Lecture 4

- Model checking/OBDDs
- Design by contract
- OCL: Object constraint language for pre and post conditions, invariants etc.
- Testing multi-threaded programs
- *Testing state machines and statecharts*

Chapter 19: State machines and statecharts

- Widely used: graphical user interfaces, networking protocols. Important role in object-oriented design: some objects contain own state machine or state chart. Also useful for multi-object coordination (traversal state).

State machine or statechart

- Two purposes
  - model
    - describes a portion of the system
  - implementation framework
    - provides skeleton for implementation

State machines

- May grow large and cumbersome
- Therefore, David Harel invented statecharts

Statecharts

- State actions
  - on entry
  - on exit
  - do (called activity)
- Example
  - on entry: notify repair center
  - on exit: log repair
  - do: flash service light

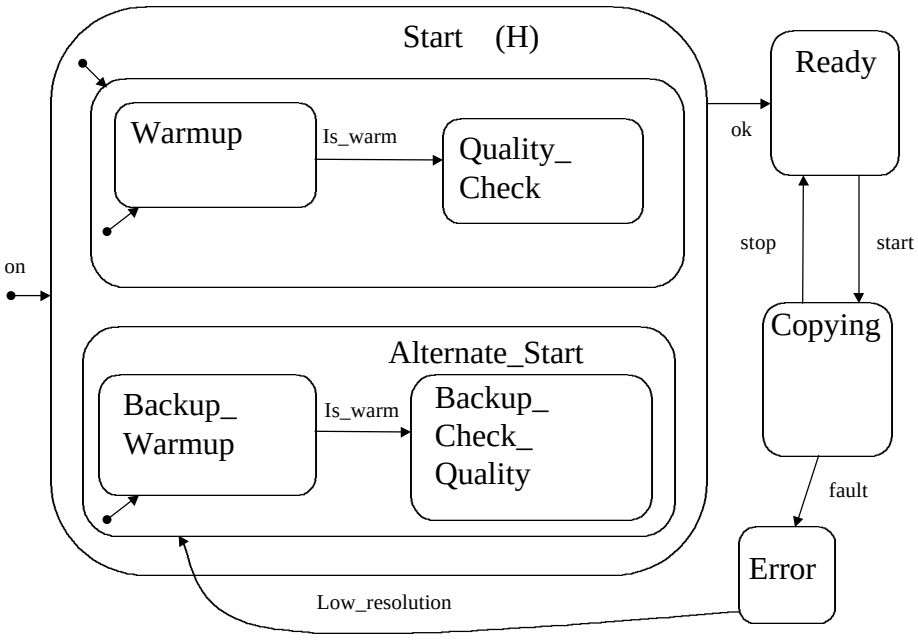
Statecharts

- Conditional state transitions
- Nested states: very useful. Allow to treat individual state as a state machine. Allow for clear boundaries between parts of the graph

Concise artifacts: a comparison

- State machine: Statechart
- sometimes exponentially smaller

- Decision tree: BDD (binary decision diag.)
- sometimes exponentially smaller



When and how to build models

- If a subsystem has a behavior that could be described with a state model but does not have one, create it. Helps with fault finding.