Model-Based Systems Requirements

Jean-Michel Bruel and João Araújo

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Chapter 2. Who are we ? (JMB)

- Professor at Univesité de Toulouse [http://www.univ-toulouse.fr]
- Co-fonder of SysML-France [http://www.sysml-france.fr]
- Editorial board of the *Software and System Modeling journal [http://www.sosym.org]* journal
- *Steering Committee* member of the ACM/IEEE MODELS [http://www.modelsconference.org/] conference
- Co-animator of the Ambient Systems team at IRIT [http://www.irit.fr]

Chapter 3. Who are we ? (JA)

- blabla

Chapter 4. Abstract

This tutorial aims at presenting an integrated approach for systems requirements elicitation and modeling. The elicitation phase is based on a goal-based approach. Goal-Oriented Requirements Engineering (GORE) is considered an established paradigm in requirements engineering to handle elicitation, specification, analysis, negotiation and evolution of requirements by using goals [1]. GORE approaches, such as KAOS [2] were developed to support the development of large-scale systems by providing different models, where the goal model is naturally the central one. Eliciting requirements for such large-scale models is typically performed in a stepwise manner. The higher-level goals are decomposed into less abstract goals. The results of requirements elicitation must then be mapped into analysis models. In this tutorial, the modeling phase uses SysML [http://www.omgwiki.org/OMGSysML/] [3], an OMG [http://www.omg.org] modeling language for systems getting more and more popularity (used in Airbus, Thales, Continental among others), being taught in several countries and that start to be a pivot language for many others (e.g., Modelica, Simulink).

The focus will be on the integration of high level requirements models with SysML models, and their traceability [5]. A practical case study using models animation will be practiced by attendees [4]. Indeed if no attention is paid to how requirements relate with each other in different requirements phases, there is a danger that the nature of these relationships will only become clear during later stages of software development when problems are more costly to rectify. enfid::backend-deckjs[]

Chapter 5. Aims and Learning Objectives

Learn the basics of systems modeling using KAOS and SysML [http://www.omgwiki.org/OMGSysML/]. But before modeling with SysML we need to specify higher level requirements models, where goals of the application are determined before building the system’s models. Here the participants will learn how to elaborate the requirements using the goal-based approach KAOS. Goal-Oriented Requirements Engineering (GORE) has received increasing attention over the past few years. There are several goal-oriented approaches, each one using different kinds of models. Here we will use the KAOS approach [5]. KAOS is a systematic approach for discovering and structuring system level requirements. In KAOS, goals can be divided into requirements (a type of goal to be achieved by a software agent), expectations (a type of goal to be achieved by an environment agent) and soft goals (e.g., quality attributes). In KAOS, goals can be refined into subgoals through and/or decompositions. There is also the possibility of specifying conflicts between goals. KAOS also introduces the concept of obstacle that is a situation that prevents the achievement of a goal. Usually the solution to the obstacle is expressed in the form of a new requirement. KAOS will be the basis for the SysML [http://www.omgwiki.org/OMGSysML/] requirements specification.

Chapter 6. Introduction

Table 6.1. Organisation of concepts

	Requirements	Structure	Comportement	Transverse
Organisation				
Analyse				
Conception				
Implémentation				

Chapter 7. Systems Engineering approach

Explanations of the point of view taken (horizontal axis of the matrix)

Chapter 8. Development phases

(vertical axis of the matrix)

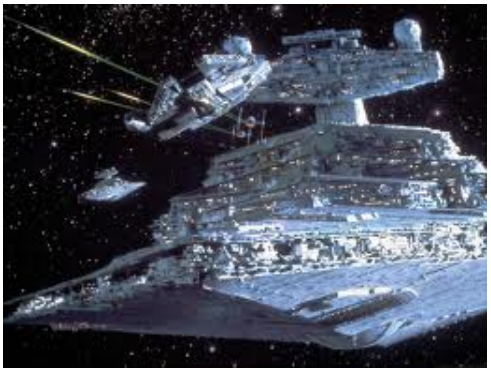
Chapter 9. Complex systems

- Humans and devices interacting
  - various technos (CS, Hydrolic, Electronic, …)
  - integrated to provide services according to their environment

Figure 9.1. Complex System

Systems of systems

Figure 9.2. Systems of systems



Chapter 10. Analysis

Figure 10.1. From requirements to system

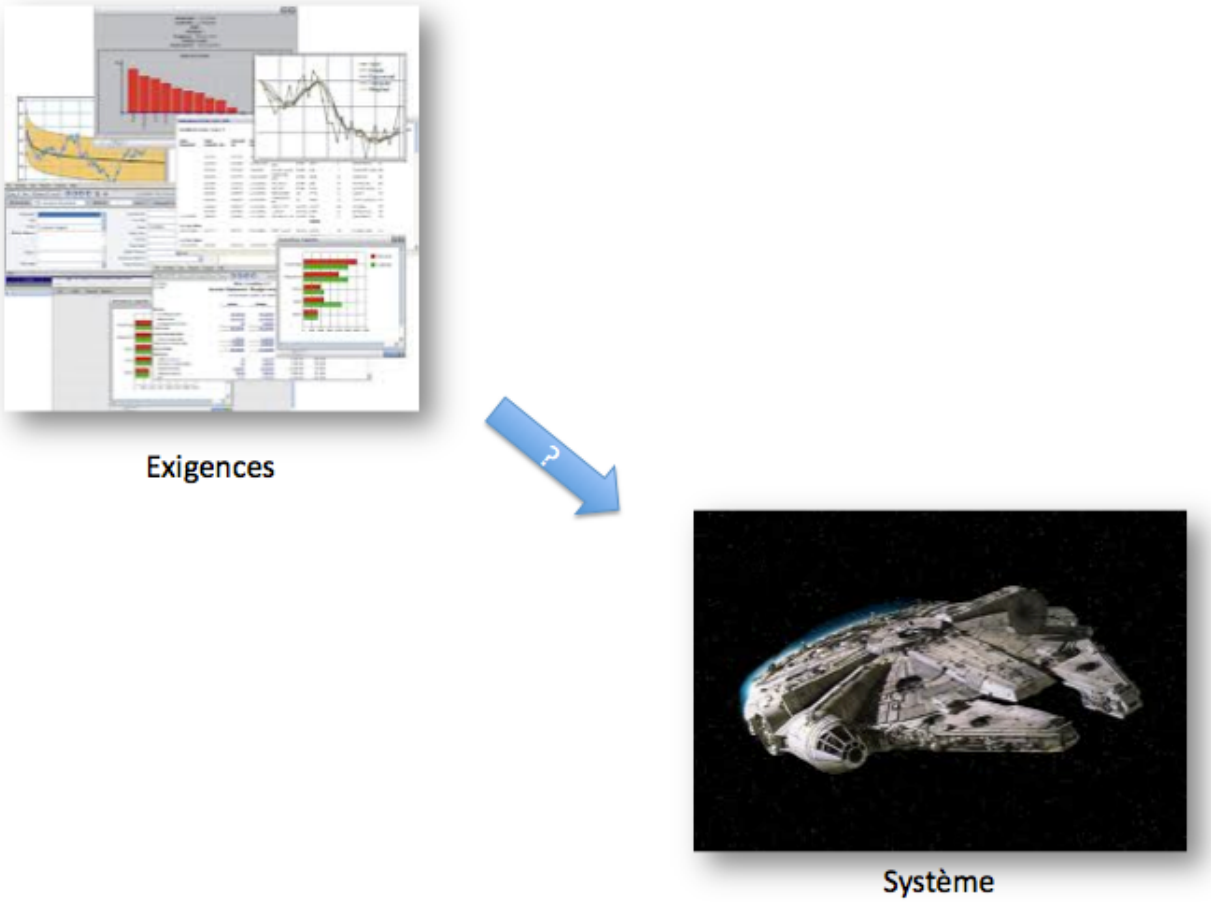


Figure 10.2. Analyse Fonctionnelle et/ou Comportementale

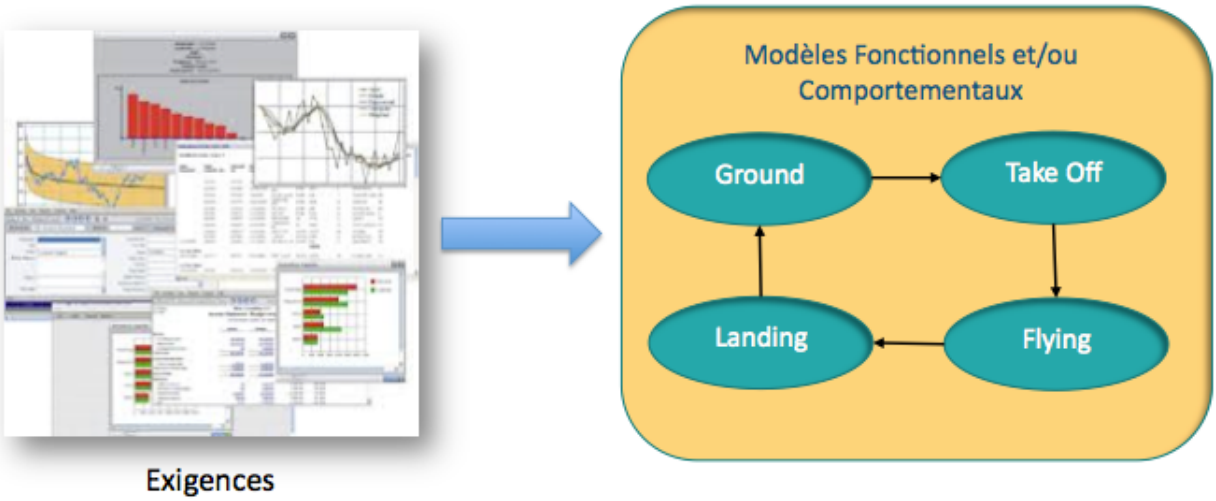


Figure 10.3. Analyse Structurelle

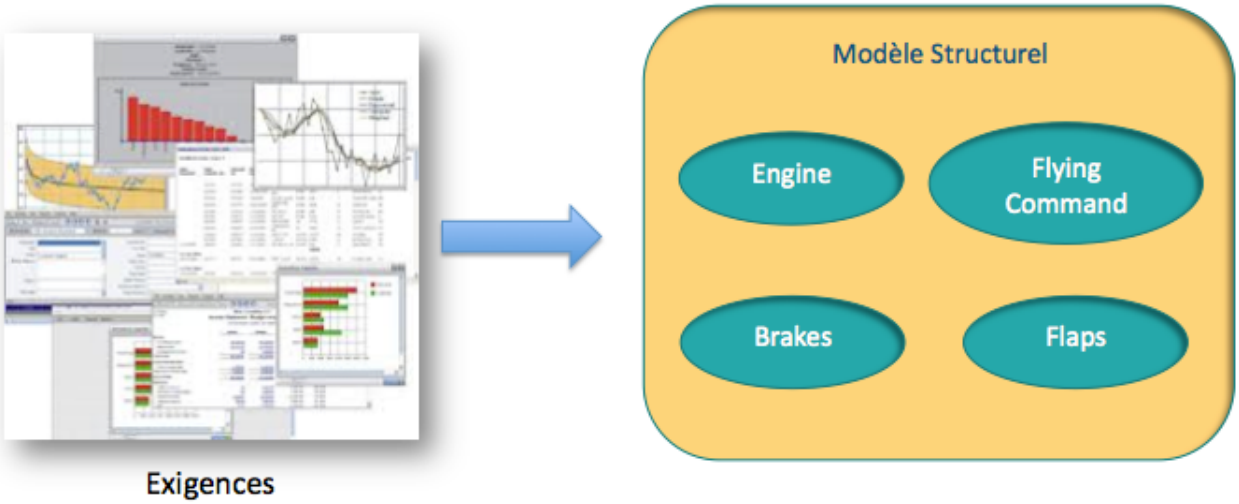


Figure 10.4. Analyse de performance

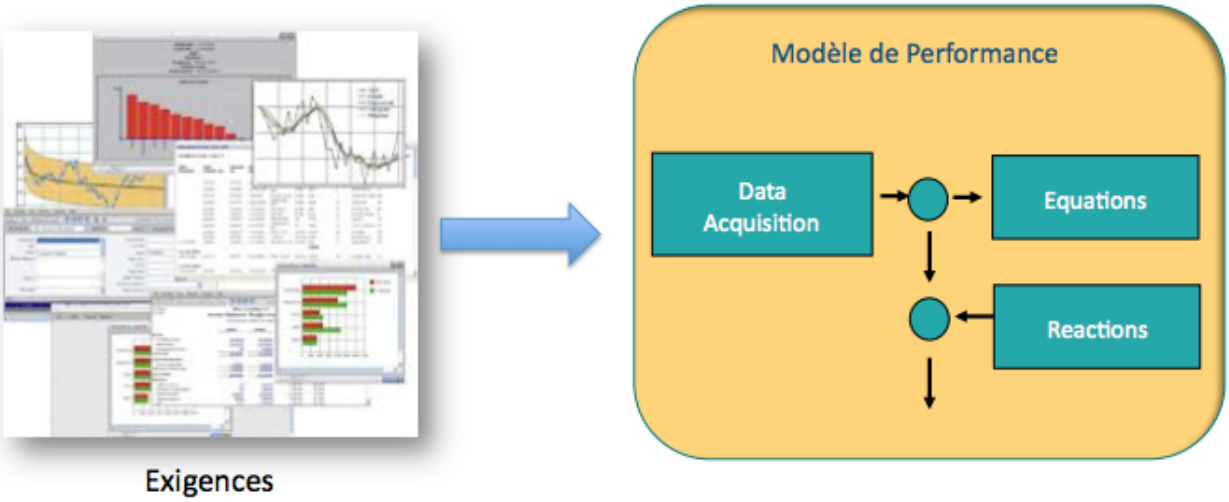


Figure 10.5. Analyses spécifiques

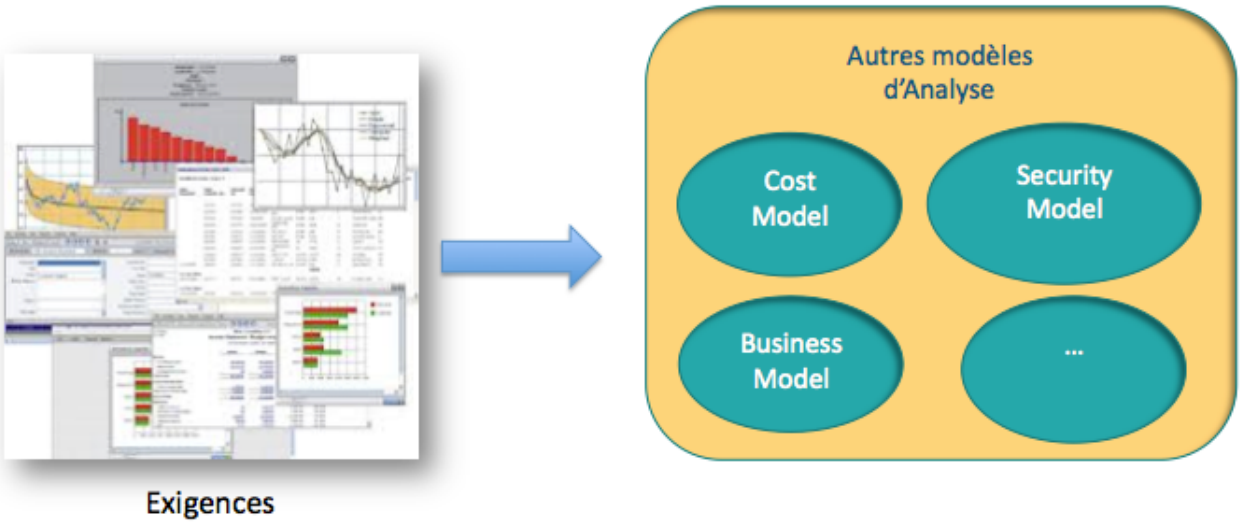
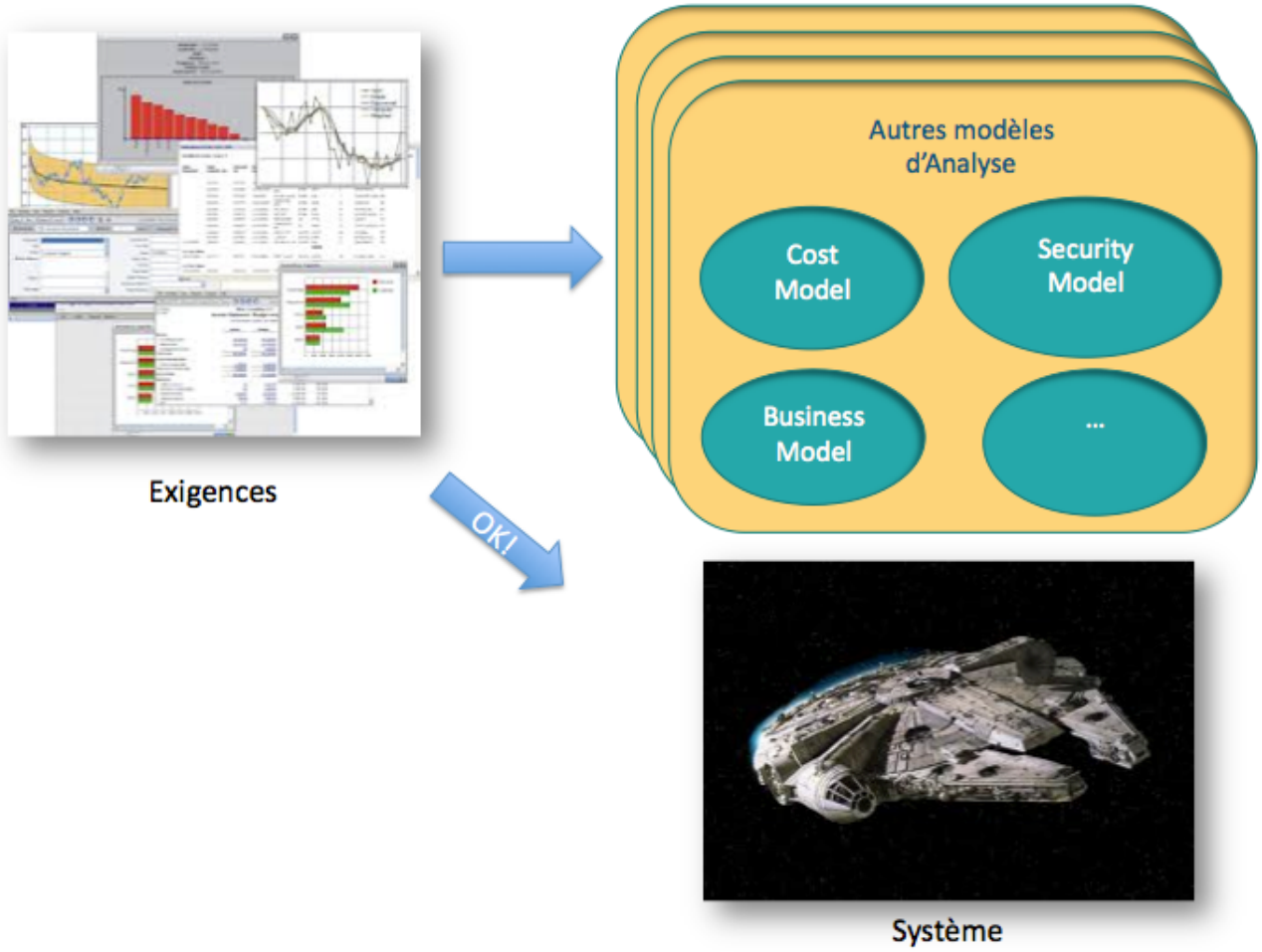


Figure 10.6. Des exigences au système



Chapter 11. Norms & standards

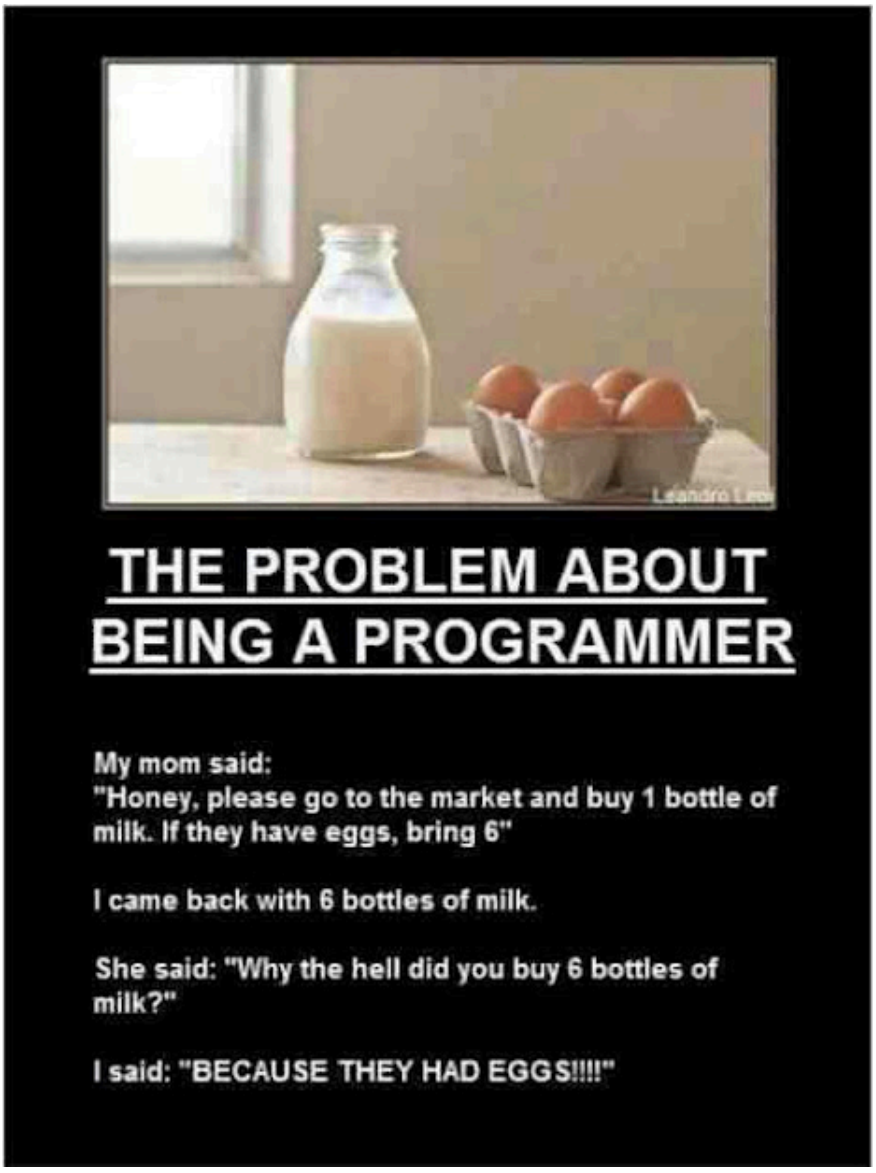
(IEEE, EIA, ISO, certification, NASA, INCOSE, AFIS, …).

Chapter 12. From document to models

Chapter 13. Requirements

Figure 13.1. 300 different skills in the same field

Figure 13.2. Ambiguities (taken from here [https://plus.google.com/100035762233109552669/posts/a8Hafq2hZ74])



Chapter 14. Architecture

Liens avec AADL, …

Chapter 15. Behavior

Liens avec la V&V

Chapter 16. Systems Requirements

Requirements engineering (quickly because public will be aware).

Chapter 17. Tutorial presenters

17.1. Prof. Jean-Michel Bruel

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U. of Toulouse [http://www.univ-tlse.fr] - CNRS/IRIT Lab [http://www.irit.fr].

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Biography
Jean-Michel Bruel received his Ph.D. from the University Paul Sabatier (Toulouse) in December 1996. From September 1997 to August 2008, he was associate professor at the University of Pau. Member of the LIUPPA (Laboratoire d'Informatique de l'Université de Pau et des Pays de l'Adour) from 2000 to 2008. Currently member of the MACAO team (Modèles, Aspects, Composants pour des Architectures à Objets) of the IRIT (Institut de Recheche en Informatique de Toulouse) CNRS laboratory. His research areas include development of distributed, component-based applications, methods integration, and on the use of formal methods in the Component-Based Software Engineering context. He has defended his "Habilitation à Diriger des Recherches" in December 2006 and obtained in 2008 a full professor position at the University of Toulouse. He is also head of the Computer Science department of the Technical Institute of Blagnac since 2009.

Related Experiences

- Co-founder of the SysML-France association [http://www.sysml-france.fr]
- Software and Systems Modeling Journal editorial board

17.2. Prof. João Araújo

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Biography
João Araújo holds a PhD in Computer Science from Lancaster University, UK, in the area of Requirements Engineering. He is an Assistant Professor of the Department of Informatics at the Universidade Nova de Lisboa, Portugal. His principal research interests are in Requirements Engineering, Model-Driven Development, Software Product Lines and and Early Aspects, where, he has published several papers on this topic in international conferences and workshops. He has particpated in the organization and/or program committees of several conferences such as RE,

MoDELS, AOSD, OOPSLA, SPLC, CAiSE and ICSE conferences since 2002. Additionally, he served on the organization or program committees of MODELS, RE, ECOOP, AOSD, CAiSE and ICSE in the past few years. He has taught several tutorials on Early Aspects.

Related Experiences

- RE and RCIS Program Board member
- Teaching Requirements Engineering in MSc and PhD courses in FCT/UNL.
- Tutorials on Early Aspects at RE, MoDELS, AOSD conferences

References

[1] A. v. Lamsweerde. "Goal-Oriented Requirements Engineering: A Guided Tour," presented at the 5th IEEE International Symposium on Requirements Engineering, Toronto, Canada, 2001.

[2] A. v. Lamsweerde. Requirements Engineering: From System Goals to UML Models to Software Specifications. Hoboken, USA: John Wiley & Sons, Inc., 2009.

[3] Jean-Michel Bruel and Pascal Roques. "Présentation des concepts de SysML." Chap. 4 of the book: "Modélisation et analyse de systèmes embarqués", Hermès Book, To be published in June 2013.

[4] Manzoor Ahmad, Jean-Michel Bruel, R #egine Laleau, Christophe Gnaho. Using RELAX, SysML and KAOS for Ambient Systems Requirements Modeling. Procedia Computer Science 10 (2012) 474–481.

[5] Jon Whittle, Pete Sawyer, Nelly Bencomo, Betty H. C. Cheng and Jean-Michel Bruel. RELAX: A Language to Address Uncertainty in Self-Adaptive Systems Requirements. Requirements Journal, Springer-Verlag, 2010, Volume 15, Number 2, Pages 177–196.

[6] http://www.sysml-france.fr