Modeling Frames

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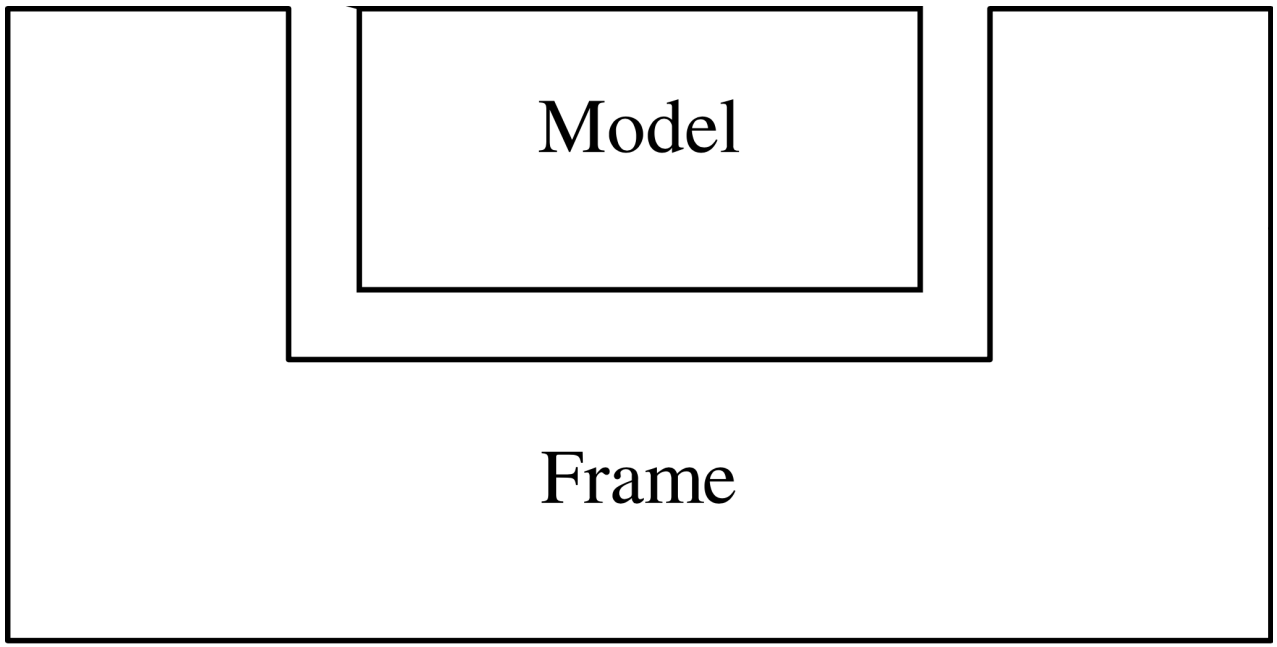
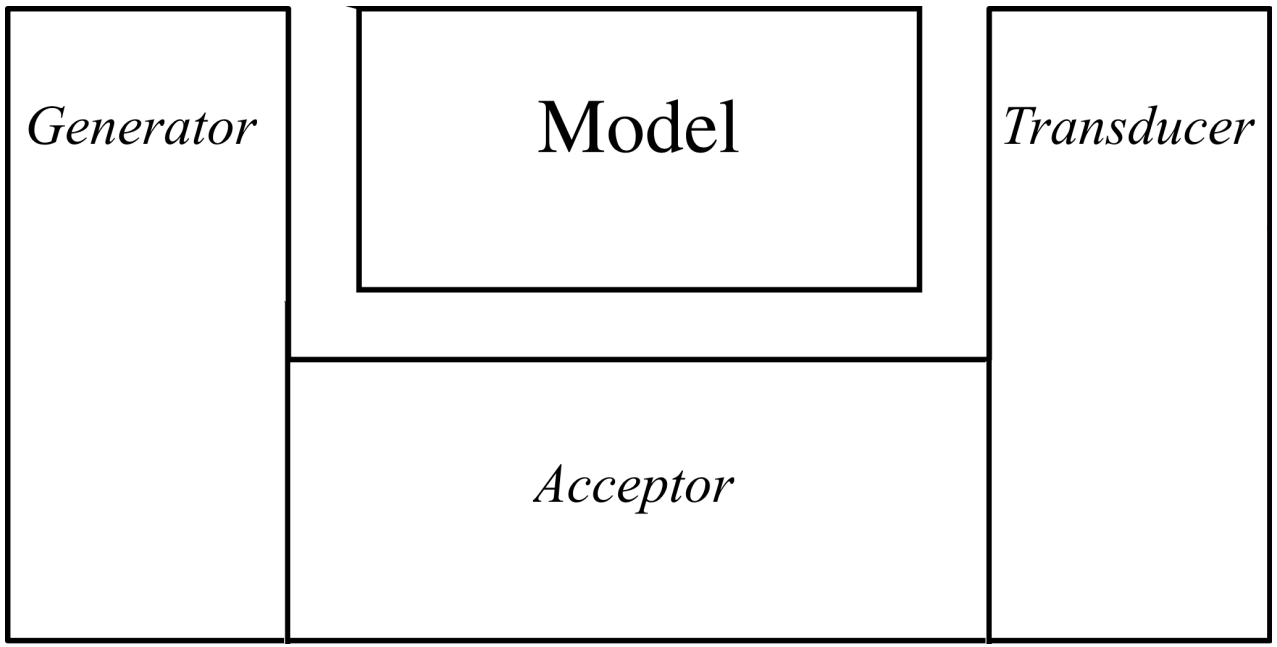
Experimental Frames



Zeigler. 1984

Experimental Frames



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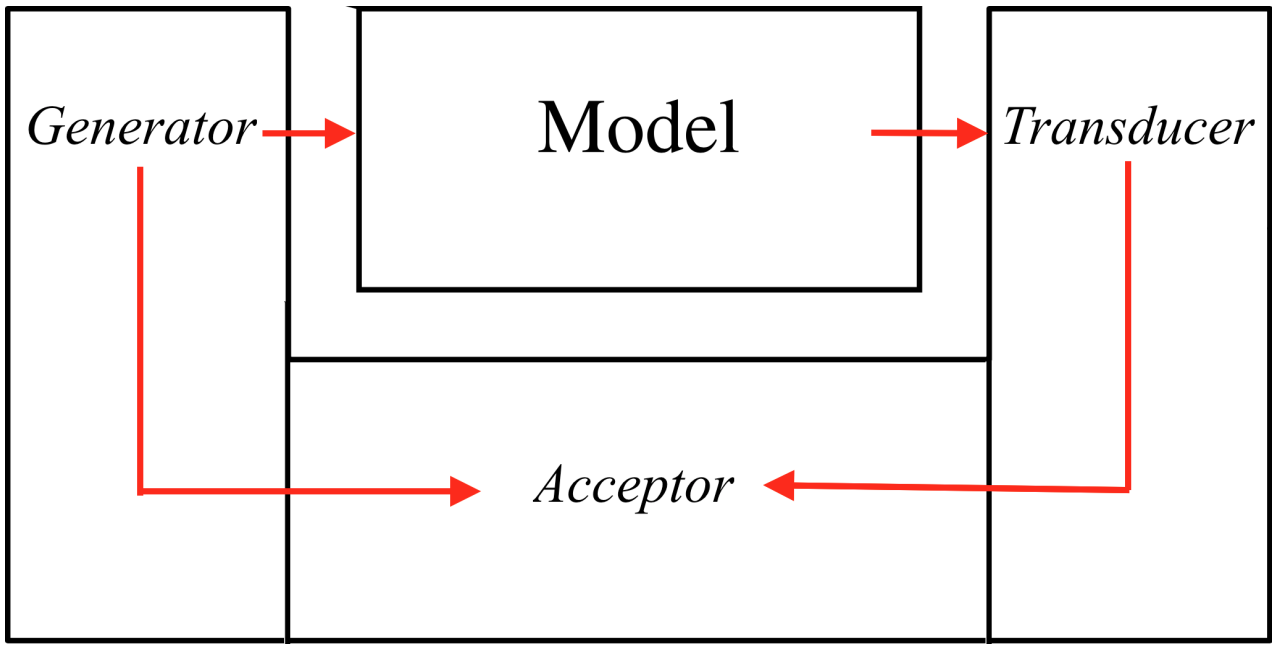
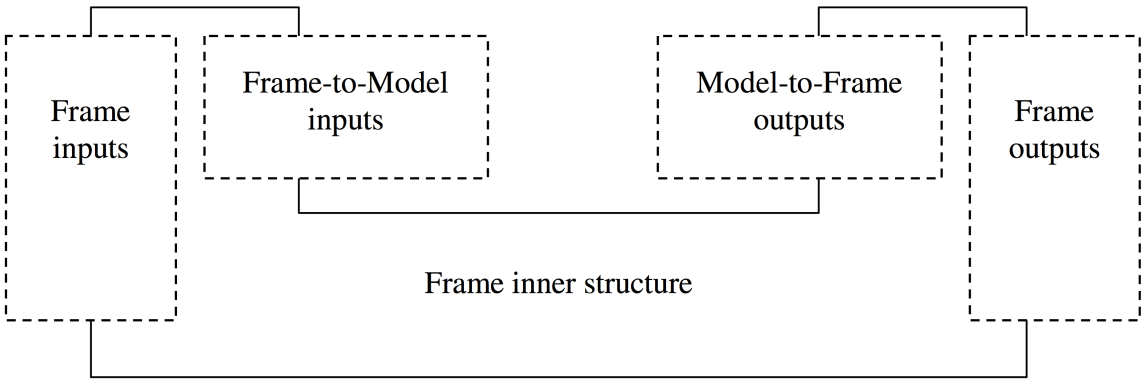


Zeigler. 1984

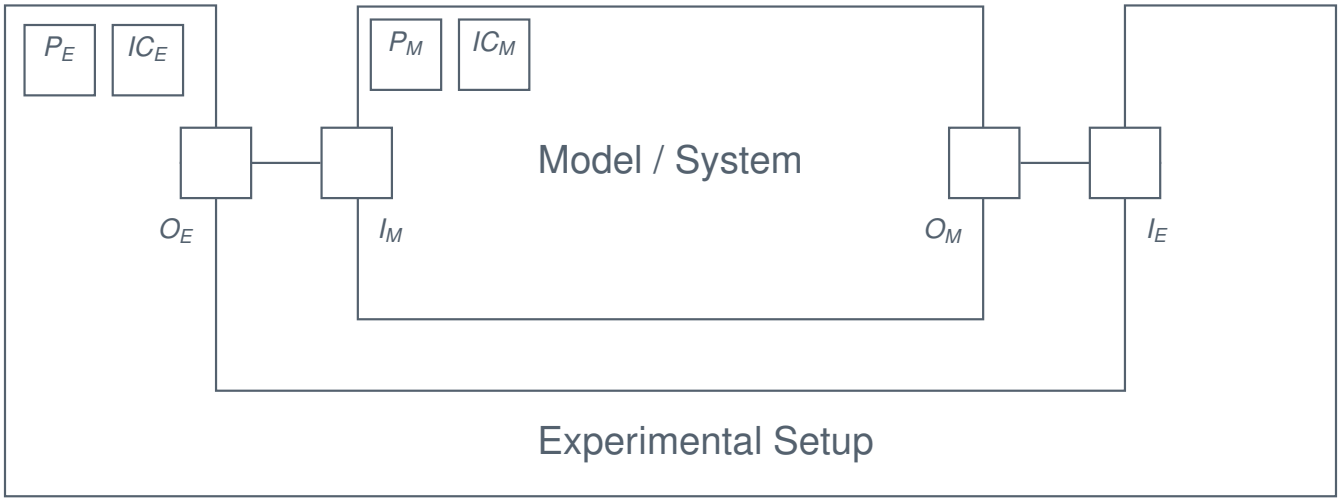
Experimental Frames

- DEVS specification hierarchy
- Frame Interface $\rightarrow$ Frame Behaviour - Frame System



Traoré, Muzy. 2005

Experimental Setups



Denil, Klikovits, Mosterman, Vallecillo, Vangheluwe. 2017

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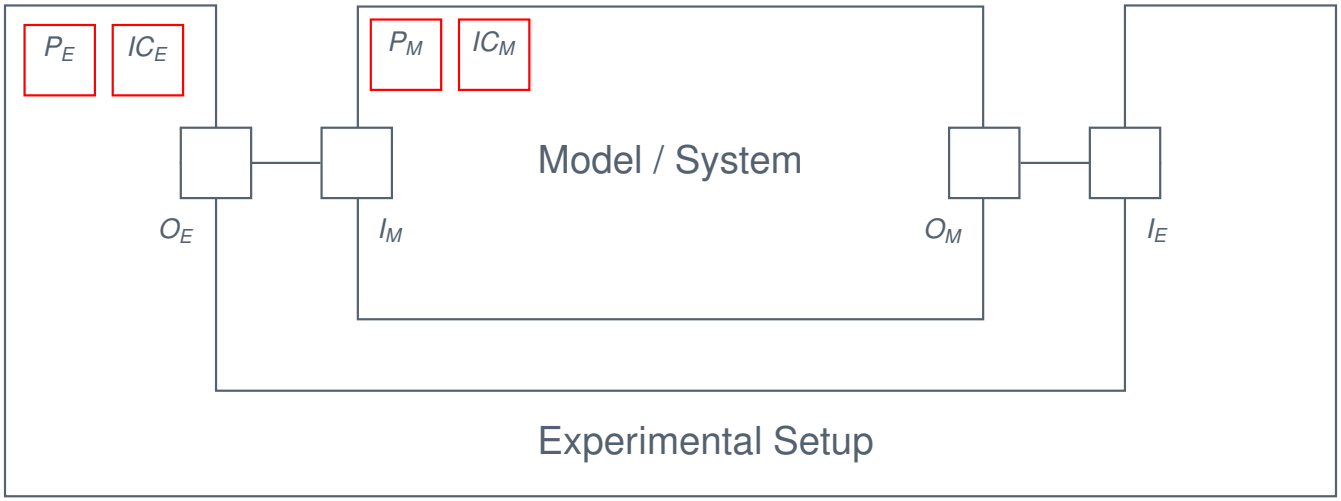

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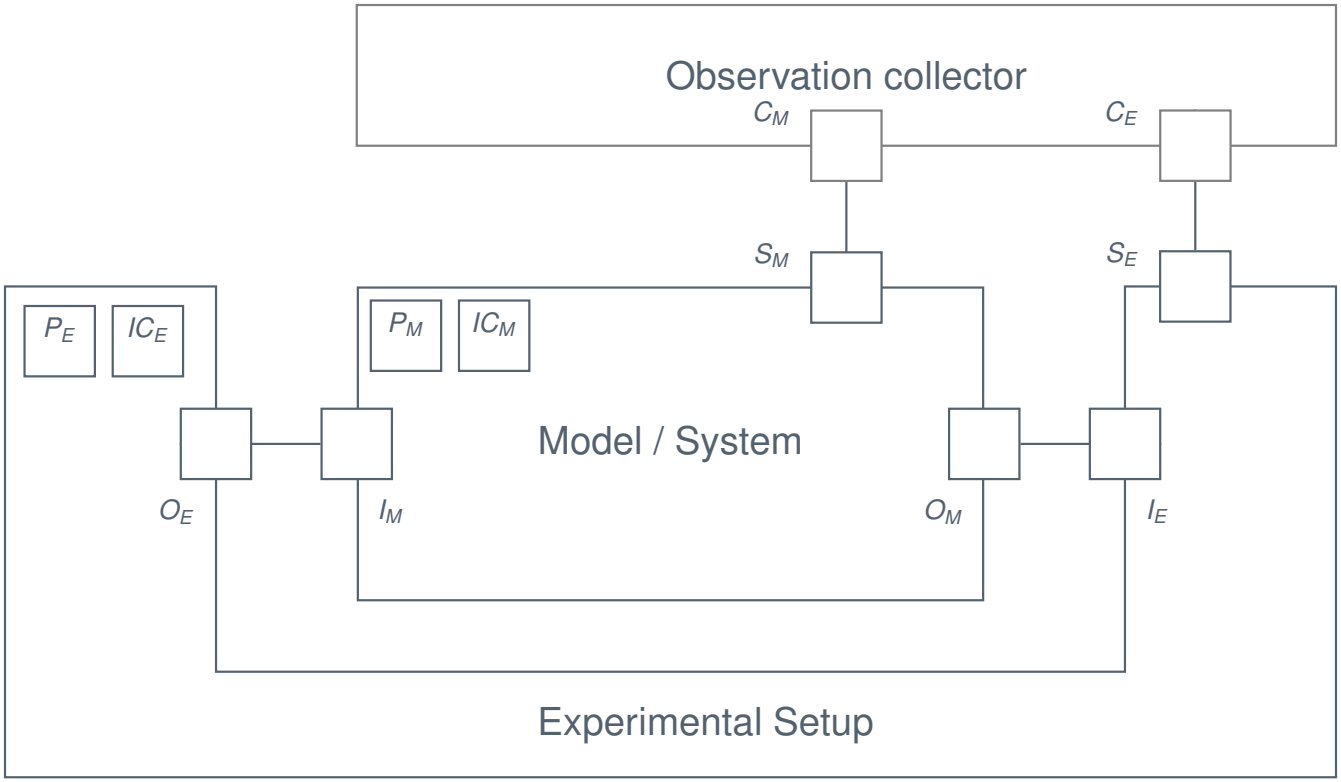

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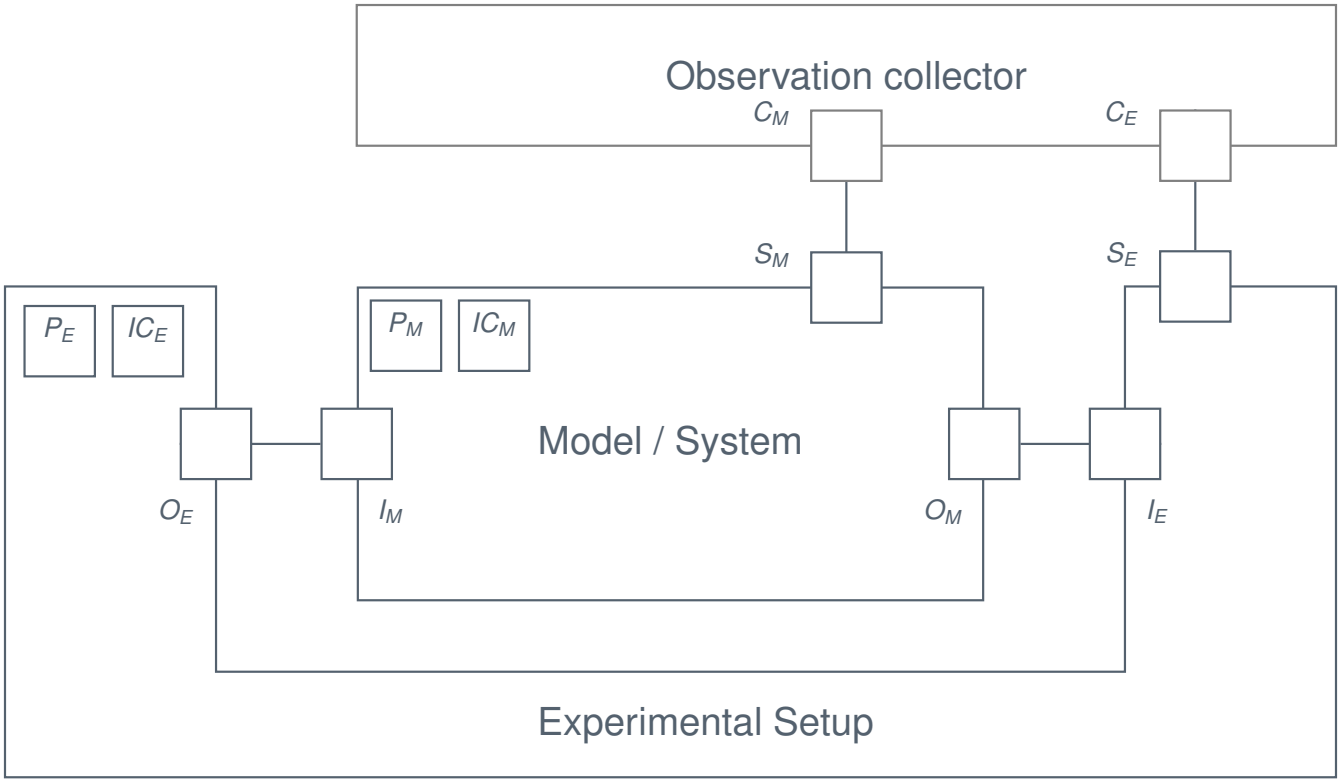
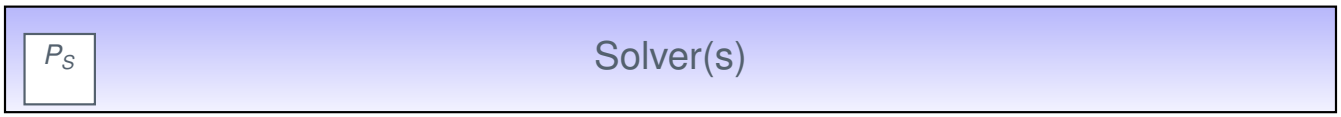




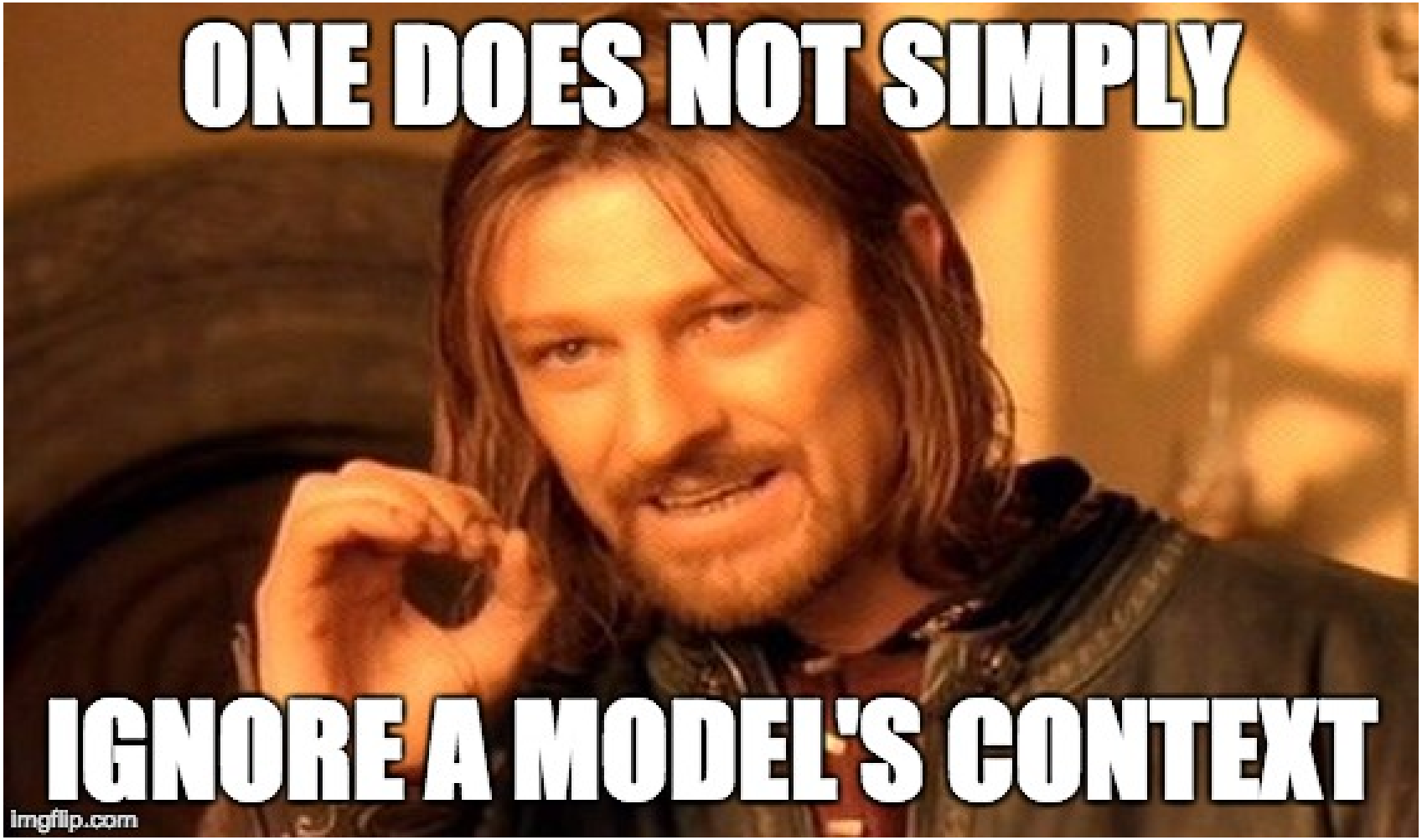
Denil, Klikovits, Mosterman, Vallecillo, Vangheluwe. 2017

Validity Frames

- focus on activities
- process centric
- calibration, validation, verification

Denil, Klikovits, Mosterman, Vallecillo, Vangheluwe. 2017

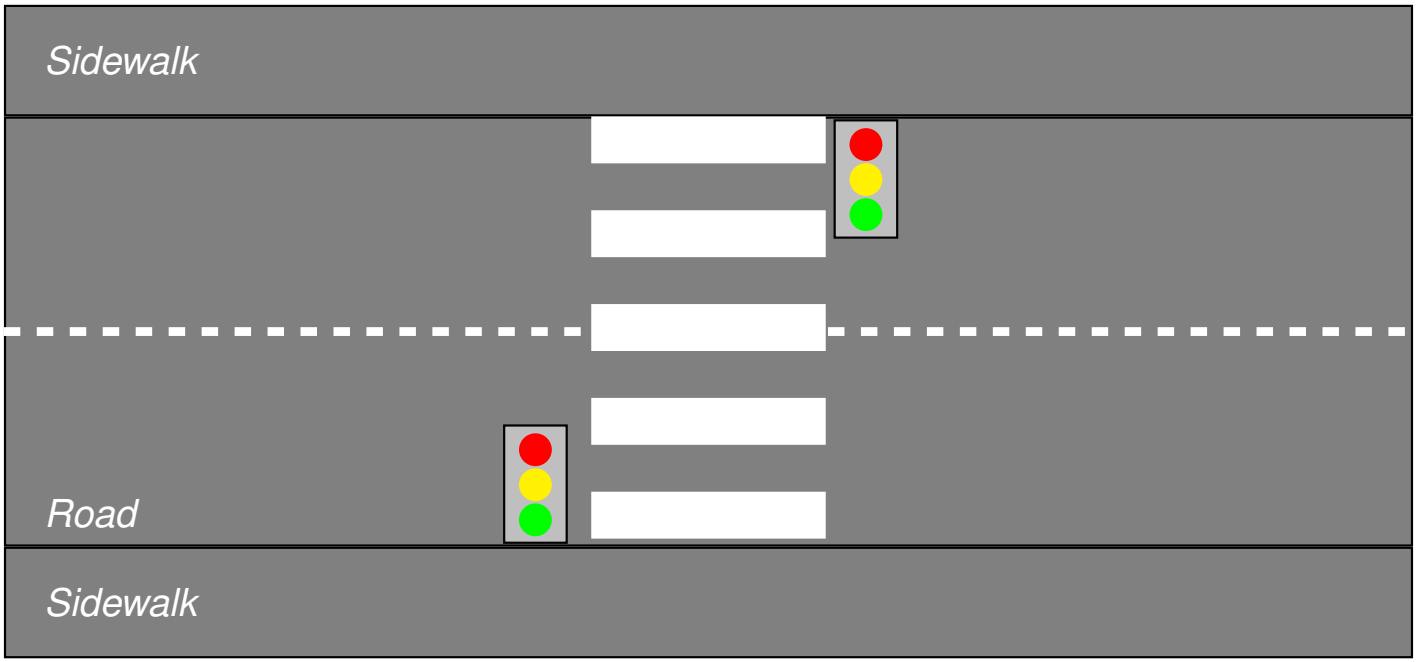
Need a context



What is it good for?

- choosing models from libraries
- model composition & decomposition
- validation, verification, reproducibility, . . .
- safety certification

Running example



Traffic Light schema

Let's define a model creation frame...

1. Context

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O: *Create a model to learn about TL timing*.

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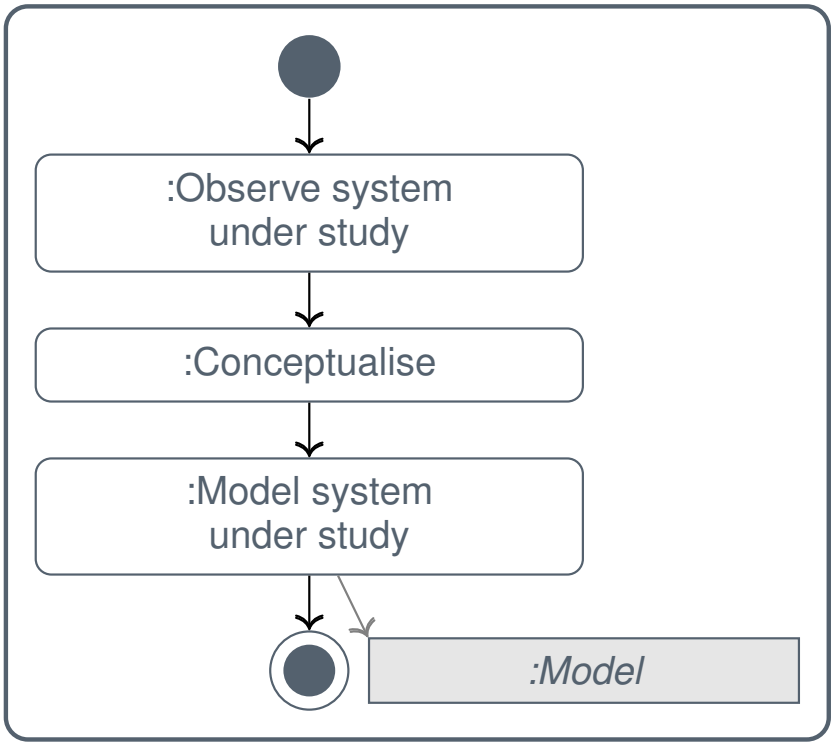

Modeling process

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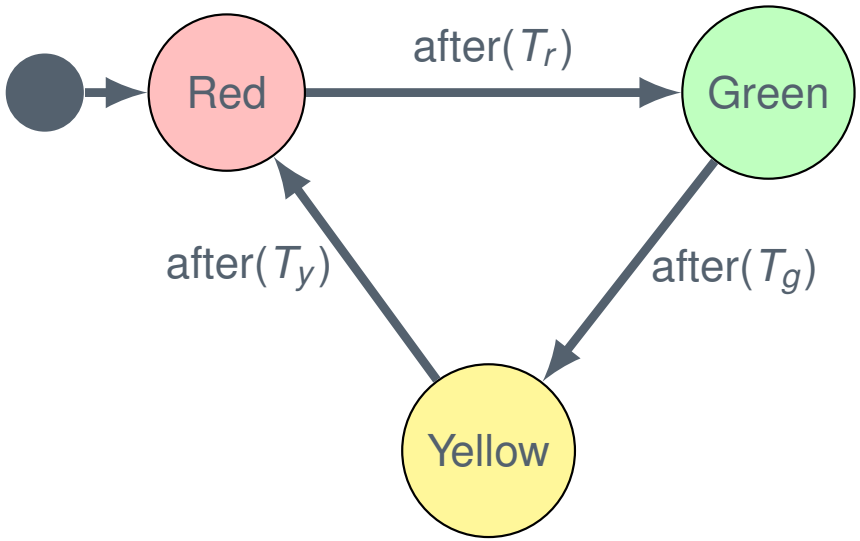

Traffic light state machine

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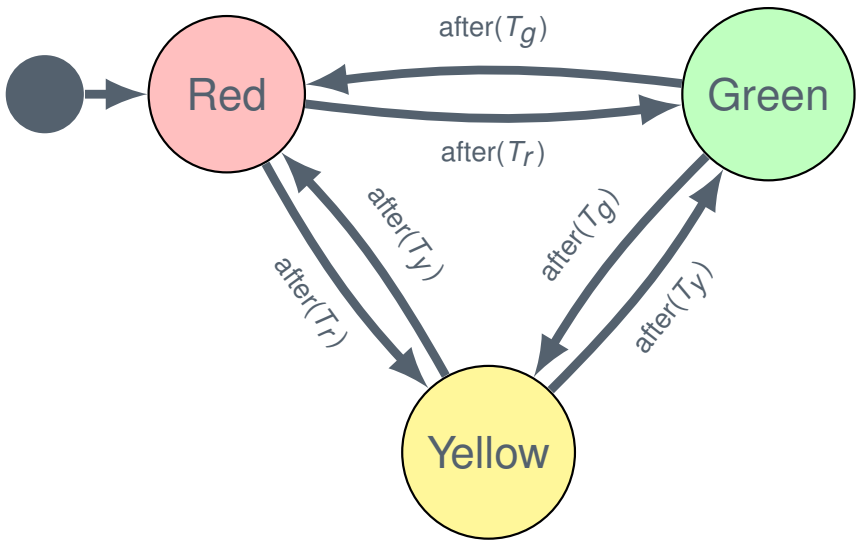

Traffic light state machine

All you need is . . . frames!

All modeling activities performed in contexts!

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Modeling Activity: $\langle \mathit{Inputs}, \mathit{Outputs}, \mathit{Process} \rangle$

Modeling Context: $\langle \mathit{Objectives}, \mathit{Assumptions}, \mathit{Constraints} \rangle$

Modeling Frame: $\langle \mathit{Activity}, \mathit{Context}, \mathit{Frame}^* \rangle$

Validation frame

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`Make sure that modeling assumptions hold!`

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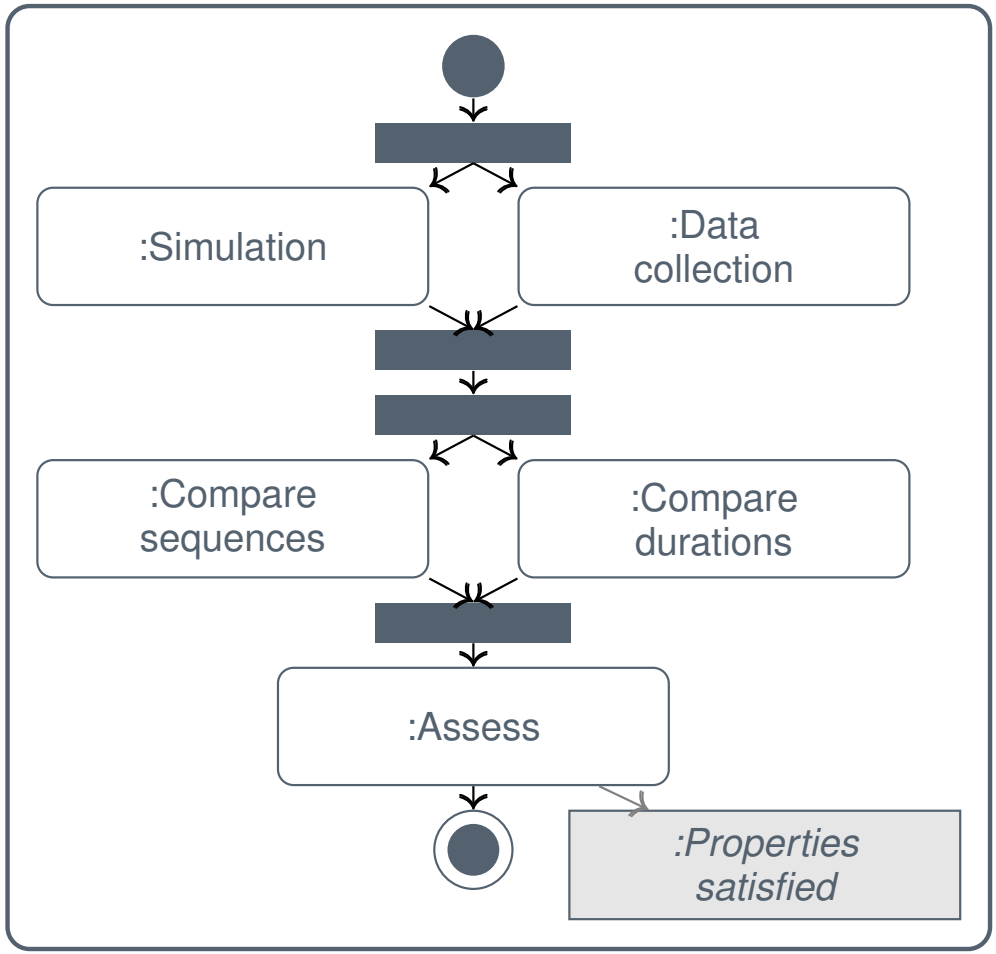

Validation process

Frame types

- Modeling Frame
- Validation Frame

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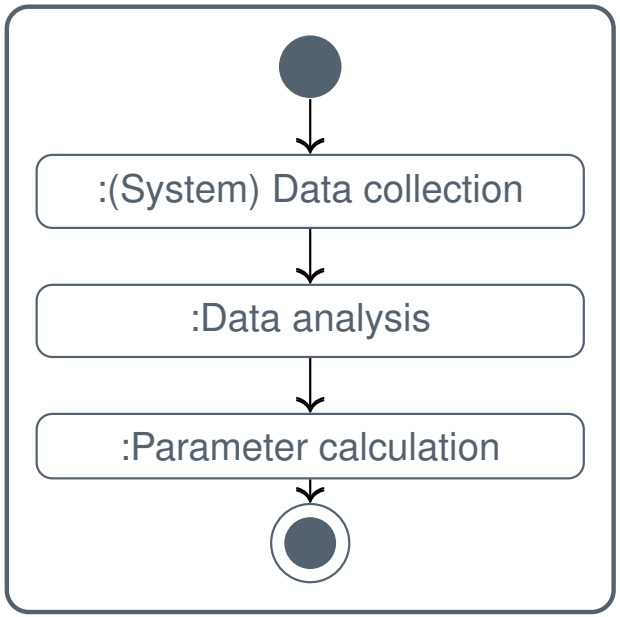

Calibration process

Frame types

- Modeling Frame
- Validation Frame
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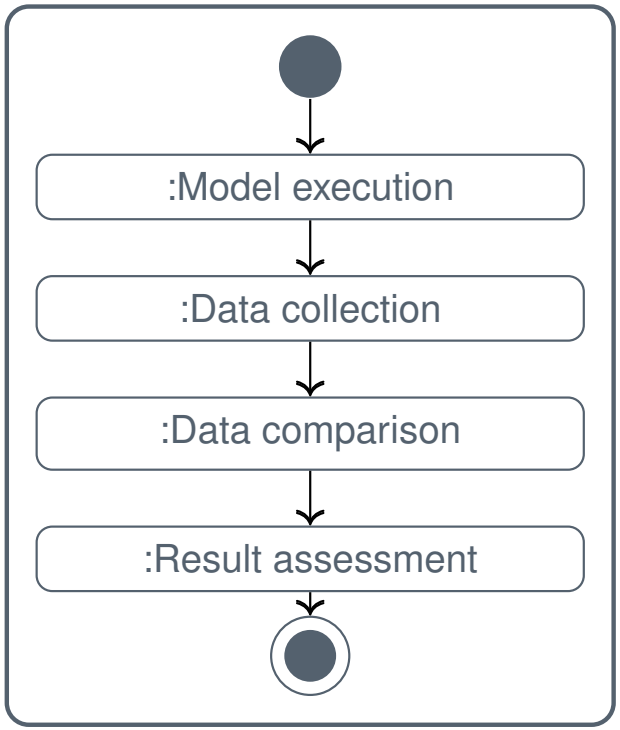
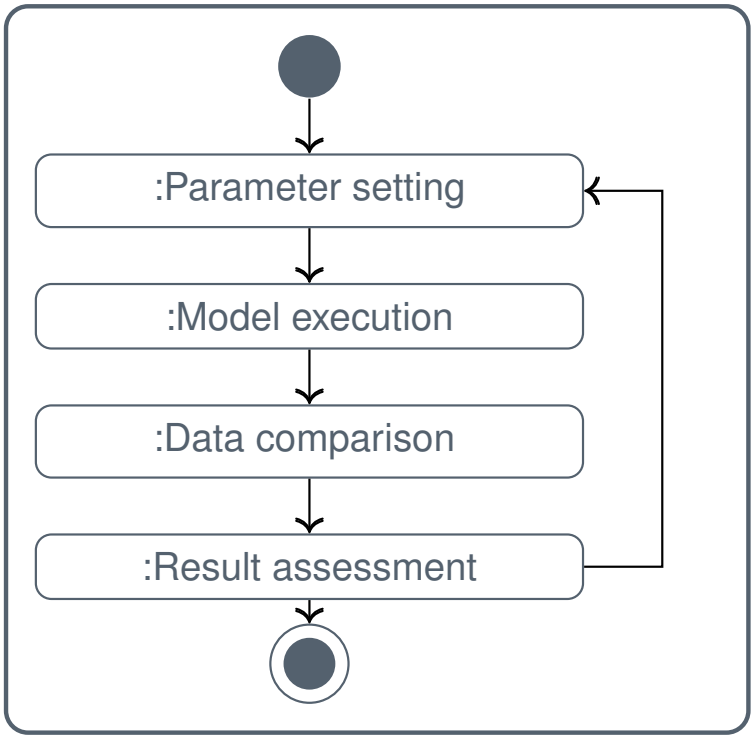
- Verification Frame



Verification process

Frame types

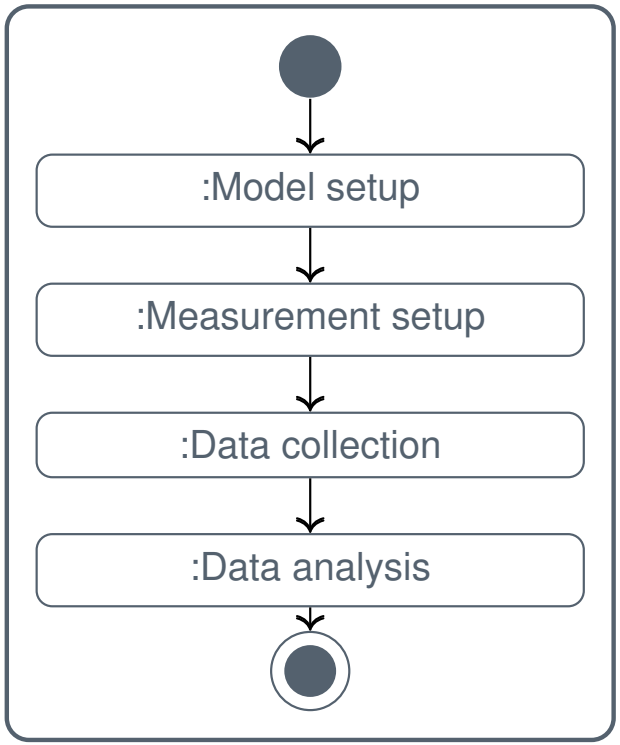
- Modeling Frame
- Validation Frame
- Calibration Frame
- Verification Frame
- Optimization Frame



Optimization process

Frame types

- Modeling Frame
- Validation Frame
- Calibration Frame
- Verification Frame
- Optimization Frame
- Experimentation Frame



Experimentation process

Frame types

- Modeling Frame
- Validation Frame
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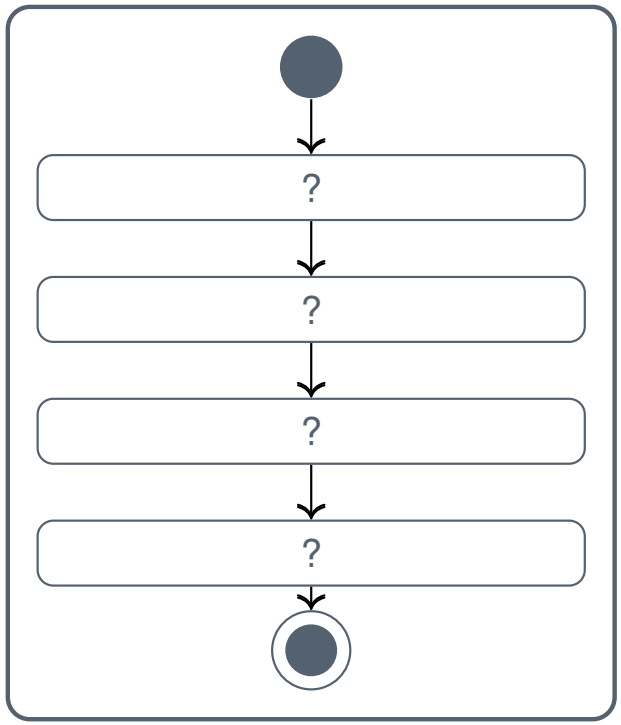
- Verification Frame
- Optimization Frame
- Experimentation Frame
- . . .



? ? ?

Basic Frames

recurring subframes – not necessarily atomic

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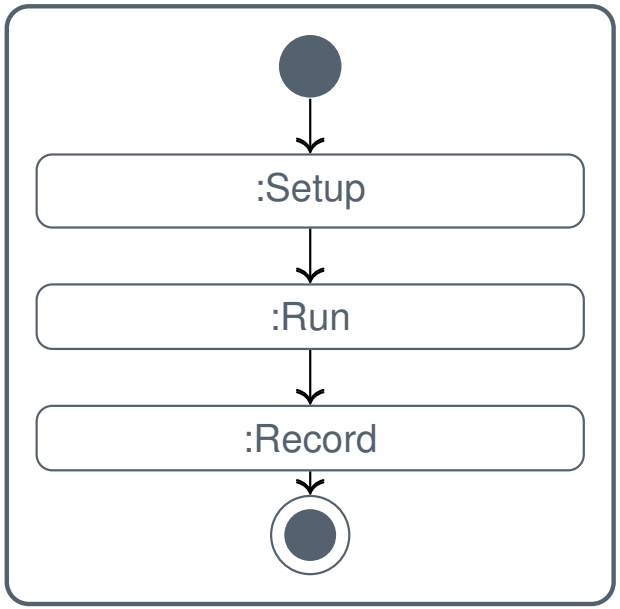
- Model Execution Frame

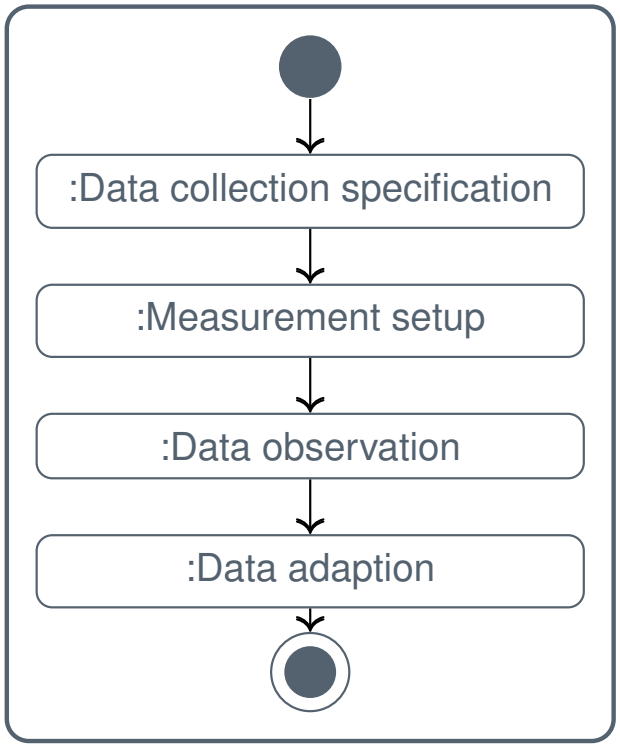


Model execution process

Basic Frames

recurring subframes – not necessarily atomic

- Model Execution Frame
- Data Collection Frame

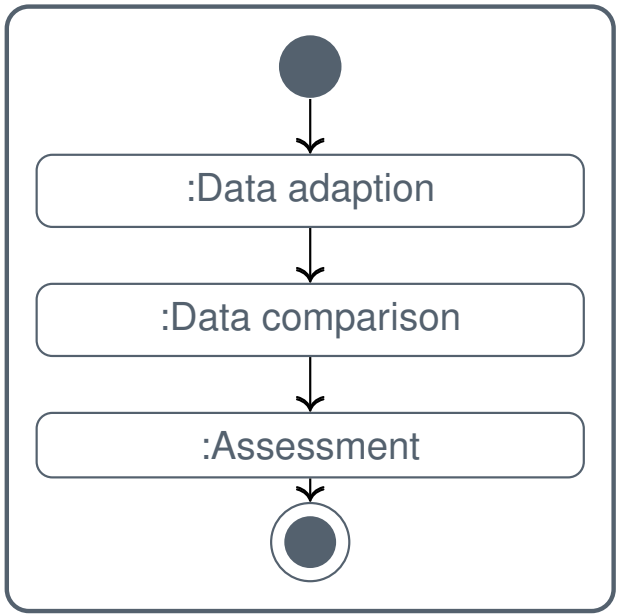


Data collection process

Basic Frames

recurring subframes – not necessarily atomic

- Model Execution Frame
- Data Collection Frame
- Data Comparison Frame



Data comparison process

Basic Frames

recurring subframes – not necessarily atomic

- Model Execution Frame
- Data Collection Frame
- Data Comparison Frame

- ...

Conclusion

- avoid underspecified contexts
- specification framework
- formal basis

Future work

- Tool support + DSL
- Frame types & basic frames
- Frame logic
- Complete case study

Modeling Frames

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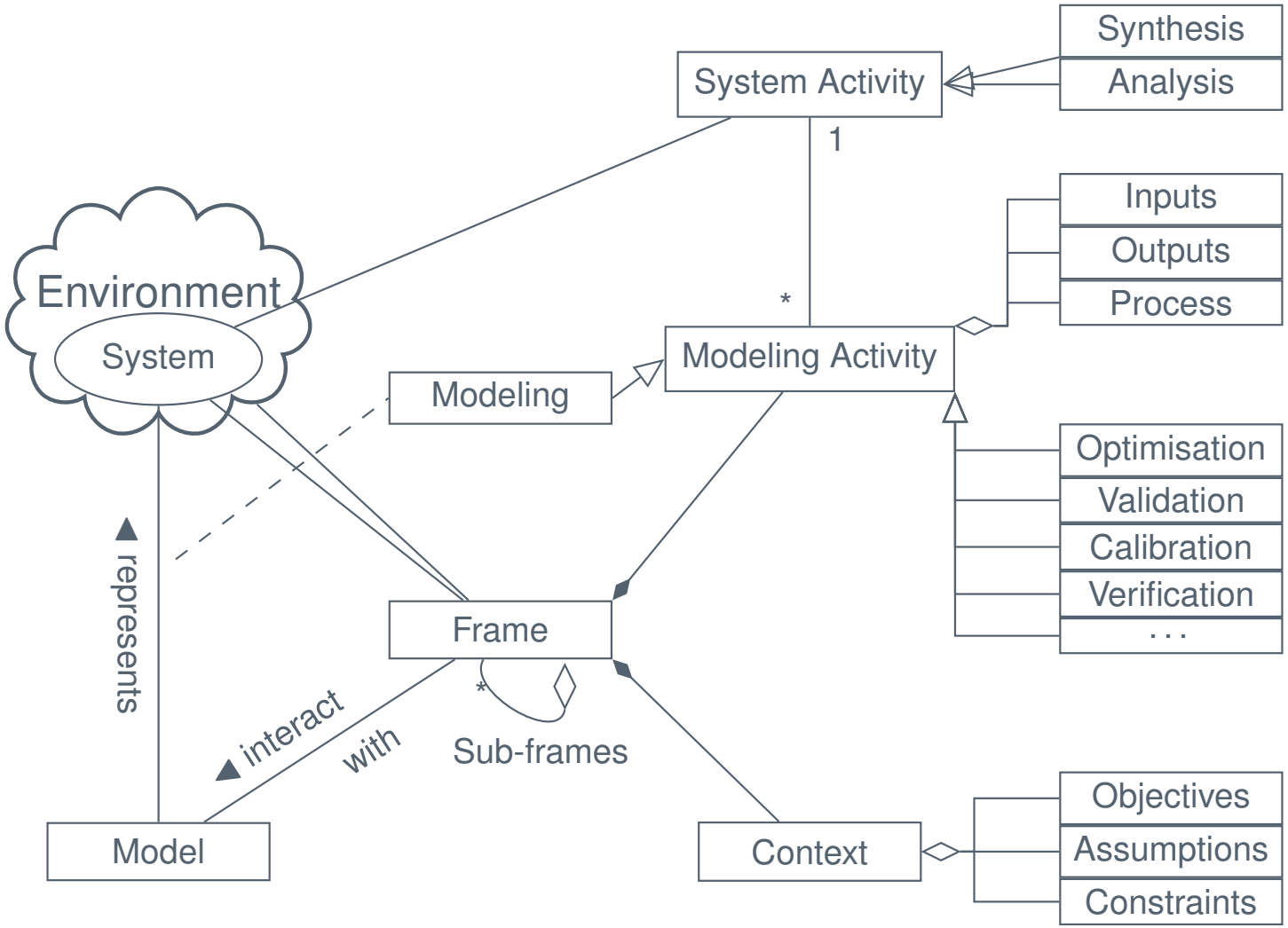
Ontology


Synthesis
Analysis
System Activity
1
Inputs
Outputs
Process
*
Environment
System
Modeling
Modeling Activity
Optimisation
Validation
Calibration
Verification
. . .
represents
Frame
interact
with
*
Sub-frames
Model
Context
Objectives
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References

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