimension, usually known. In this work are presented two methodology which are usefull to calculate the µll and the p parameters. The µll mathematical model has been defined as a function of the production specifications of the components whereas the definition of the coupling pressure was obtained going on improving some methodologies already proposed by the authors.

AN INTEGRATED INFORMATION AND TYPE SHEET SYSTEM FOR RAIL VEHICLES

Hosnedl S., Heller P. - *University of West Bohemia (CZE)*　　　263

A comprehensive integrated system based on the theory of properties of technical products has been developed and implemented on MS Excel. It currently covers 179 property characteristics for each of 49 variants of 20 regional rail vehicles RRV types of 10 leading European competitors. The system enables user friendly modifications and systematic extensions and enables easy conversion for any class and type of technical product. The next aim is to search especially for information which is not generally available, for example, accessible only at users, repair shops, and so on, to provide engineering designers and engineering designer managers with even more effective support for their conceptual decisions.

DIRECT DRIVE - TREND IN MODERN ELEVATORS

Kostelac M., Herold Z., MaljkoviæZ. - *University of Zagreb (HRV)*　　　277

In general, in the design of elevator driving mechanisms, there is a high demand for small installation space, silent function and programmable control with high driving reliability and safety. Classical solutions of elevator drives with electric motor and mechanical power transmission cannot fully meet the requirements of the state of the art buildings. However, the problem can be overcome by using high torque electric motors with high technical performances. They still have a high price, but they are increasingly used as elevator driving mechanisms.

A CONTRIBUTION TO METHODOLOGY OF ENGINEERING CALCULATIONS

Rohatyñski R., Babirecki W. - *University of Zielona Gora (POL)*　　　323

The paper presents a new methodology of engineering calculation algorithmization based on constraint management. The constraints and variables are represented in a Boolean matrix form called the occurence matrix. The analysis and decomposition of the occurence matrices are described, which results in their re-ordering to a form convenient to the algorithmization procedure. It is outlined and then applied in setting-up a calculation algorithm for helical spring. It is shown that the method enables the user to have a full insight into complex relationships among variables and constraints and to find the most efficient sequence of computations. The method deals not only with equations but also with inequalities, tabular data, graphs and other.