Multi-Agent Approach For Software Functional Size Measurement

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Agenda

• Principle of agent-based system design
• A methodology for designing and developing multi-agent systems
• The question of automating the software functional size measurement process
• Agent-based approach for software functional size measurement
• Advantages of the agent-based approach
• Questions and further research steps
• Some references
Principle of agent-based system design

• Perceive a real world system as a set of autonomous, interacting agents in a given environment.

• Two main perceptions of the concept of agent:
  – Some authors confer to an agent, mental habilities such as belief, desire, intention, … which are to be taken into account when modeling an agent
  – Other authors suggest to take into consideration only observable properties of agents such as autonomy, reactivity, pro-activity, cooperation, …
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MaSE: A methodology for designing and developing multi-agent systems

- MaSE: Multi-agent System Engineering

Diagram:
- Domain Level Design
- Agent Level Design
- Component Design
- System Design
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The question of automating the software functional size measurement process

• To simplify the application of methods
• To reduce subjectivity
• To ensure repeatability

• What is to be automated?
DEFINITION OF OBJECTIVES

DEFINITION OF NUMERICAL ASSIGNMENT RULES

DEFINITION OF THE CONCEPT TO BE MEASURED

CHARACTERISATION OF THE CONCEPT TO BE MEASURED

DESIGN OR SELECTION OF A META-MODEL

DESIGN OF A MEASUREMENT METHOD

COLLECTION OF SOFTWARE DOCUMENTATION

CONSTRUCTION OF THE SOFTWARE MODEL RELATED TO THE METHOD

APPLICATION OF NUMERICAL ASSIGNMENT RULES

RESULT

AUDIT

ESTIMATION MODEL

PRODUCTIVITY MODEL

BUDGET MODEL

QUALITY MODEL

Activities 1

Activities 2

Activities 3

Activities 4

DESIGN OF A MEASUREMENT METHOD

APPLICATION OF A MEASUREMENT METHOD

ANALYSIS OF MEASUREMENT RESULTS

EXPLOITATION OF MEASUREMENT RESULTS

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The question of automating the software functional size measurement process

- Two main research areas:
  - Based on source code (retro-engineering)
  - Based on specifications (case tools)
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UML TRANSLATION OF THE COSMIC-FFP STATIC MODEL

UML TRANSLATION OF THE FPA STATIC MODEL

UML TRANSLATION OF THE MK II FPA STATIC MODEL

ANALYSIS

+ PROPOSITION OF A GENERAL META-MODEL OR CHOICE OF A STATIC MODEL FOR THE GENERAL FRAMEWORK (UML TRANSLATION)

DEFINITION OF A GENERAL FRAMEWORK FOR THE AUTOMATION OF ALL OR PART OF THE FUNCTIONAL SIZE MEASUREMENT PROCESS

"Mapping"

CONSTRUCTION OF THE MODEL OF THE SOFTWARE TO BE MEASURED

APPLICATION NUMERICAL ASSIGNMENT RULES AND AGREGATION

RELATED AGENT(S)

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Advantages of the agent-based approach

• Modularity (abstraction levels, specialized agents, ...)
• Flexibility (interaction with the user when automation is not possible or for validation, possibility of learning rules, ...)
• Feedback to measurement methods
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Questions and further research steps

- Is it possible to automate the « mapping »?
  - \( \text{Concepts}_{\text{Measurement}} \cong F_{\text{mapping}}(\text{Concepts}_{\text{specifications language}}) \)

- How to represent the results of the « mapping » so that they could be used to build the model of a software to be measured?
  - Production rules, decision trees, ... ?

- Is it possible to automate the construction of the model of a software to be measured?
  - Text analysis tools, ... ?
Questions and further research steps

- How to represent the model of a software to be measured?
  - *Decomposition tree, ... ?*

- Is it possible to automate the application of numerical assignment rules (*measurement function*) and the aggregation of results, from the model of a software to be measured?
  - *Probably.*

- How to represent numerical assignment rules?
  - *Function [numericalValue-F(concept)], Array[concept, numericalValue], ...?*
References


References


Thank you for your attention.