MODELLING and SIMULATION

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Course structure

- Lectures 36 hours
- Labs 36 hours
- Exam

Main terms

- **Model** is a material or abstract object which substitutes an original object in investigation (studying) process, saving some important and typical characteristics and features for investigation

- **Modelling** is a process where one object (original) substitutes another one (model) and fixes original object characteristics by means of model characteristics studying

What models can be created for?

- For understanding:

1. What is the object structure?
2. What are main object properties and characteristics?
3. What are object evolution laws and object interaction with environment?

What models can be created for?

- For object management and controlling at the framework of certain goals and conditions
- For forecasting of direct and indirect consequences of different influences on the object

The model allows to

- manage the original object by means of changing and approving different control methods over the model;
- avoid and decrease financial costs;
- carry out experiments with the model in case when a real object is unavailable.

Main terms

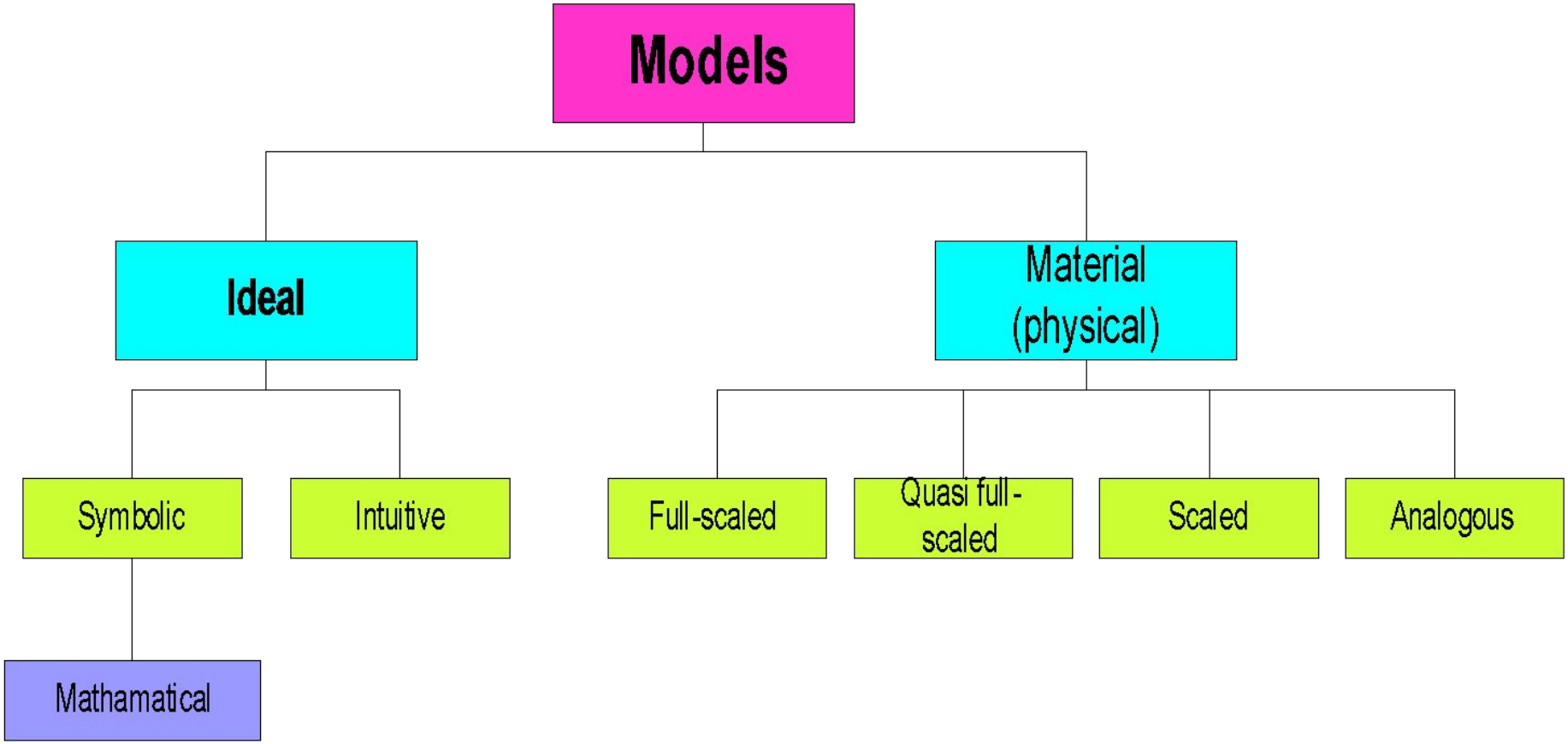
- **System boundary**
- **Hierarchy level**
- **Alternative solutions**

Main terms

- **Adequacy** is a degree of conformity of modelling to original object, which we obtained in the process of model investigation, testing tasks and experiments

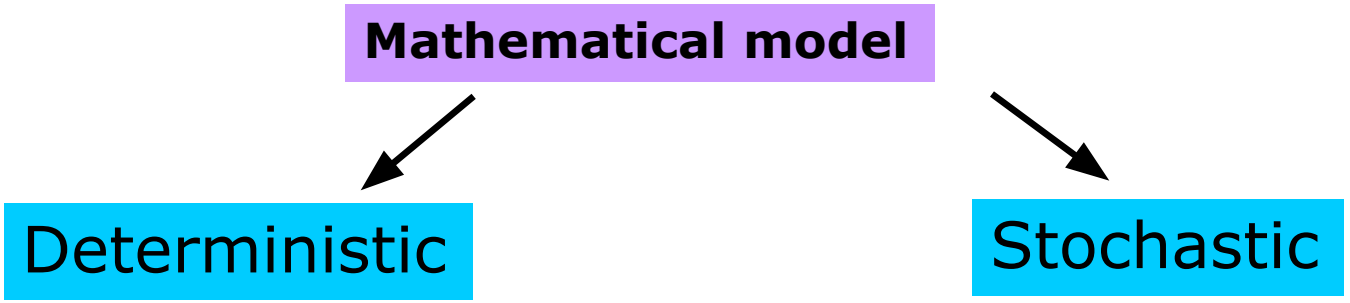
- **Adequate model** is the model with certain approximation degree which reflects the process of original object functioning in the real conditions

Model classification



Mathematical model classification

I



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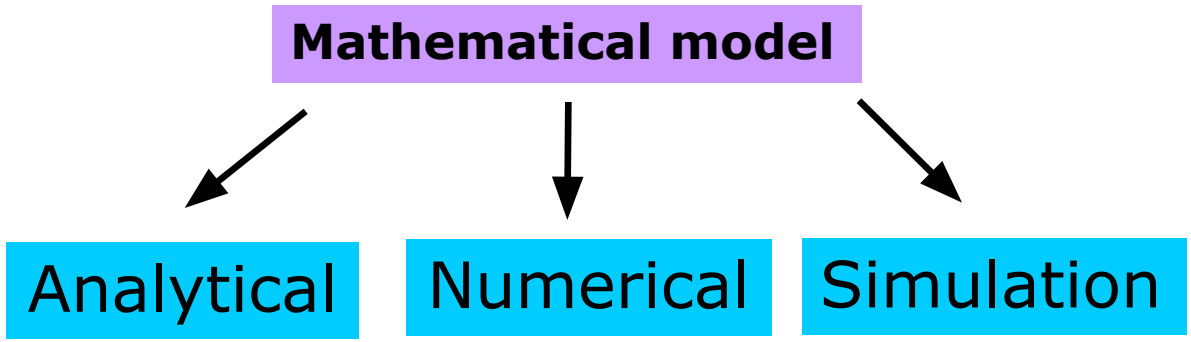
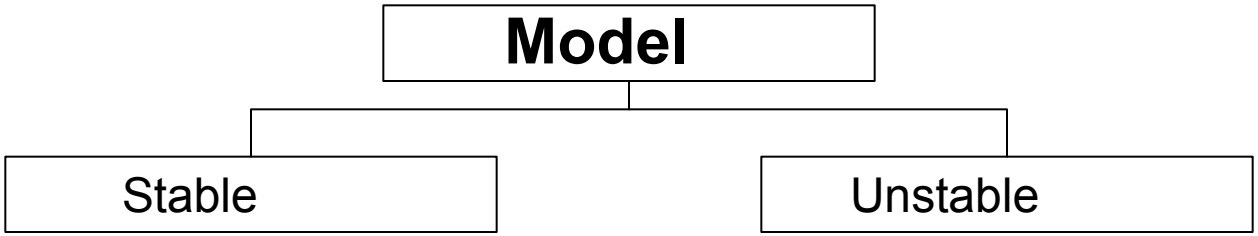


Model classification

I



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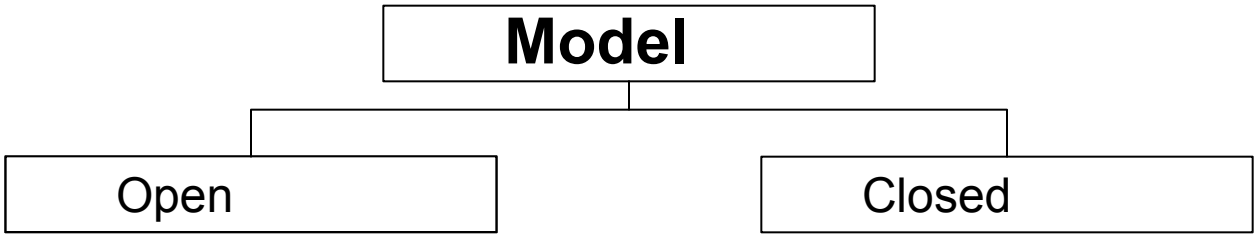
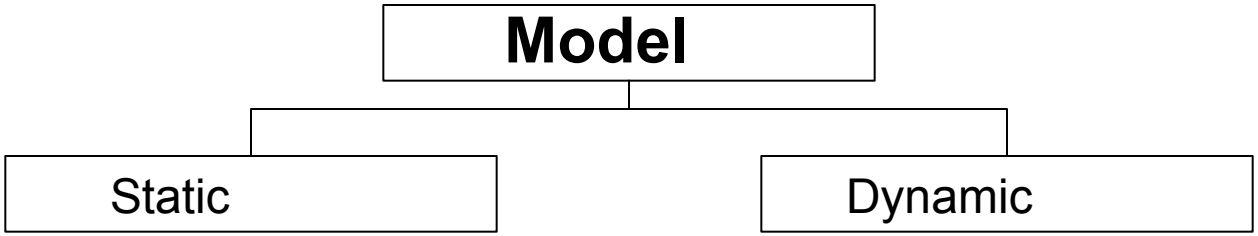


III

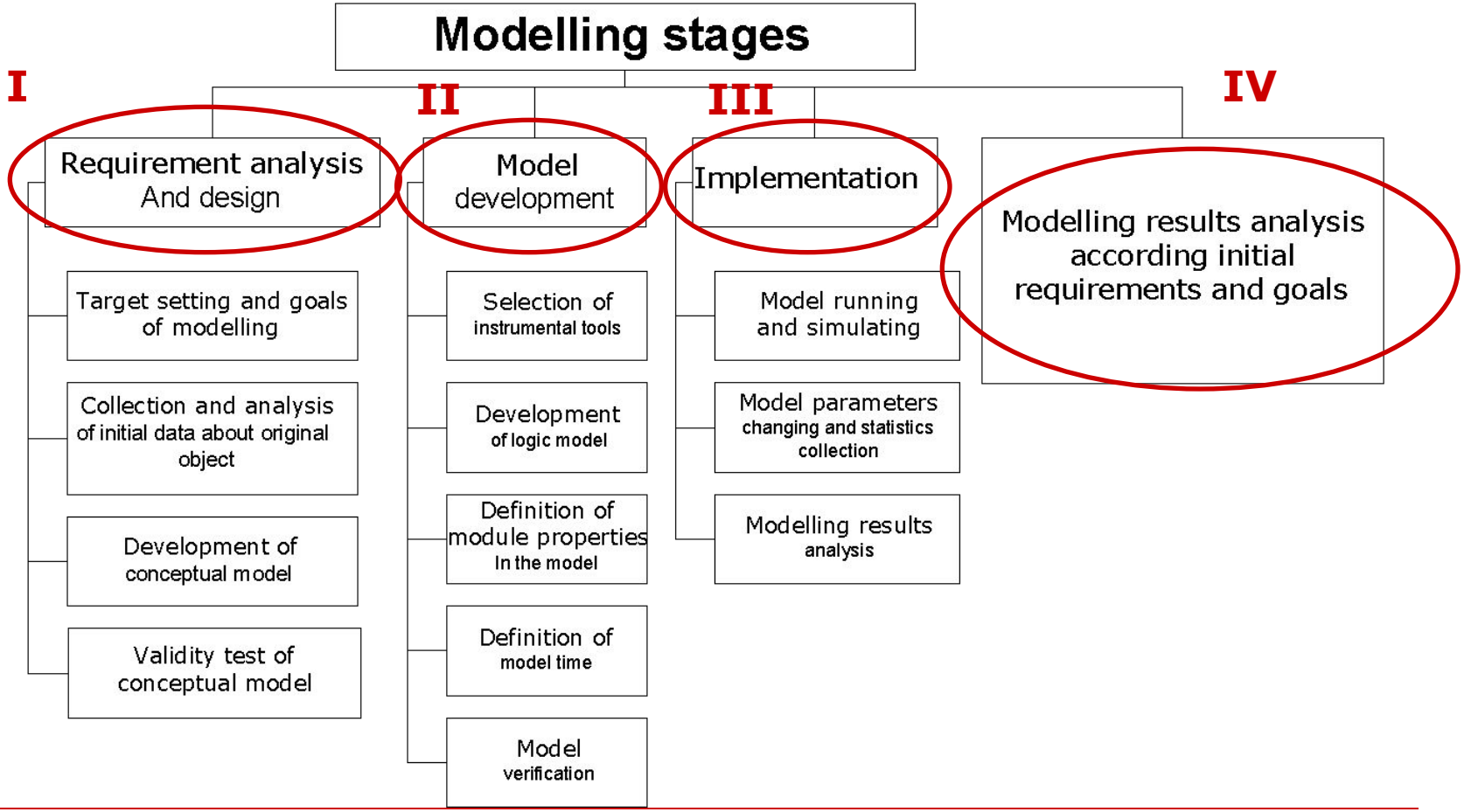


Stages of complex model development

Model properties

- Finitude
- Simplicity
- Approximateness
- Adequacy
- Information density

Modelling stages



Modelling stages

1. Requirement analysis and design
2. Model development
3. Implementation
4. Modelling results analysis according initial requirements and goals

1. Requirement analysis and design

1.1. Target setting

1.2. Collection and analysis of initial data about original object

1.3. Development of a conceptual model

1.4. Validity test of a conceptual model

2. Model development

2.1. Instrumental tools selection

2.2. Logic model development

2.3. Module properties setting

2.4. Model time setting

2.5. Model verification

3. Implementation

3.1. Model running and simulating

3.2. Model parameters changing and statistic data collection

3.3. Analysis of modelling results

Thank you for attention!