6.005 Elements of Software Construction

Fall 2008

State Machine Syntax and Semantics
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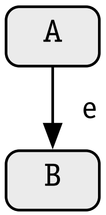
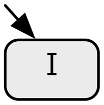
Basic elements

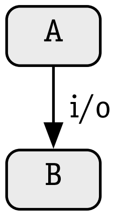


in state A, machine can transition to state B on event e



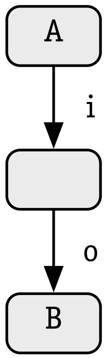
I is the initial state

I/O shorthand



in state A, machine can perform event i and then event o and end in state B

short for:



Semantics

State machine consists of:
-- set of states S
-- initial state I ∈ S
-- set of event classes E
-- transition relation R ⊆ S×E×S

Semantics of state machine is:
*-- set of traces T ⊆ E**
-- the empty sequence is a trace <> ∈ T leading to the initial state
-- if trace t can lead to state s, and (s,e,s') ∈ R, then t^<e> ∈ T is a trace that can lead to state s'

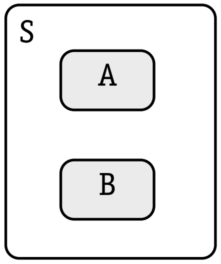
Parallel combination:
-- given machines (S1,E1,R1,T1) and (S2,E2,R2,T2)
-- a sequence t in (E1∪E2) is a trace if t restricted to the events in E1 (E2) is in T1 (T2)*

Defining a state machine

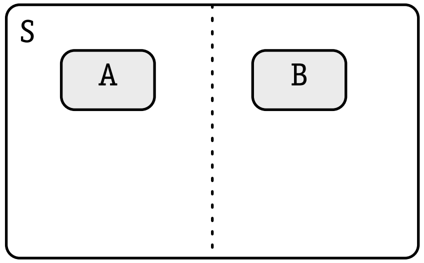
Definition should include:
-- state machine diagram
-- designations of events

Sample designation:
offhook: user hangs up phone by pressing END button

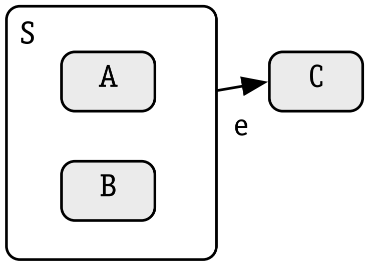
Statechart notation



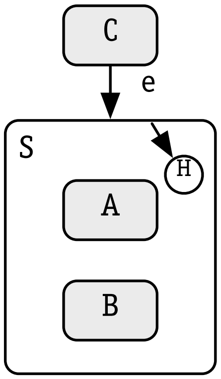
S is a superstate (OR) grouping A and B



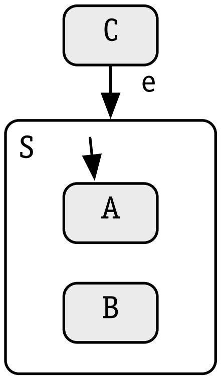
S is a superstate (AND) grouping A and B in parallel



transition on event e from any state in S to C



history (H): on entry to state S (eg, by event e from state C), return to last state visited in S



initialization: on entry to S (eg, by event e from state C), enter state A