Contents & Goals

Last Lecture:
• State Machines and OCL
• Hierarchical State Machines Syntax
• Initial and Final State

This Lecture:
• Educational Objectives:
  • What does this State Machine mean? What happens if I inject this event?
  • Can you please model the following behaviour.
  • What does this hierarchical State Machine mean? What may happen if I inject this event?
  • What is: AND-State, OR-State, pseudo-state, entry/exit/do, final state, ...

Composite States

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

Idea: in Tron, for the Player’s State Machine, instead of writing

we resigned

we can write


Recall: Syntax

\[
\begin{align*}
S,
\end{align*}
\]

\[
\begin{align*}
\begin{cases}
\top & \mapsto \rightarrow \{s\},
s & \mapsto \rightarrow \{(s_1, s'_1), (s_2, s'_2), (s_3, s'_3)\},
s_1 & \mapsto \rightarrow \emptyset,
s'_1 & \mapsto \rightarrow \emptyset,
\end{cases}
\end{align*}
\]

Composite States
A PartialOrder on States

The substate-(or child-)relation induces a partial order on states:

• \( \text{top} \leq s \), for all \( s \in S \),
• \( s \leq s' \), for all \( s' \in \text{child}(s) \),
• transitive, reflexive, antisymmetric,
• \( s' \leq s \) and \( s'' \leq s \) implies \( s' \leq s'' \) or \( s'' \leq s' \).
Legal Transitions

A Partial Order on States

Least Common Ancestor and Ting
adjust ⇝ priority

Note: the standard seems not to clarify whether internal transitions have
• instead of only

Recall: each action's supposed to have a transformer. Here:
•

Intuition: the state is neither left nor entered, so: no exit, no entry.
•

Taking the transition above then amounts to applying
•

Example

The Depth of States

Entry/Do/Exit Actions, Internal Transitions

InternalTransitions

Transitions in Hierarchical State Machines

Transformation in Hierarchical State Machines

Transformation in Hierarchical State Machines
• As abbrevation for...

...as abbreviation for...

• That is: Entry/Internal/Exit don't add expressive power to Core State Machines.

If internal actions should have priority, can be embedded into an OR-state (see later).

• Abbreviation may avoid confusion in context of hierarchical states (see later).

• Intuition: after entering a state, start its do-action.

• If the do-action terminates, then the state is considered completed, otherwise, if the state is left before termination, the do-action is stopped.

• Recall the overall UML State Machine philosophy: “An object is either idle or doing a run-to-completion step.”

• Now, what is it exactly while the do-action is executing...?

References


