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APPLY FUNCTIONAL MODELING TO CONSEQUENCE ANALYSIS IN SUPERVISION SYSTEMS

Present by

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AGENDA

- Introduction
- Consequence analysis and functional modeling
- Multilevel Flow Modeling (MFM)
- Rule-based tool development
- Implementation challenges
- Conclusion

INTRODUCTION

- PHD project
 - Funded together by DTU and IFE
- Period
 - March 2012 to March 2015
- Subject
 - Consequence Reasoning in MFM and Its Application in Operation Supportive Systems

CONSEQUENCE ANALYSIS



- Scope:

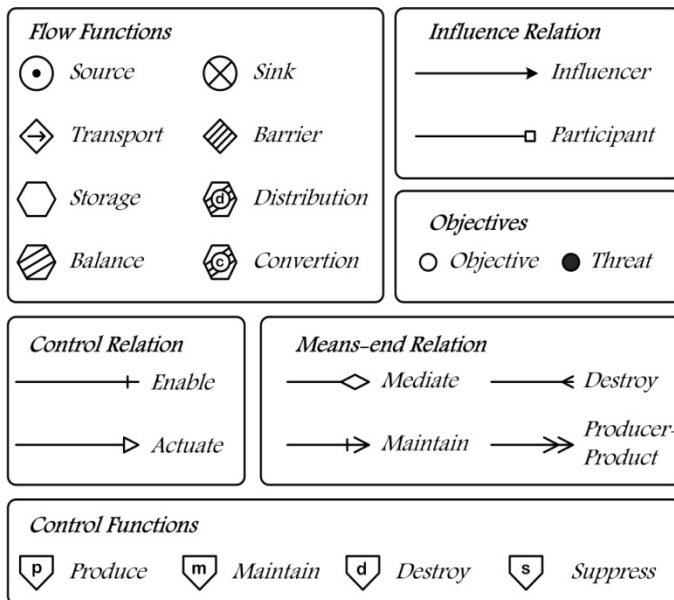
FUNCTIONAL MODELLING



- What – Definition
- Why – Justification
 - Means-end concept
 - Goal-function representation of the process
- How – Methodology

MULTILEVEL FLOW MODELING

- MFM Concepts and MFM models



- Means-end and whole-part decomposition
- State dependency relations are generic
- Means-end relations
- Means-end patterns
- MFM patterns
- Potential path of event propagation, temporal information

- Domain: NPP, etc. [refs]

MFM REASONING



RULE-BASED SYSTEM

- Components of a typical rule-base system:
 - A user interface or other connection to the outside world through which the knowledge of the system is collected and the input and output signal can be sent.
 - A knowledge base that stores the system information and conditions.
 - A rule base contains a set of rules, which is a specific type of knowledge base.
 - An inference engine or semantic reasoner, which infers information or takes action based on the interaction of knowledge base and the rule base.

RULE-BASED SYSTEM

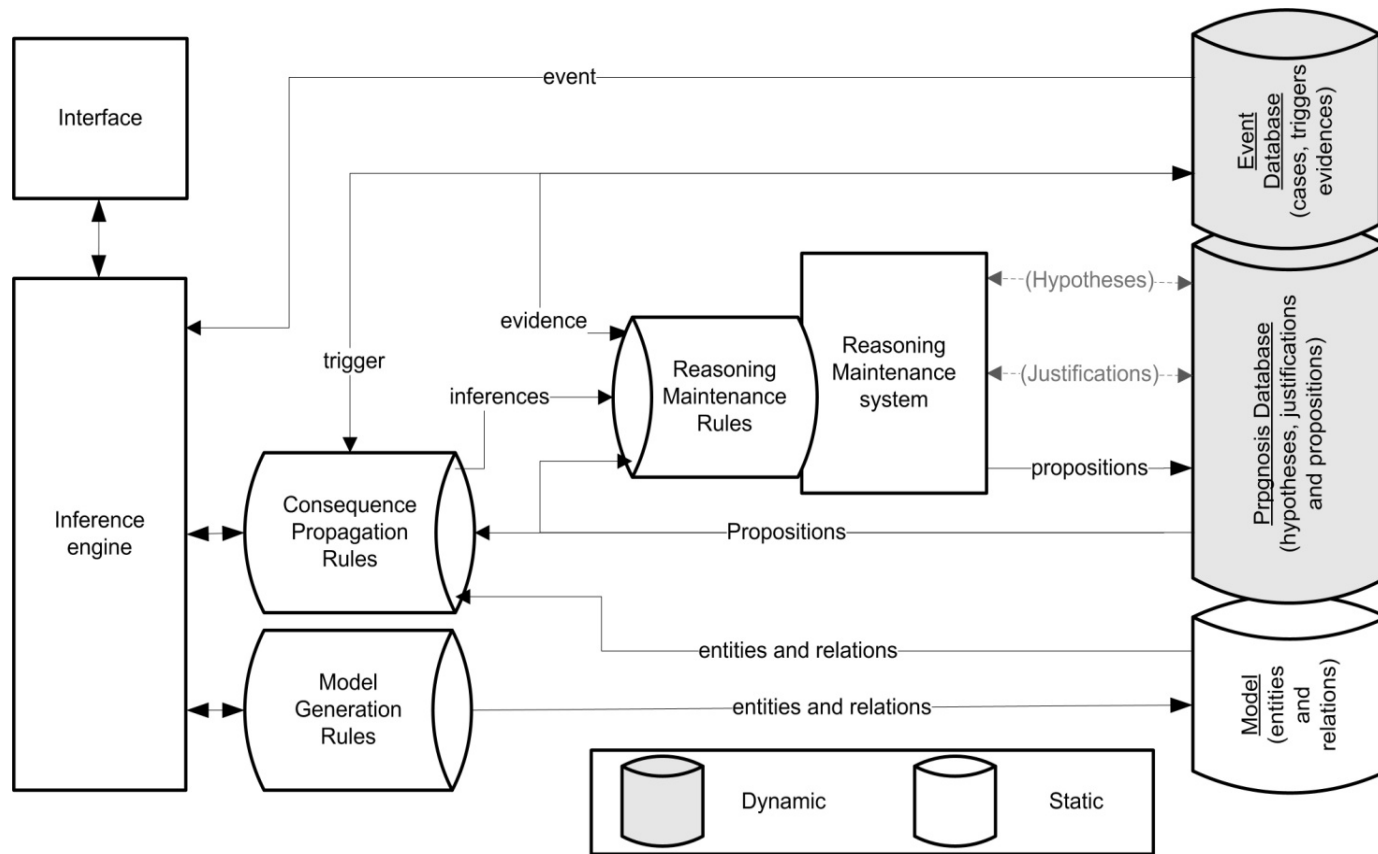


Fig2. Reasoning System Architecture for Consequence Analysis

RULE-BASED SYSTEM

- Database:

Modelling methodology challenge

- Static – Functional Model (process knowledge)

- Dynamic – Observations and Inferences

- Rule-base:

Interpretation/Visualization challenge

- Reasoning rules

- Special Facility:

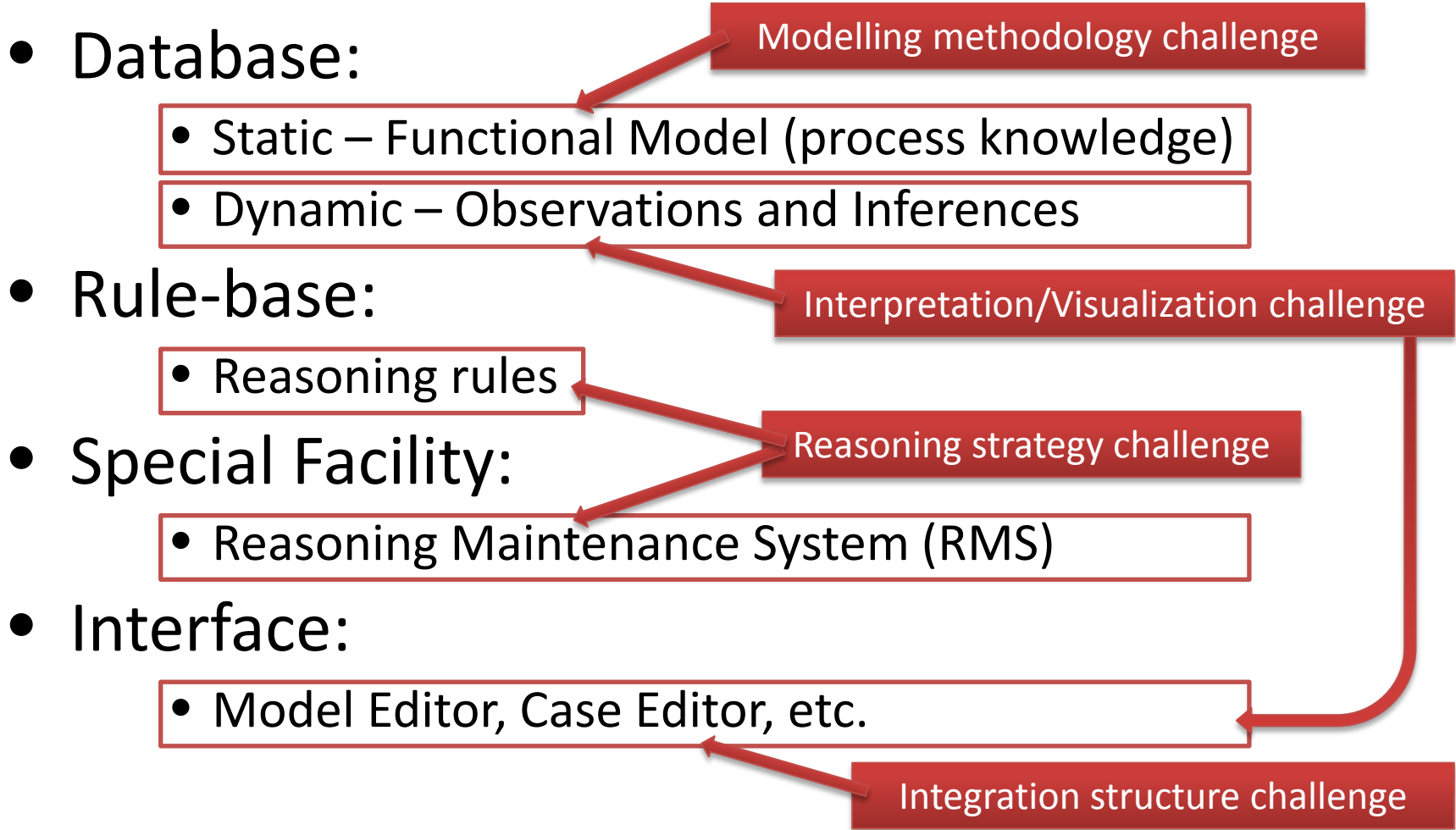
Reasoning strategy challenge

- Reasoning Maintenance System (RMS)

- Interface:

- Model Editor, Case Editor, etc.

Integration structure challenge



CHALLENGES

- **Modelling challenge:**
 - Represent operation modes, barriers, control structures, etc.
 - [Refs]
- **Reasoning strategy challenge**
 - Inference propagation and validation
- **Integration challenge**
 - Interface design with other operation support systems
- **Data interpretation challenge**
 - Structure-role-function mapping
- **Visualization challenge**
 - Knowledge representation and display

INFERENCE PROPAGATION



- Identify propagation loops

MULTIAGENTN ARCHITECTURE



CONCLUSION



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THANK YOU FOR YOUR ATTENTION!