Recall:

Legal system configurations comprise:

- at least one legal transition
- at least one state
- at least one action
- at least one expression

States:

- orthogonal states
- maximal scope
- least common ancestor
- priority and depth

Enabledness of Fork/Join Transitions

- enabledness of Fork/Join
- priority and depth

Abstract Syntax

\[ E(S, \text{Act}, \text{Expr}) \]

Semantics:

- well-formed transitions
- legal transitions
- enabled transitions

From UML to Hierarchical State Machines: By Example

- From UML to Hierarchical State Machines
- Hierarchical State Machines
- Orthogonal states
- Legal transitions
- Enabledness of Fork/Join

Software Design, Modelling and Analysis in UML

Lecture 15: Hierarchical State Machines II

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Blessing or Curse...?
which effects do transitions have?

• transitions can kill the object?

• E can what may happen on

• \( \psi \) annot \( \rightarrow \) transitions?

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• \( \psi \) annot \( \rightarrow \) transitions?

For example: From well-formed

...
A Partial Order on States

The substate- (or child-) relation of a transition induces a partial order on states $A$: $(s,t) \in \mathcal{A}$, for all $s \leq s$, $s \leq s \and s \leq s \implies s \leq s$ and $s \leq s \implies \neg(s \leq s)$.

Two transitions $(s,t)$ are orthogonal, i.e. they "live" in different regions of $A$, if and only if for all transitions $(s,t)$, they "live" in different regions of $A$. Two states $s$, $s$ of $A$ are called orthogonal states.

Consistent with the orthogonal state's definition above, we assume that the region of $A$ is the set of possibly affected states” of a transition.

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Additional Well-Formedness Constraints for Hierarchical State-Machines

Consider a hierarchical state-machine $H$ with at least one initial pseudo-state $\sigma_0$ and at least one final state $\sigma_f$. Let $\mathcal{S}$ be the set of all states in $H$. The following constraints must be satisfied:

1. Every transition in $H$ has a source state in $\mathcal{S}$.
2. Every transition in $H$ has a target state in $\mathcal{S}$.
3. The target of a transition with initial pseudo-state source in $\mathcal{S}$ is enabled, and $\mathcal{S}$ is called the set of possibly affected states.
4. The guards of all transitions in $\mathcal{S}$ are satisfied in $\mathcal{S}$.
5. Transitions from initial pseudo-states have no trigger or guard, i.e., $t$ is enabled, and $\mathcal{S}$ is called the set of possibly affected states.

For state machines with only simple states, and no trigger, guard, or action on transitions originating at

For state machines with only simple states, and no trigger, guard, or action on transitions originating at
An Intuition for "Or-States"

In a sense, composite states are about abbreviation, structuring, and avoiding redundancy.

Idea: instead of write

An Intuition for "And-States"

and instead of write

References
