System Validation: Hennessy-Milner Logic

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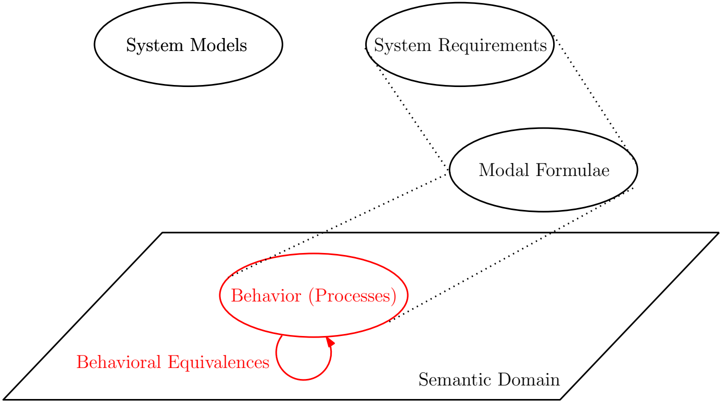
Open Universiteit

General Overview



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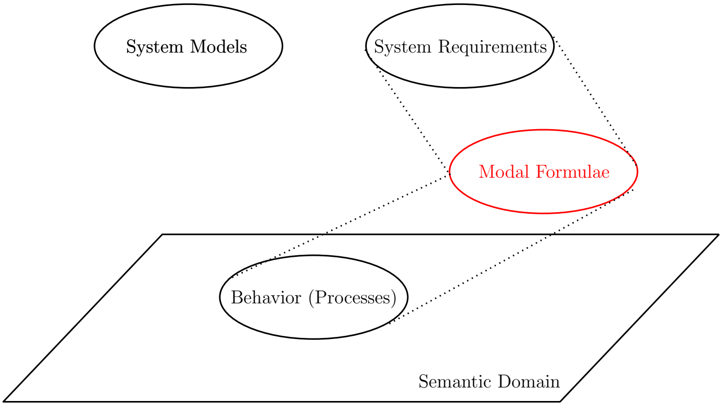

Motivation

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Solution: express properties outside of behaviour

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- Fix observable events (interactions with external world)

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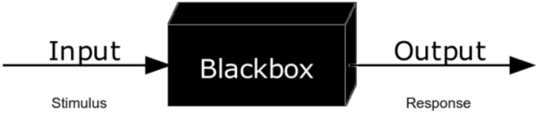

- Describe temporal properties using these
- Verify correctness of properties with respect to some LTS

Observable Events: Examples

A scientist interacts with environment

- *coffee* for taking coffee in

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Properties of interest

- the scientist is not willing to drink coffee now
- the scientist is willing to drink both coffee and tea now
- the scientist will always produce a publication immediately after drinking two coffees in a row

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true	holds in every state

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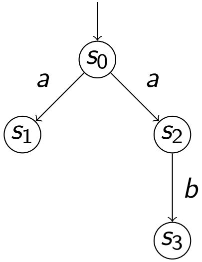
Algorithm

- Identify all subformulas
- Label states with subformulas they satisfy, starting from the smallest subformula (*true*)

Examples

Is the HML formula $\langle a \rangle \langle b \rangle \mathit{true}$ satisfied by the labelled transition system (i.e., by its initial state)?



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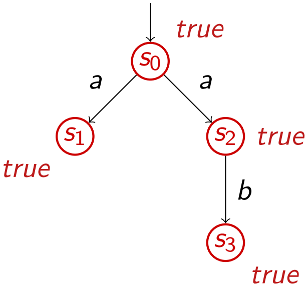

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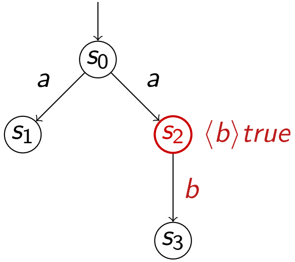

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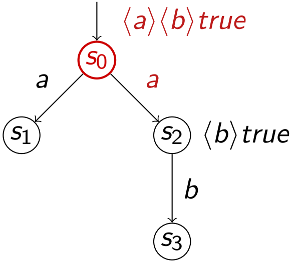

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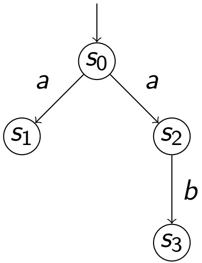

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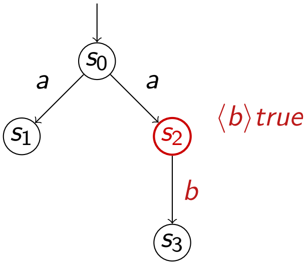

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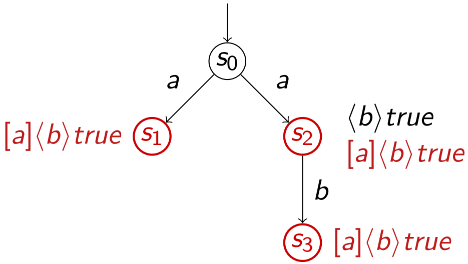

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Observations

There are relevant properties that cannot be expressed in HML. HML is restricted to a finite depth.

Summary

- Behavioural equivalences not always suitable for verification
- Hennessy-Milner logic provides alternative way to describe properties
- Only properties of finite depth can be described

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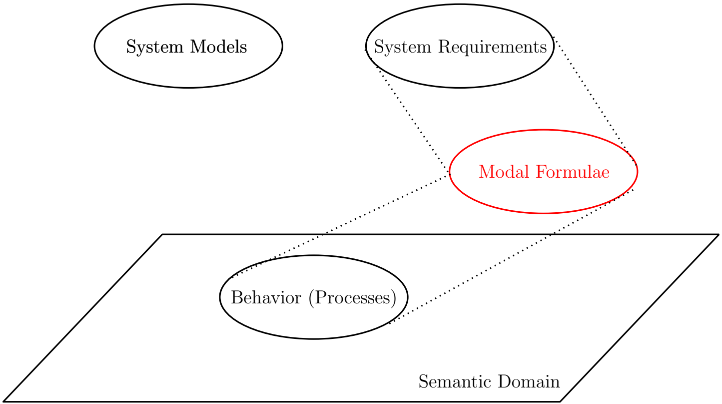

Thank you very much.