PMR 5020

Modelagem de Projeto de Sistemas

Aula 6: Goal Oriented Requirements Engineering

Prof. José Reinaldo Silva
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Objectiver

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Question: What do safety critical system engineers, business analysts, software engineers have in common ?

Answer: They all know too well how difficult and important it is to write good requirements at the very start of their projects !

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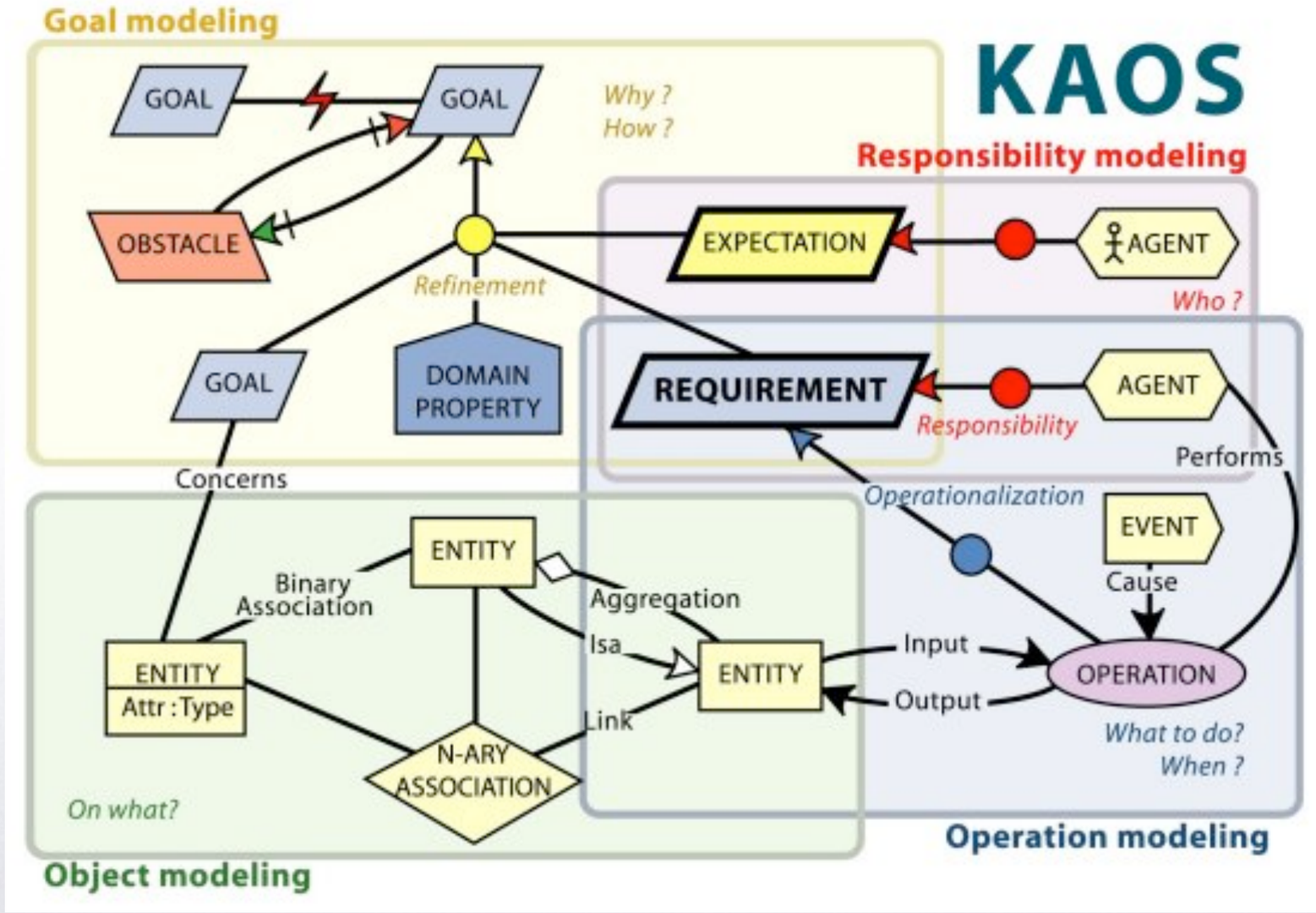
KAOS metamodel



Knowledge Engineering

Edward Feigenbaum
"Pai" dos Sistemas Especialistas
Sanford University

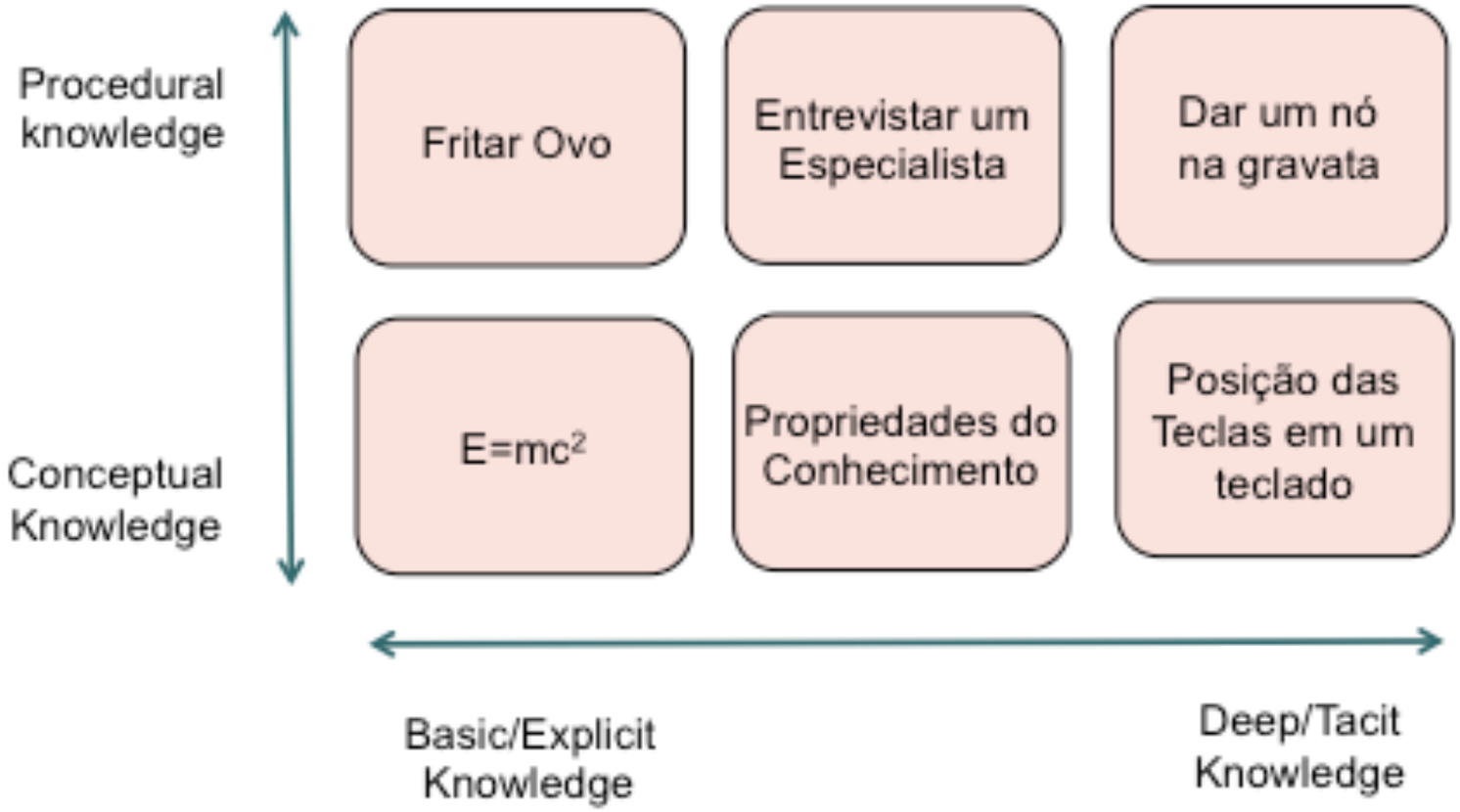
KE is an engineering discipline that involves integrating knowledge into computer systems in order to solve complex problems normally requiring a high level of human expertise

Knowledge Engineering

Knowledge Acquisition
Knowledge Modeling and Analysis
Knowledge Validation
Knowledge Base Building

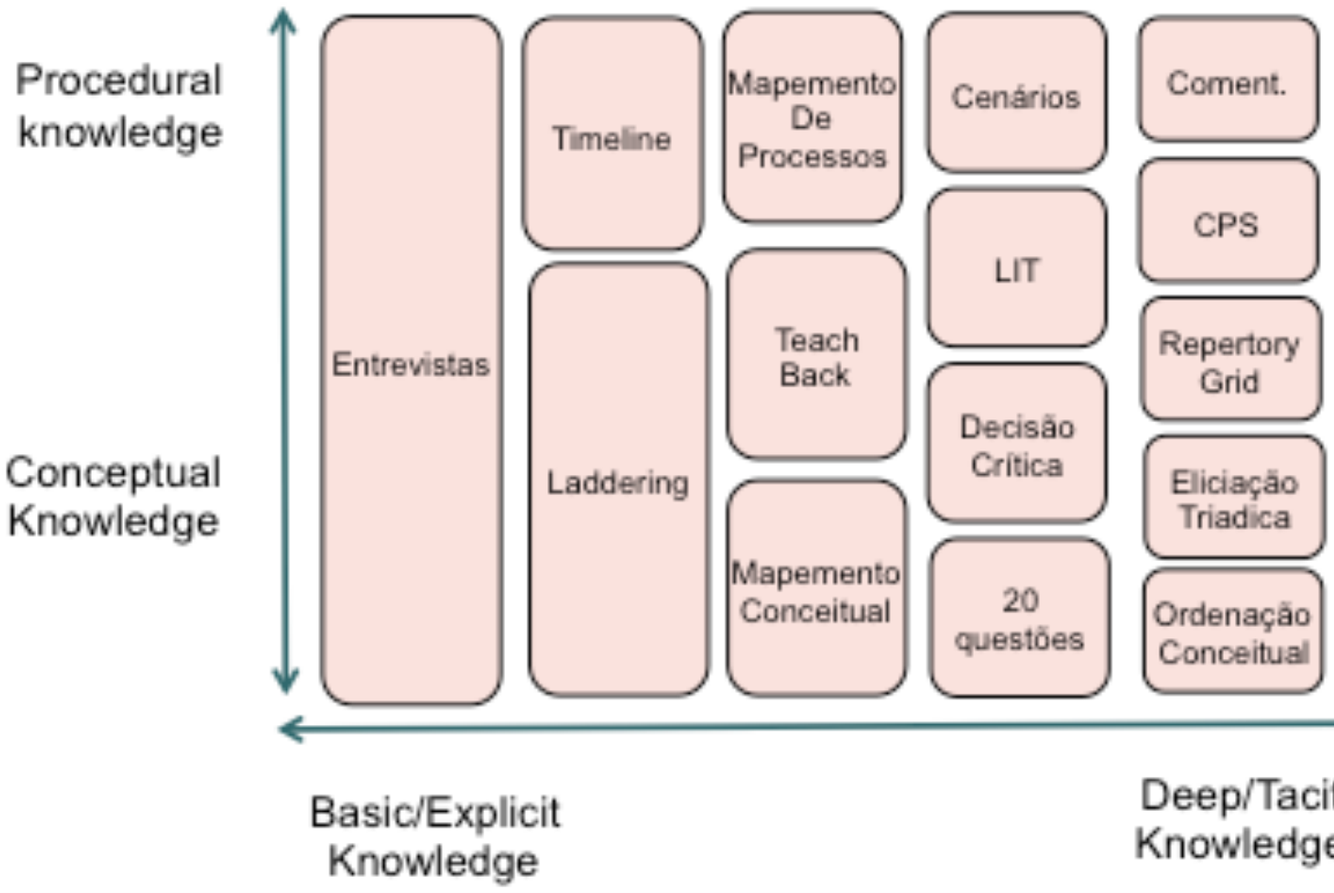
→ KNOWLEDGE ENGINEERING

Knowledge Types



Milton, N. R; Knowledge Acquisition in Practice, Springer-Verlag, 2007

Knowledge Elicitation



Milton, N. R; Knowledge Acquisition in Practice, Springer-Verlag, 2007

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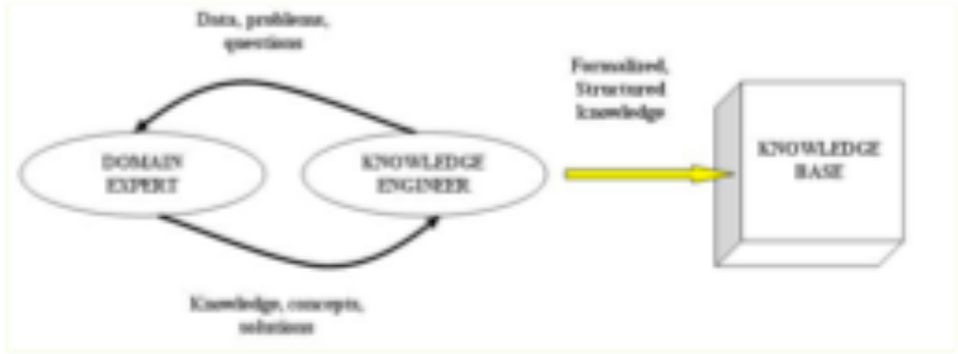
O Processo de eliciação



Domínios acoplados

stakeholder

desenvolveor

Questions, feedback

Métodos clássicos

Unformalized Structured Knowledge

Expert World

Requirement Engineer

Requirements Base

Knowledge, concepts, Application results

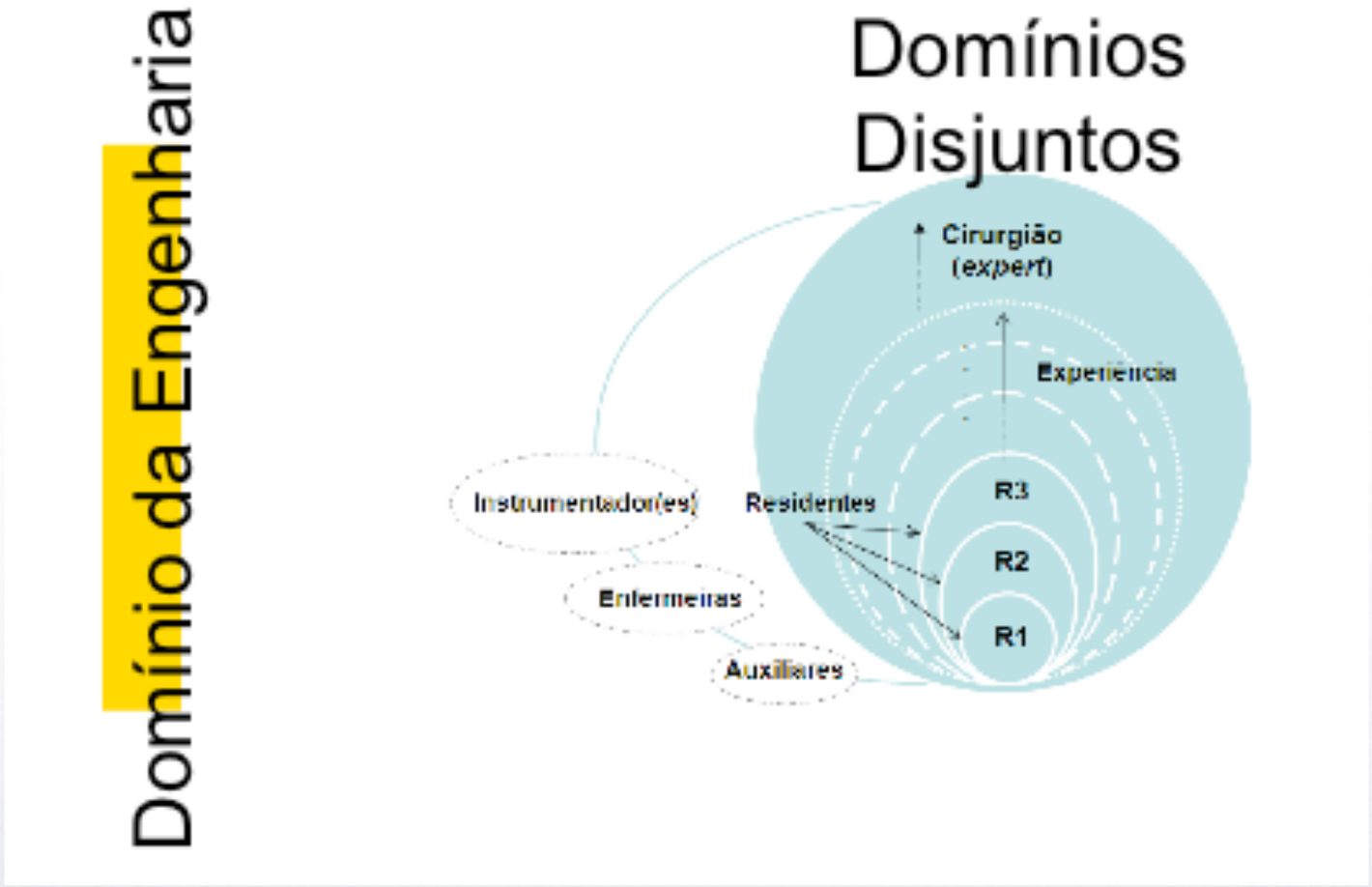
Domínios disjuntos

stakeholder

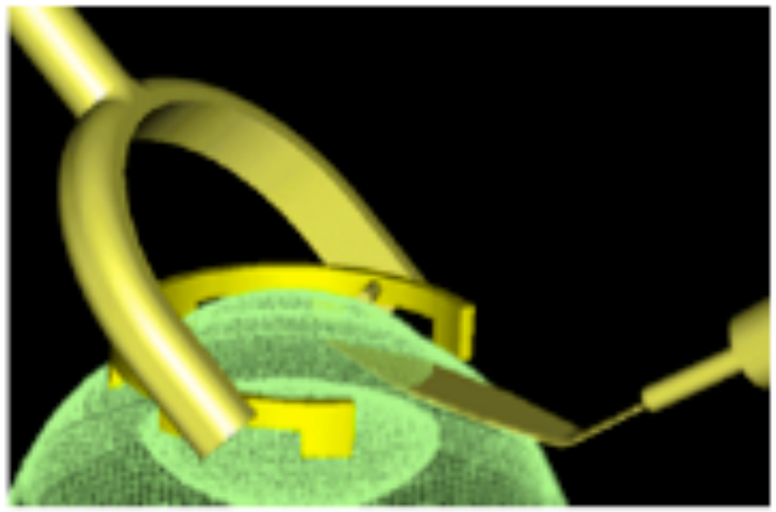
desenvolvedor

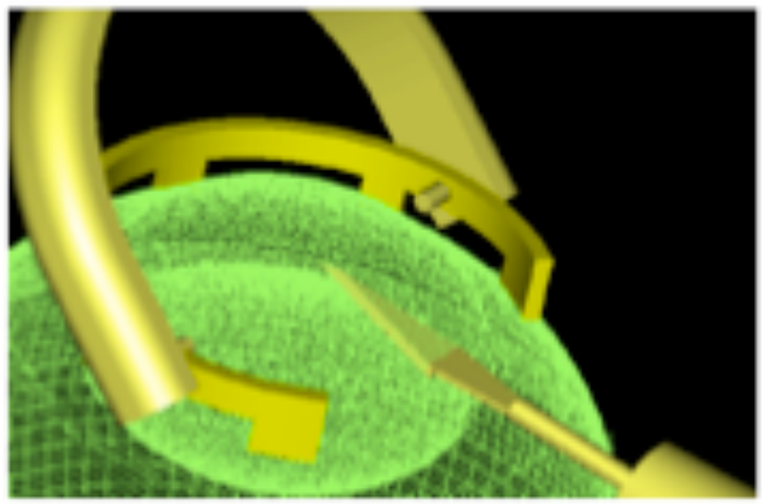
KB methods

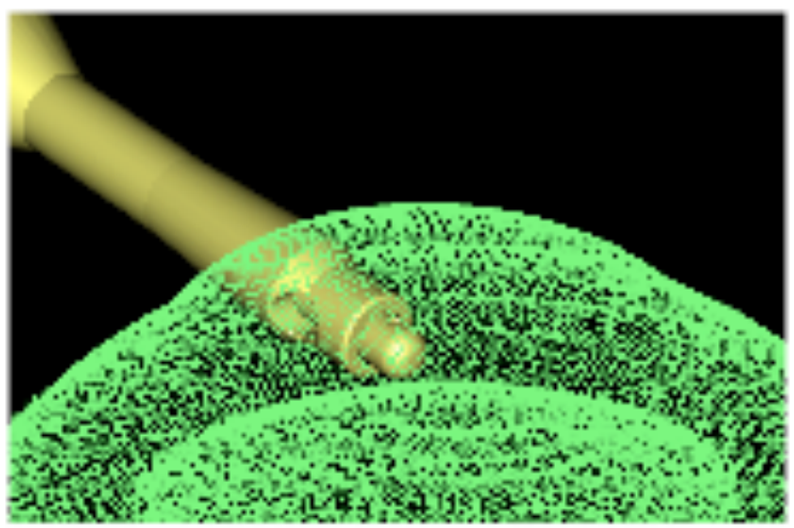
Um exemplo: automação de procedimento cirúrgico

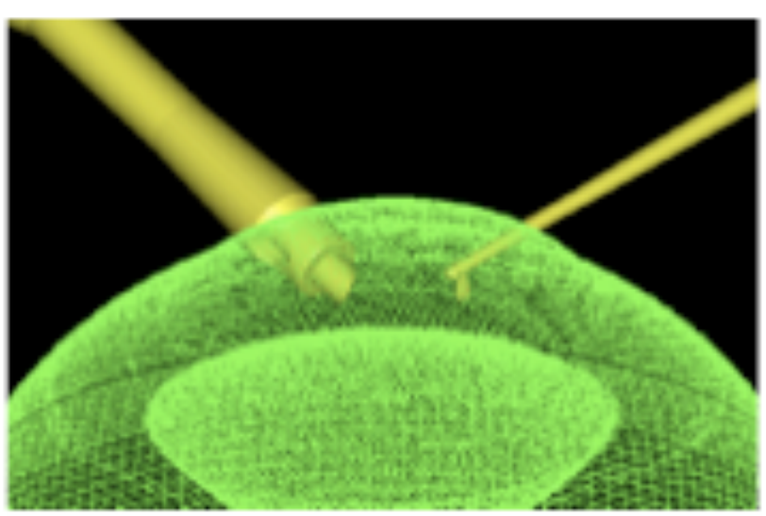


validação?

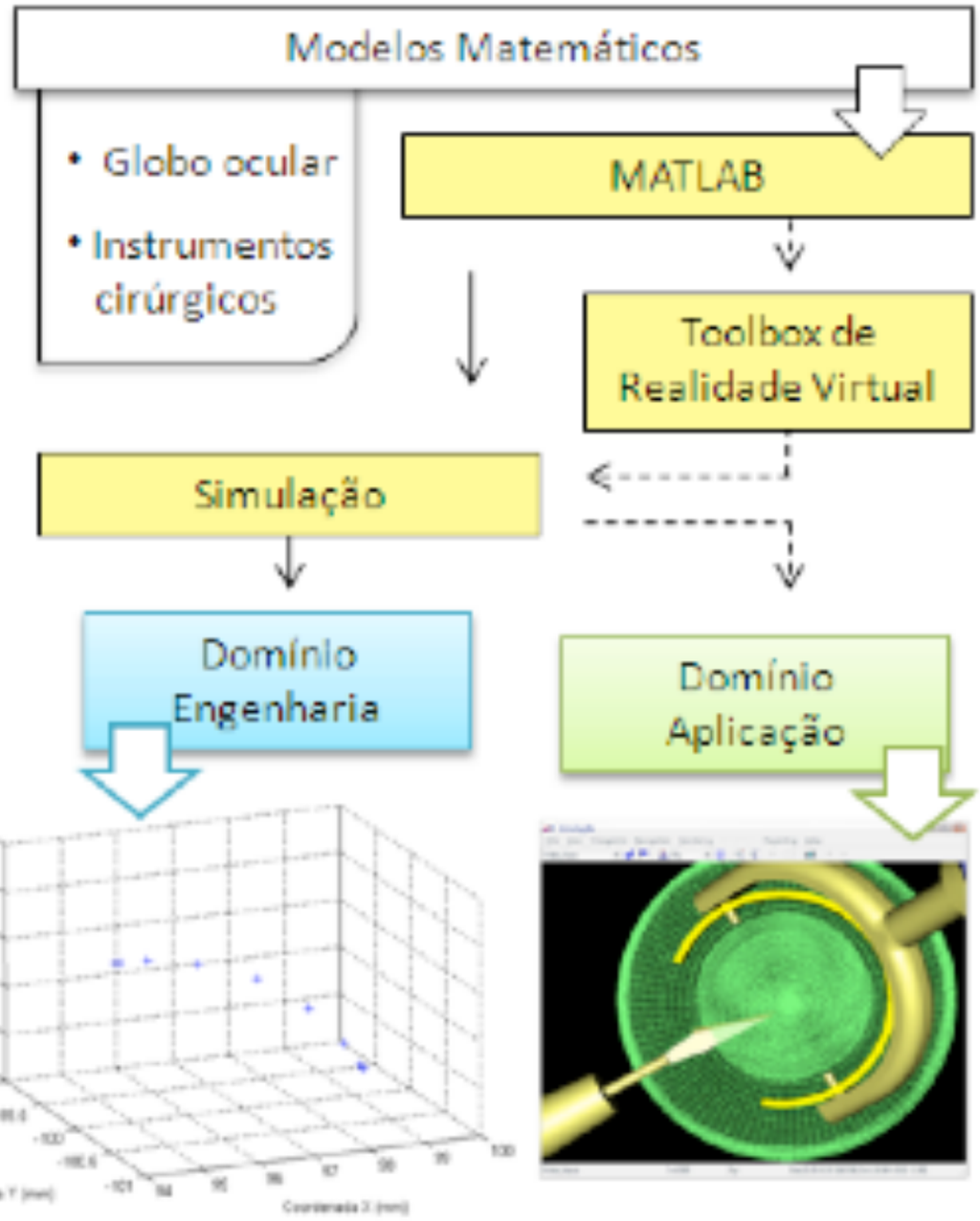








Queiroz, R.A.A., and Silva, J.R.; Elicíação e Comunicação de Requisitos em Domínios Disjuntos: Estudo de Caso para a Área Médica, submetido à revista Controle e Automação, Sociedade Brasileira de Automática.



Entendendo o momento atual da ER

No final dos anos 80 surgiu um movimento liderado por alguns dos maiores pesquisadores do mundo em Engineering Design (Paul J.W. ten Hagen, Paul Veerkamp, do CWI e Tetsuo Tomiyama e Hiroyuke Yoshikawa, da Univ. de Tokyo que se chamou iCAD, ou inteligent CAD cuja meta era estudar a inserção de conhecimento no processo de Design.

Evaluating the Effectiveness of a Goal-Oriented Requirements Engineering Method

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Tom S. E. Maibaum
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Abstract

As an attempt to answer the need for methods and tools in requirements engineering (RE) which are domain specific and can address the main RE objectives (REOs), and the growing interest in the goal oriented requirements engineering (GORE)

the identification of system goals and the transformation of these goals into requirements; it addresses concerns of why a certain goal is required, how it can be achieved and who is responsible for it in the system and/or the environment [2] [3] [22]. To address these issues, the research we are undertaking proposes to evaluate KAOS, a GORE method, and Objectiver as associated tool for KAOS for the

About the authors

Al-Subaie, H., Maibaum, T.S.E.; Evaluating the Effectiveness of a Goal-Oriented Requirement Engineering Method. Fourth Int. Workshop on Comparative Evaluation in Requirements Engineering (CERE06-RE06), 2006

Huzam Al-Subaie is a researcher in the Department of Informatics of King's College London by the time he wrote this article with Thomas Maibaum. He graduated in Information Systems in King Saud University (1990), South Arabia, got a Master degree from Keele University (2000) and a PhD in Computer Software Engineering from King's College London (2007). Today is a Chief Executive of projects in Saudi Arabia.

Thomas Stephen Edward Maibaum (born 18 August 1947 in Hungary) is a computer scientist. He got an undergraduate degree in Pure Mathematics from the University of Toronto, Canada (1970), and a PhD in Computer Science from Queen Mary and Royal Holloway Colleges, University of London, England (1974).

Maibaum has held academic posts at Imperial College, London, King's College London (UK) and McMaster University (Canada). His research interests have concentrated on the theory of specification, together with and its application in different contexts, in the general area of software engineering.

Maibaum is a Fellow of the Institution of Engineering and Technology and the Royal Society of Arts

How much GORE is to be trusted?

Al-Subaie and Maibaum propose a comparative study to evaluate the effectiveness of GORE Methods and specifically of Objectiver based on the following:

1. The major REOs (Requirements Eng. Objectives) accepted by RE researchers and practitioners as being important attributes of requirements specifications; these include: completeness, correctness, non-ambiguity,

2. The objectives of KAOS itself, which includes providing constructive assistance during requirements engineering activities, such as:
(a) create problem descriptions by using predefined concepts;

(b) analyze the problem through a systematic technique for eliciting, discovering, and structuring goals;

(c) identify roles and responsibilities of the stakeholders;

(d) provides formal definition of the requirements of the most critical parts of the system; and

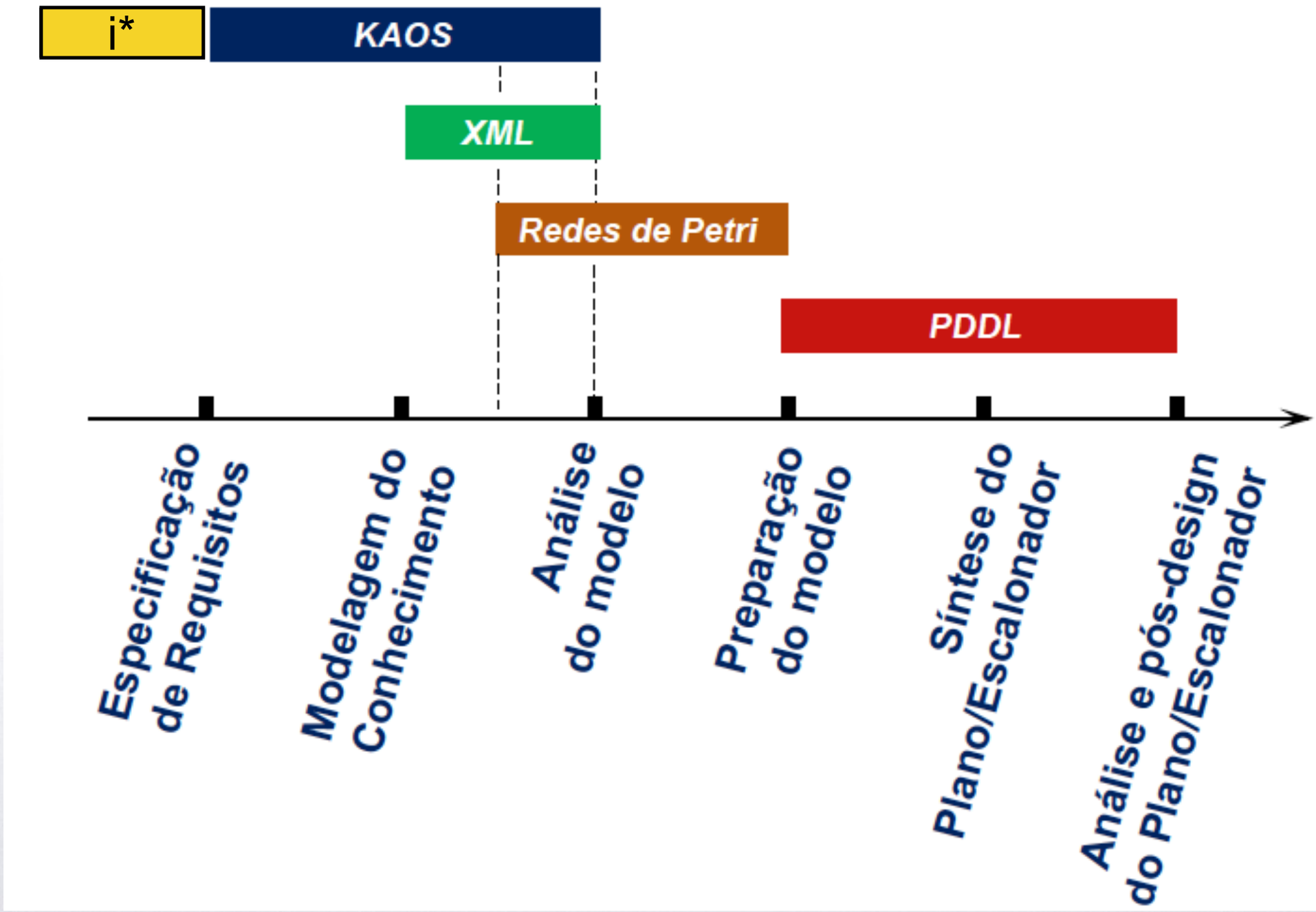
(e) establish efficient stakeholders communication.

3. The objectives of Objectiver itself which includes:

(i) supporting the KAOS method semi-formally to identify, model and write requirements;

(ii) enabling a systematic derivation of requirements documents from requirements models; and

(iii) improving the validation process, the quality of requirements documents and stakeholder communication pertinence, consistency, and traceability.


¡*
KAOS
XML
Redes de Petri
PDDL
Especificação de Requisitos
Modelagem do Conhecimento
Análise do modelo
Preparação do modelo
Síntese do Plano/Escalonador
Análise e pós-design do Plano/Escalonador

The paper really wants to answer the following questions:

(i) How well do KAOS and Objectiver meet the criteria established in the discipline of RE; and

(ii) How well do KAOS and Objectiver achieve their own self-defined objectives

A fase de requisitos e a ER

Como vimos até aqui:

i) a fase de requisitos é muito importante para os projetos;
ii) o sucesso do projeto depende de uma boa ER;
iii) para o design de sistemas esta fase é primordial;
iv) a ER é composta da: eliciação, modelagem e análise, validação/ verificação de requisitos;

The key problems

- The priority of requirements from different viewpoints changes during the development process.
- System customers may specify requirements from a business perspective that conflict with end-user requirements.
- The business and technical environment of the system changes during its development.

Good req's X Bad req's

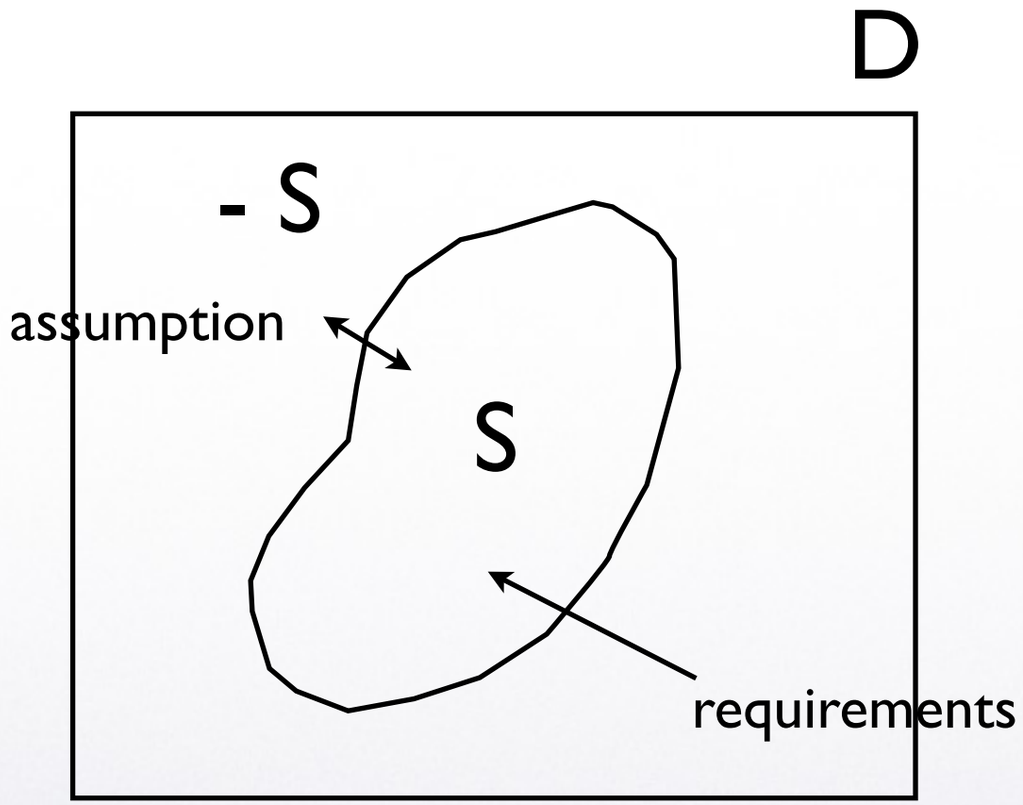
- Enduring requirements. Stable requirements derived from the core activity of the customer organisation. E.g. a hospital will always have doctors, nurses, etc. May be derived from domain models
- Volatile requirements. Requirements which change during development or when the system is in use. In a hospital, requirements derived from health-care policy

Traceability

"The requirements traceability is the ability to describe and follow the life of a requirement, in both a forward and backward direction, i.e. from its origins, through its development and specification, to its subsequent deployment and use, and through periods of ongoing refinement and iteration in any of these phases."

Gotel, O., Filkenstein, A.; An Analysis of the Requirements Traceability Problem, in Proc. of the First Int. Conf. on Requirements Engineering, pp 94-101, Colorado Springs, USA, 1994.

Contexto



Dominio de aplicação

The RE criteria (of what is a good requirements set):

The Requirement engineering criteria consists in finalizing a requirements systematic phase with what could be called "requirement specification", which differs from the remaining "requirements" for some basic criteria: i) it is supposed to be complete, that is, there is no missing important issue; ii) it is correct, in the sense that what is specified fits the business process and provides what all agents demanded in their respective viewpoints; iii) the whole set is consistent - although emerging from an informal process it should be as close as possible from a model; iv) should be unambiguous and verifiable, in the sense that it is possible to identify parameter and process issues to mark satisfiability of requirements.

The paper really wants to answer the following questions:

(i) How well do KAOS and Objectiver meet the criteria established in the discipline of RE; and

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KAOS

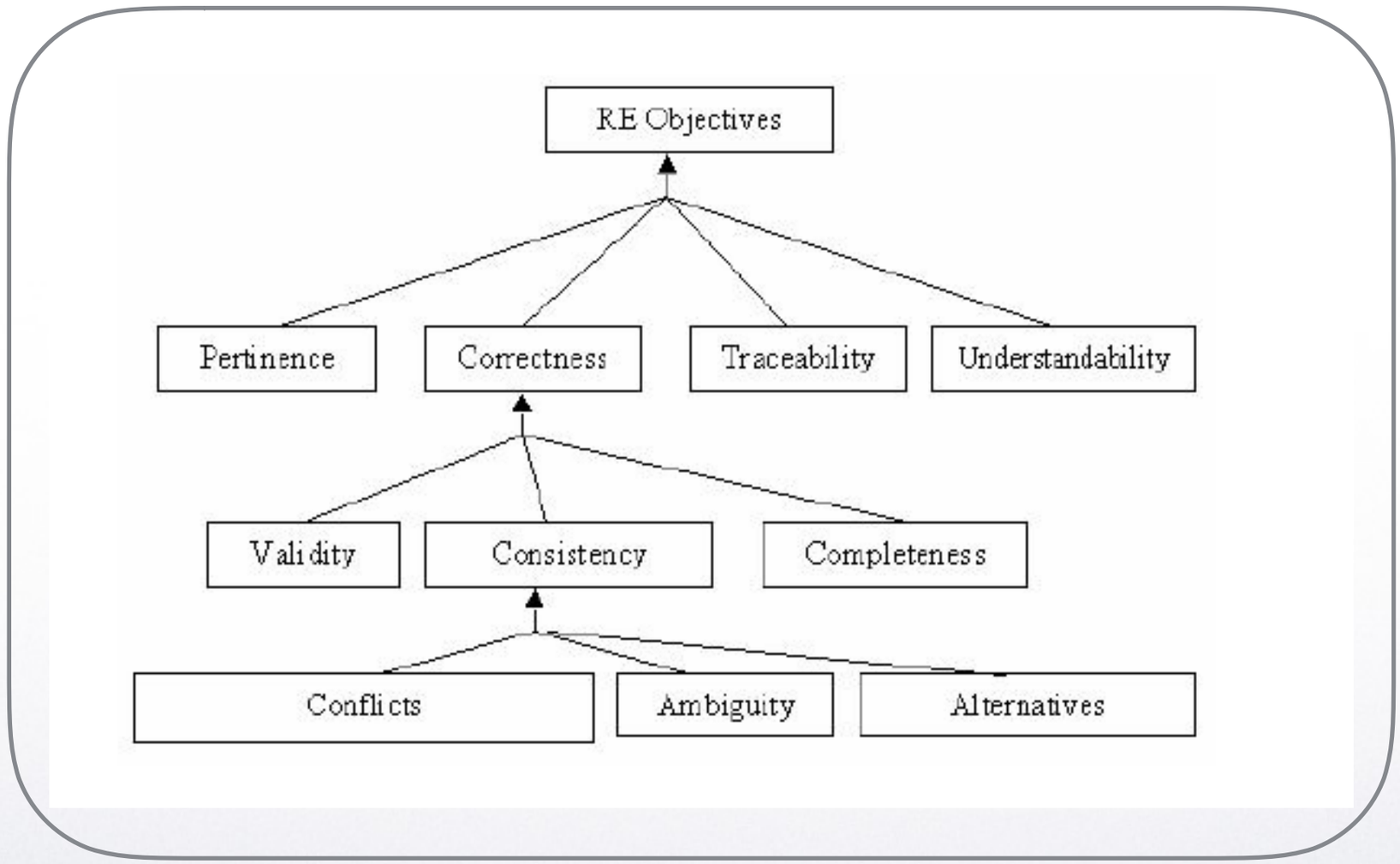
KAOS is a prospective method based on REOs that claims to provide a complete model of requirements from an informal phase up to specifications once some basic rules of composition were respected. Formal modeling can also be generated base on the specification model.

Objectiver

ObjectivER is a computer application that claims to support a systematic process to conduct KAOS modeling, generate the formal specification and automatically synthesize the requirement documentation.

RE objectives (REOs)

The REOs are defined as those attributes that need to be achieved to produce complete, valid, correct, pertinent, consistent, traceable, unambiguous and understandable requirements


RE Objectives
Pertinence
Correctness
Traceability
Understandability
Validity
Consistency
Completeness
Conflicts
Ambiguity
Alternatives

A. Fully achieved:
   1. The objective completely supported by:
      - Providing step-by-step assistance to the developer.
      - Providing explicitly detailed information in the literature.
   2. All aspects of the objective are covered:
      - No number of error reports mapped to this particular objective.
      - No number of negative observations mapped to the objective.

B. Strongly achieved:
   1. The objective largely supported by:
      - Providing step-by-step assistance to the developer.
      - Providing explicitly detailed information in the literature.
   2. All aspects of the objective are covered but the full achievement of the objective depends on the expertise and the talent of the developer:
      - Some error reports from the first target problem mapped to this particular objective but not from the second one.
      - Some negative observations to the objective from the first target problem mapped to this particular objective but not from the second one.

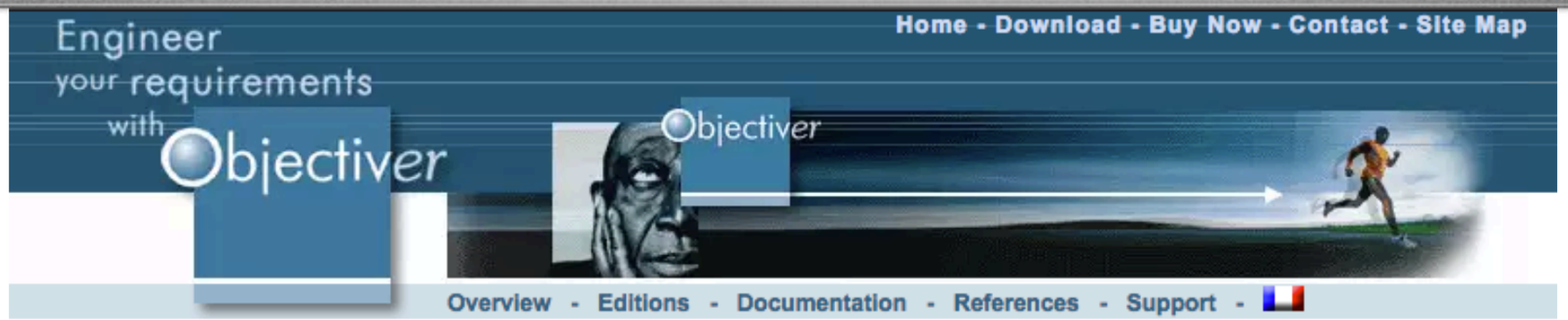
C. Partially achieved:
   1. The objective partially supported by:
      - Providing some assistance to the developer.
      - Providing some information in the literature.
   2. Part of aspects of the objective are covered but the full achievement of objective depends on the help of another tool or method:
      - Lightweight error reports mapped to this particular objective.
      - Lightweight negative observations mapped to this particular objective.

D. Slightly achieved:
   1. The objective supported in very limited degree by:
      - Providing Limited assistance to the developer.
      - The literature does not cater for the objective.
   2. Very limited achievement of objective:
      - Developer needs to extend the method to overcome its limitation.
      - Heavyweight error reports mapped to this particular objective.
      - Heavyweight negative observations mapped to this particular objective.

E. Fail to be achieved:
   1. The objective unrealised
      - The objective is not addressed.
   2. The objective totally left out.
      - The objective is not referred to in the literature.

Besides all the authors conclusion the question is: are we really expecting to find out a "perfect" system? a "perfect" method? if not what would be a reasonable tolerance level? and which improvements should be required?

... and the question that sumarize last exercises and the current analysis: i) what do you think about the "intuitive" approach you probably used in both exercises? ii) are you really ready to invest in a systematic change both to direct applicative, information systems and service systems? iii) what would be the expected advantages and drawbacks?



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Objectiver's documentation

You will find here an exhautive list of our brochures concerning objectiver :

- general overview
- functional overview
- technical datasheet
- movies
- more...

Presentations

Quality starts by defining your goals ! (1067 Kb)
See how **Objectiver** eases the requirements engineering process.

Goal-Oriented Requirements Engineering: from System Objectives to UML Models to Precise Software Specifications (283 Kb)

Prof. Axel van Lamsweerde's presentation of the KAOS approach to requirements engineering.

The GRAIL Tool (1309 Kb)
A general presentation of GRAIL (**Objectiver** predecessor)

Methodology

Objectiver is based on a goal-driven requirements methodology called KAOS....

KAOS Tutorial (5.3 Mb)
This tutorial covers the KAOS method, concepts and modeling techniques for analysing project requirements.

Using Objectiver in combination with UML
Objectiver should be used to drive your work in the Unified Modeling Language.

White papers

Sofware quality Starts with the Modelling of Goal-Oriented Requirements (193 Kb)
This paper was presented at ICCSEA 2003.

Requirements Engineering with KAOS/GRAIL : From Goal Analysis to Autaomatically Derived Requirements Documents (156 Kb)
Paper presented at RE03.

More...

pxc387750.pdf

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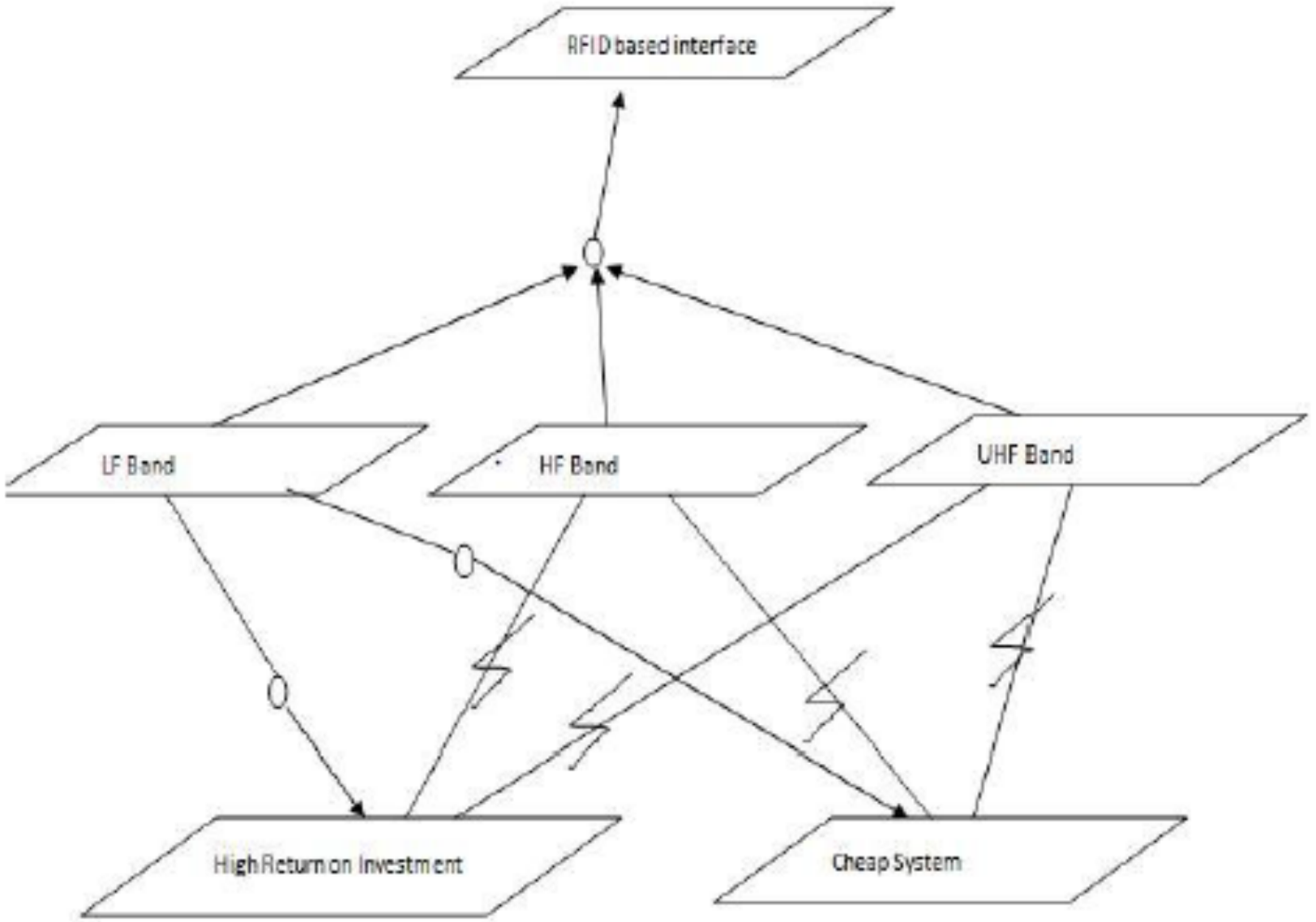
Design of a Smart Stick Prototype Using Goal Oriented Requirements Engineering Methodology

ARTICLE *in* INTERNATIONAL JOURNAL OF COMPUTER APPLICATIONS · FEBRUARY 2010

DOI: 10.5120/578-750 · Source: DOAJ


RFID based interface
LF Band
HF Band
UHF Band
High Return on Investment
Cheap System

The new Assignment is now to redo the same Exercise 2 in KAOS using ObjectivER taking in account all the points in the article that is our reading of the week (from Al-Subaie and Maibaum). Check all the points and how to overcome that. Requirements documentation should be generated and that is the result of the exercise.

Obrigado

Reinaldo