

ProSim'05 Extended Abstracts

Full Technical Papers - Research

Title	Measurement of Software- Product- Families in Automotive Control Units
Submission Type	Full Technical Paper - Research
Submission Scope	Process modeling - focus on process model implementation
Authors	Sebastian Kiebusch, University of Leipzig, Germany
Abstract	<p>Embedded software systems have become the driving force in many areas of technology like the automotive industry. Control functions of cars, driver assistance as well as systems for information and entertainment are accomplished by software driven control units. Due to the high complexity and development effort of embedded systems, these resources have to be reused to gain a cost reduction. Software Product Families (SPF) are a promising solution to reuse common software assets in different variants of an automobile. As a precondition in applying this development approach we need software metrics to estimate the effort of building embedded SPF. Techniques of size measurement and cost estimation for SPF are highly insufficient in general and do not exist for the automotive domain. Therefore we propose a conglomerate of innovative metrics to measure the functional size and estimate the development costs of embedded SPF.</p>

Title	Simulation Models Applied to Game-Based Training for Software Project Managers
Submission Type	Full Technical Paper - Research
Submission Scope	Simulation modeling - focus on model implementation
Authors	Alexandre Dantas, COPPE-UFRJ, Brazil Marcio Barros, DIA-UNIRIO, Brazil Claudia Werner, COPE-UFRJ, Brazil
Abstract	<p>Abstract: Inadequate use of project management techniques in software projects can be traced to the lack of efficient education strategies for managers. In this work, the learning-by-doing model is presented as a well suited approach for project management education. This model requires an environment where students can act as managers without the risks associated to the failure of real software projects. The limitations of simulation tools and pilot-projects are discussed and a game-based training approach is proposed to address project management hands-on education requirements.</p>

Full Technical Papers - Research

Title	DEVS-based Software Process Simulation Modeling: Formally Specified, Modularized, and Extensible SPSM
Submission Type	Full Technical Paper - Research
Submission Scope	Simulation modeling - focus on simulation modeling methodology
Authors	Kyungsik Choi, Department of EECS, Korea Advanced Institute of Science and Technology, Korea (South) Doo-Hwan Bae, Department of EECS, Korea Advanced Institute of Science and Technology, Korea (South) TagGon Kim, Department of EECS, Korea Advanced Institute of Science and Technology, Korea (South)
Abstract	We propose DEVS (Discrete Event System Specification)based software process simulation modeling method which is a formally specified, modularized, and extensible simulation modeling approach. We argue why software process simulation models are not widely used in industry and describe the modeling method using DEVS-based simulation environment. This approach excludes misunderstandings on system dynamics simulation models and modularizes the simulation model by encapsulating closely related variables in one atomic model. We then describe how to model software process system dynamics model using this method and demonstrate the extensibility and reusability by examples.

Title	MODEL SUPPORT FOR SIMULATION-BASED TRAINING GAMES: FROM BEHAVIORAL MODELING TO USER INTERACTIONS
Submission Type	Full Technical Paper - Research
Submission Scope	Process modeling - focus on process modeling methodology
Authors	Gustavo Veronese, COPPE – UFRJ, Brasil Márcio Barros, DIA - CCET - UNIRIO, Brasil Cláudia Werner, COPPE - UFRJ, Brasil
Abstract	Current trends in education point to an increasing use of simulation based environments for learning purposes. However, the industry still lacks well-documented techniques, models, and processes to organize the development of simulation-based educational games. In this paper, we propose a framework to support the development of educational games based on simulation models. The framework is composed by a lightweight process and a set of models that emphasize the separation of activities regarding distinct aspects of a game and the reuse of artifacts representing such aspects throughout game development. A software project management training game was modeled as a case study of the proposed approach.

Full Technical Papers - Research

Title	Towards Interactive Systems Usability Improvement through Simulation Modeling
Submission Type	Full Technical Paper - Research
Submission Scope	Simulation modeling - focus on model implementation
Authors	Nuria Hurtado, University of Cádiz, Spain Mercedes Ruiz, University of Cádiz, Spain Jesús Torres, University of Sevilla, Spain
Abstract	Nowadays, usability has become an essential contribution to the success of interactive systems and is recognized as a quality attribute for software products. This paper proposes the use of dynamic simulation models for the improvement of interactive systems usability through the application of a User Centered Design (UCD) process and its integration into the software development process. The simulation model developed is used to determine the effect that different levels of usability have over the UCD process of a specific kind of interactive systems such as website application development.

Title	ECONOMICAL ANALYSIS OF SOFTWARE PRODUCT AND SERVICE COMPANIES
Submission Type	Full Technical Paper - Research
Submission Scope	Simulation modeling - focus on model implementation
Authors	Charbel Noujeim, University of Karlsruhe, Germany Jörg Sandrock, University of Karlsruhe, Information Management and Systems, Germany Christof Weinhardt, University of Karlsruhe, Information Management and Systems, Germany
Abstract	<p>The still growing use of Internet technologies and corporate software shape the structure of the software industry. While visions of the Computational Grid or service orientated architectures promise systems and environments where users merely access software in a plug-and-play manner, experience and empirical results point at the installation and integration efforts for software rollout and integration projects.</p> <p>Also economic practice blurs the boundaries between software and service providers and different models of software vendor and software integrator relationships have evolved. The paper therefore addresses strategic issues of joint software vendor/software integrator companies with the aim to understand the underlying dynamics and complex feedback structures of such companies. With the help of a System Dynamics simulation model we analyze the complex interaction for different pricing, quality and timing strategies for the software production process in combination with several sales and software integration strategies.</p>

Full Technical Papers - Research

Title	A Discrete Event Simulation Model of Extreme Programming Process
Submission Type	Full Technical Paper - Research
Submission Scope	Process modeling - focus on process model implementation
Authors	Alessandra Cau, Universita' di Cagliari, Italy Giulio Concas, Universita' di Cagliari, Italy Marco Melis, Universita' di Cagliari, Italy Ivana Turnu, Universita' di Cagliari, Italy
Abstract	In this paper we present a simulation approach to evaluate the applicability and effectiveness of Extreme Programming process, and the effects of some of its individual practices. The XP process has been modelled using a discrete event model, and a simulation executive has been written, enabling to simulate XP software development activities. The model follows an object-oriented approach, and has been implemented in Smalltalk language, following XP process itself. It will be able to vary the usage level of some XP practices and to simulate how all the project entities evolve consequently. Here we present some results concerning the simulation of an XP process varying the adoption level of the Pair Programming practice.

Title	Architecture-Based Software Product Line Process Simulator
Submission Type	Full Technical Paper - Research
Submission Scope	Simulation modeling - focus on model implementation
Authors	Yu Chen, Arizona State University, U.S.A. Gerald Gannod, Arizona State University, U.S.A. James Collofello, Arizona State University, U.S.A.
Abstract	A software product line is a set of software-intensive systems sharing a common, managed set of features that satisfy the specific needs of a particular market segment or mission and are developed from a common set of core assets in a prescribed way. A software product line approach promises shorter time-to-market and decreased life-cycle cost. However, those benefits are not guaranteed under every situation and are affected by many factors, such as number of available employees, market demands, reuse rate, process maturity, and product line adoption and evolution approaches. Before initiating a software product line, an organization need evaluate available process options and to see which one best fits its goals. The aim of this research is to develop a software product line process simulator that can predict the cost for a selected software product line process and provide useful information for cost-benefit analysis.

Full Technical Papers - Research

Title	Self-organized development in libre software projects: a model based on the stigmergy concept
Submission Type	Full Technical Paper - Research
Submission Scope	Process modeling - focus on process modeling methodology
Authors	Gregorio Robles, Universidad Rey Juan Carlos, Spain Juan Julian Merelo, Universidad de Granada, Spain Jesus M. Gonzalez-Barahona, Universidad Rey Juan Carlos, Spain
Abstract	Open Source Software is becoming an increasingly important component of today's software industry. While many studies have focused on the inner working of a few mostly successful projects, few have paid attention to explain the big picture. This is probably due to its distributed and mostly self-organized development nature, which makes it difficult to understand and research. In this paper, an analogy between the OSS phenomenon and the way some social insects perform large-scale works is proposed. The analogy is based on the stigmergy concept, which states that communication does not happen directly among entities but through changes in the environment. Stigmergy makes an autocatalytic reaction possible as it has been observed in OSS projects. We have built a model based upon these ideas, implemented a simulation software, calibrated the model with data from previous studies and finally verified its output comparing it to results from investigations performed on OSS.

Title	Software Process and Business Value Modeling
Submission Type	Full Technical Paper - Research
Submission Scope	Simulation modeling - focus on model implementation
Authors	Ray Madachy, USC Center for Software Engineering and Cost Xpert Group, USA
Abstract	Business value attainment should be a key consideration when designing software processes. Ideally they are structured to meet organizational business goals, but it is usually difficult to integrate the process and business perspectives quantitatively. This research uses modeling and simulation to assess tradeoffs for business case analysis. An improved model relates the dynamics between product specifications, cost, schedule, software quality practices, market size, license retention, pricing and revenue generation. The system dynamics model allows one to experiment with different product strategies, software processes, marketing practices and pricing schemes while tracking financial measures over time. It can be used to determine the appropriate balance of process activities to meet goals. Examples are developed for varying scope, reliability, delivery of multiple releases, and determining the quality sweet spot for different time horizons. Results show that optimal policies depend on various stakeholder value functions, opposing market factors and business constraints.

Full Technical Papers - Research

Title	People Applications in Software Process Modeling and Simulation
Submission Type	Full Technical Paper - Research
Submission Scope	Simulation modeling - focus on model implementation
Authors	Ray Madachy, USC Center for Software Engineering, USA
Abstract	Focusing on people is one of the highest leverage opportunities to improve process performance. But people issues have been under-represented in process modeling and simulation, as much of the work has dealt with technical aspects. Software processes will always be socio-technical by nature, and due attention should be paid to the human aspects and people dynamics. Simulation using system dynamics is useful to represent and understand some people issues, and can also be used directly for training personnel. This paper describes basic phenomenology, model structures and sample simulation results for people considerations. Constructs are shown for important aspects including motivation, exhaustion, experience and learning curves, skill development, training, hiring and retention, communication, stakeholder collaboration, and workforce dynamics at the project and macro levels. A summary of lessons learned about people issues, a comparison of modeling techniques for the people context and directions for future work are also discussed.

Title	Using Process Simulation to Assess the Value of New Defect Detection Technologies
Submission Type	Full Technical Paper - Research
Submission Scope	Process modeling - focus on process model implementation
Authors	David M. Raffo, Portland State University, USA Tim Menzies, Portland State University, USA Bhuricha Sethanandha, Portland State University, USA
Abstract	Not available

Title	Modeling Recruitment and Role Migration Processes in OSSD Projects
Submission Type	Full Technical Paper - Research
Submission Scope	Process modeling - focus on process model implementation
Authors	Chris Jensen, UC Irvine/Institute for Software Research, USA Walt Scacchi, UC Irvine/Institute for Software Research, USA
Abstract	Socio-technical processes have come to the forefront of discussion in recent months within open source software development (OSSD) world. Though there many anecdotal accounts of these processes, such narratives lack the precision of more formal modeling techniques, which are needed if these processes are going to be systematically analyzed, simulated, or re-enacted. Interest in making these processes explicit is mounting, both from the commercial side of the industry, as well as among spectators who may become contributors to OSSD organization. Thus, the work we will discuss in this paper serves to close this gap by analyzing and modeling recruitment and role transition processes across three prominent OSSD communities whose software development processes we've examined already: Mozilla.org, the Apache community, and NetBeans.

Full Technical Papers - Research

Title	Towards an Agile Development Process of Software Process Simulation
Submission Type	Full Technical Paper - Research
Submission Scope	Simulation modeling - focus on simulation modeling methodology
Authors	Ninie Angkasaputra, Fraunhofer IESE, Germany Dietmar Pfahl, Fraunhofer IESE, Germany
Abstract	In this paper, we will identify the different possibilities to adopt the agile practices used in XP and present the enhanced IMMoS as a potential agile method for SPS model development.

Full Technical Papers - Experience Reports

Title	Implementing Generalized Simulation Models
Submission Type	Full Technical Paper - Experience Report
Submission Scope	Process modeling - focus on process model implementation
Authors	David Raffo, Portland State University, USA Umanatha Nayak, Portland State University, USA Siri-on Setamanit, Portland State University, USA Wayne Wakeland, Portland State University, USA
Abstract	Not available

Title	Simulating Problem Report Flow in an Integration Process
Submission Type	Full Technical Paper - Experience Report
Submission Scope	Simulation modeling - focus on model implementation
Authors	Dan Houston, Honeywell, USA
Abstract	Software process improvement (SPI) has been a discernible theme in the literature on software process simulation. This literature has recognized a wide variety of ways in which simulation can support SPI. This case study describes one of those ways. Very focused, retrospective modeling of integration problem report flows provided insight into integration dynamics. The insight gained, both from modeling the recent development phase and from modeling some alternative scenarios, clarified the lessons learned and suggested a major improvement for the next release cycle.

Position Papers

Title	Goal-oriented Composition of Software Process Patterns
Submission Type	Position Paper
Submission Scope	Process modeling - focus on process modeling methodology
Authors	Jürgen Münch, Fraunhofer Institute for Experimental Software Engineering, Germany
Abstract	<p>The development of high-quality software or software intensive systems requires custom-tailored process models that fit the organizational and project goals as well as the development contexts. These models are a necessary prerequisite for creating project plans that are expected to fulfill business goals. Although project planners require individual process models custom tailored to their constraints, software or system developing organizations also require generic processes (i.e., reference processes) that capture project independent knowledge for similar development contexts. The latter is emphasized by assessment approaches (such as CMMI, SPICE) that require explicit process descriptions in order to reach a certain capability or maturity level. Among other concepts such as polymorphism, templates, or process fragment descriptions, software process patterns are used to describe generic process knowledge. Several approaches for describing the architecture of process patterns have already been published (e.g., [7]). However, there is a lack of descriptions on how to compose process patterns for a specific development context in order to gain a custom-tailored process model for a project. This paper focuses on the composition of process patterns in a goal oriented way. First, the paper describes which information a process pattern should contain so that it can be used for systematic composition. Second, a composition method is sketched. Afterwards, the results of a proof-of-concept evaluation of the method are described. Finally, the paper is summarized and open research questions are sketched.</p>

Position Papers

Title	Towards an Interactive Simulator for Software Process Management under Uncertainty
Submission Type	Position Paper
Submission Scope	Simulation modeling - focus on simulation modeling methodology
Authors	Thomas Birkhoelzer, University of Applied Science, Konstanz, Germany Christoph Dickmann, Siemens Medical Solutions, Germany Juergen Vaupel, Siemens Medical Solutions, Germany Joerg Stubenrauch, University of Applied Science, Konstanz, Germany
Abstract	<p>The management of a software producing organization can be considered as controlling a complex system. However, the dynamics and the parameters of this system are often unknown, or just vaguely known in the best case. Nevertheless, managers need to operate and decide in their daily practice despite uncertain or not validated information. Therefore, a simulator is developed in this work, which includes three essential building blocks to simulate an environment of such uncertainties: 1. Parameters with random deviations; 2. Time-varying parameters causing structural different behavior; 3. Dynamics such that short-term effects are opposite to long-term effects.</p> <p>The purpose of such a simulator is to raise the awareness and understanding of such effects.</p>

Title	A Simulation Model for Global Software Development Project
Submission Type	Position Paper
Submission Scope	Simulation modeling - focus on model implementation
Authors	David Raffo, Portland State University, USA Siri-on Setamanit, Portland State University, USA
Abstract	<p>Global software development (GSD) is becoming a dominant paradigm in the software industry. Conducting development projects in multiple countries offers many potential benefits including significantly reduced cost and better response times. However, it also poses some difficulties and challenges in managing this kind of project. Software Process Simulation Modeling (SPSM) can be used to support, enrich and evaluate GSD theories, to facilitate understanding, and to support corporate decisions. The discrete-event paradigm and system dynamic paradigm compliment each other and together enable the construction of models that capture both the dynamic nature of project variables and the complex sequences of discrete activities that take place. Thus, we believe that the ideal SPSM for representing GSD projects would have to effectively support both system dynamics equations and discrete-event logic.</p>

Position Papers

Title	Teaching by Modeling instead of by Models
Submission Type	Position Paper
Submission Scope	Process modeling - focus on process model implementation
Authors	Thomas Birkhölzer, University of Applied Science, Konstanz, Germany Emily Navarro, University of California, Irvine, USA André van der Hoek, University of California, Irvine, USA
Abstract	<p>Teaching and training is one of the important applications of software engineering process simulation. Up until this point, however, it has only been used in the context of students running simulations of process models that were built by someone else.</p> <p>In this paper, we suggest a different approach: to use the modeling activity for teaching as well, rather than the simulation activity only. In particular, we propose to assign students the task of building a new software process simulation model using an existing educational software process simulation environment, SimSE.</p> <p>First experiences from a feasibility project are reported.</p>

Title	Effective Resource Allocation for Process Simulation: A Position Paper
Submission Type	Position Paper
Submission Scope	Process modeling - focus on process model implementation
Authors	Mohammad S. Raunak, University of Massachusetts at Amherst, USA Leon J. Osterweil, University of Massachusetts at Amherst, USA
Abstract	<p>Abstract:</p> <p>One of the primary reasons to execute or simulate processes is to be able to reason about, forecast, and plan the best utilization of available resources. As process programmers, we define resources to be the agents that carry out tasks, and the tools and other entities required by agents in order for them to be able to complete their assigned work. Specifying these resources rigorously and allocating them efficiently during process simulation or execution is a non trivial problem. In this paper, we present many hard and interesting issues related to resource management and propose some solution approaches. In particular, we talk about an auction based solution approach, which we feel fits well in different types of process simulation.</p>

Position Papers

Title	Understanding Open Source and Agile Evolution through Qualitative Reasoning
Submission Type	Position Paper
Submission Scope	Simulation modeling - focus on model implementation
Authors	Juan Fernandez Ramil, Faculty of Maths and Computing, Department of Computing - The Open University, UK Andrea Capiluppi, Faculty of Maths and Computing, Department of Computing - The Open University, UK Neil Smith, Faculty of Maths and Computing, Department of Computing - The Open University, UK
Abstract	<p>The phenomenon of software evolution has been described in the literature [e.g., Lehman 1974; Lehman and Belady 1985] and several models of different nature [e.g., Aoyama 2002; Capiluppi 2003; Lehman et al 2002; Rajlich and Bennett 2000; FEAST] have been proposed to understand and explain the empirical observations. Some of these models purport to be universally applicable to all software development processes. However, the models in the literature were built mainly observing software developed in what has been the traditional centrally-managed Waterfall development process or one its variants. Since these theories were developed, software development methods have themselves evolved and now much software is developed and evolved by using agile methods (such as XP [Beck 1999]) and in open-source environments. It remains a question to be investigated what are the characteristics of software evolution under these new paradigms and whether the existing models form an accurate description of the evolution of software under these new regimes or whether new models will be required. In previous work [e.g., Ramil & Smith 2002; Smith & Ramil 2002, 2003; Smith et al 2004, 2005] the authors have illustrated how qualitative reasoning methods, such a qualitative simulation, provide a useful way to examine the general behaviour of models of software evolution. This extended abstract describes our plans for further research into the topic.</p>