Politecnico
di Milano

Modeling requirements

Slides used in the video available here
https://polimi365-my.sharepoint.com/:v:/g/personal/10143828_polimi_it/EfuNIeNgPwtIrwcJQNI1s2YBw6G0vEhQDw4yNbpqLH4wQg?e=per3xm

Modeling requirements

- What is a model
- What to model in RE
- Tools for modeling

The Central Role of Requirements Models

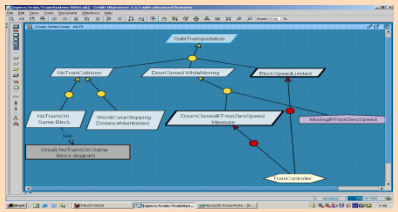
stakeholders

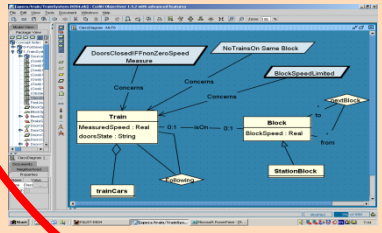
existing systems

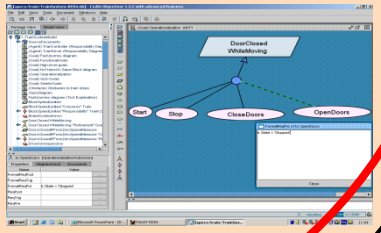
documents

elicitation & **modelling**

Requirements Models

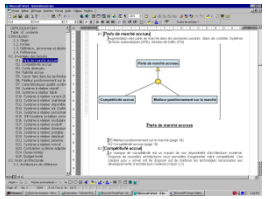






analysis & validation

generation of RE deliverables

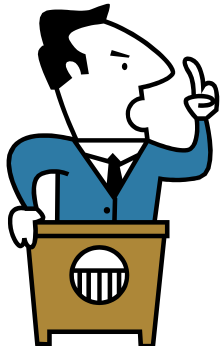


requirements document

Model: A definition

"A model is a representation in a certain medium of something in the same or another medium.
The model captures the important aspects of the thing being modeled and simplifies or omits the rest"

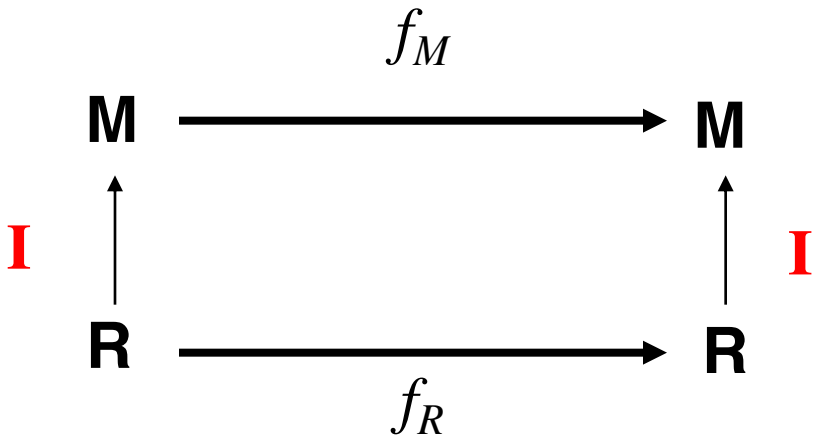
Grady Booch



Reality and Model

- Reality R: Real Things, People, Processes, Relationship
- Model M: Abstractions from (really existing or only thought of) things, people, processes and relationships between these abstractions

What is a "good" model?



- I is the mapping of real things in reality R to abstractions in the model M
  - also called **Interpretation**
- Relationships, which are valid in reality R, are also valid in model M
  - f_R: relationship between real things in R
  - f_M: relationship between abstractions in M

What are software models for

- Capture and precisely state requirements and domain knowledge
- Think about the design of a software system
- Generate usable work products
- Give a simplified view of complex systems
- Evaluate and simulate a complex system
- Generate potential configurations of systems
  - all consistent configurations should be possible
  - not always possible to represent all constraints in the model (model is an abstraction !)

Modelling issues

- Coherence
  - different views of the system must be coherent
- Variations in interpretation and ambiguity
  - define where different interpretations of the model are acceptable

What should we model in RE?

- The objects and people that are of interest for the given problem
  - E.g., the aircraft and the sensors and actuators relevant to the braking system
- The relevant phenomena
  - Weels_turning, Reverse_enabled, …
- The goals, requirements, and domain assumptions

Which tools can we use for modeling?

- Natural language (e.g., Italian, English, …)
  - Pros: simplicity of use
  - Cons:
    - high level of ambiguity,
    - it is easy to forget to include relevant information
- A formal language (e.g., first order logic, Alloy, Z, …)
  - Pros:
    - possibility to use some tool to support analysis and validation
    - the approach forces the user in specifying all relevant details
  - Cons: you need to be expert in the use of the language

Which tools can we use for modeling?

- A semi-formal language like UML
  - Pros:
    - simpler than a formal language
    - imposes some kind of structure in the models
  - Cons:
    - not amenable for automated analysis
    - some level of ambiguity
- A mixed approach
  - Use a semi-formal language for the basics
  - Comment and complement the semi-formal models with explanatory informal text
  - Use a formal language for the most critical parts