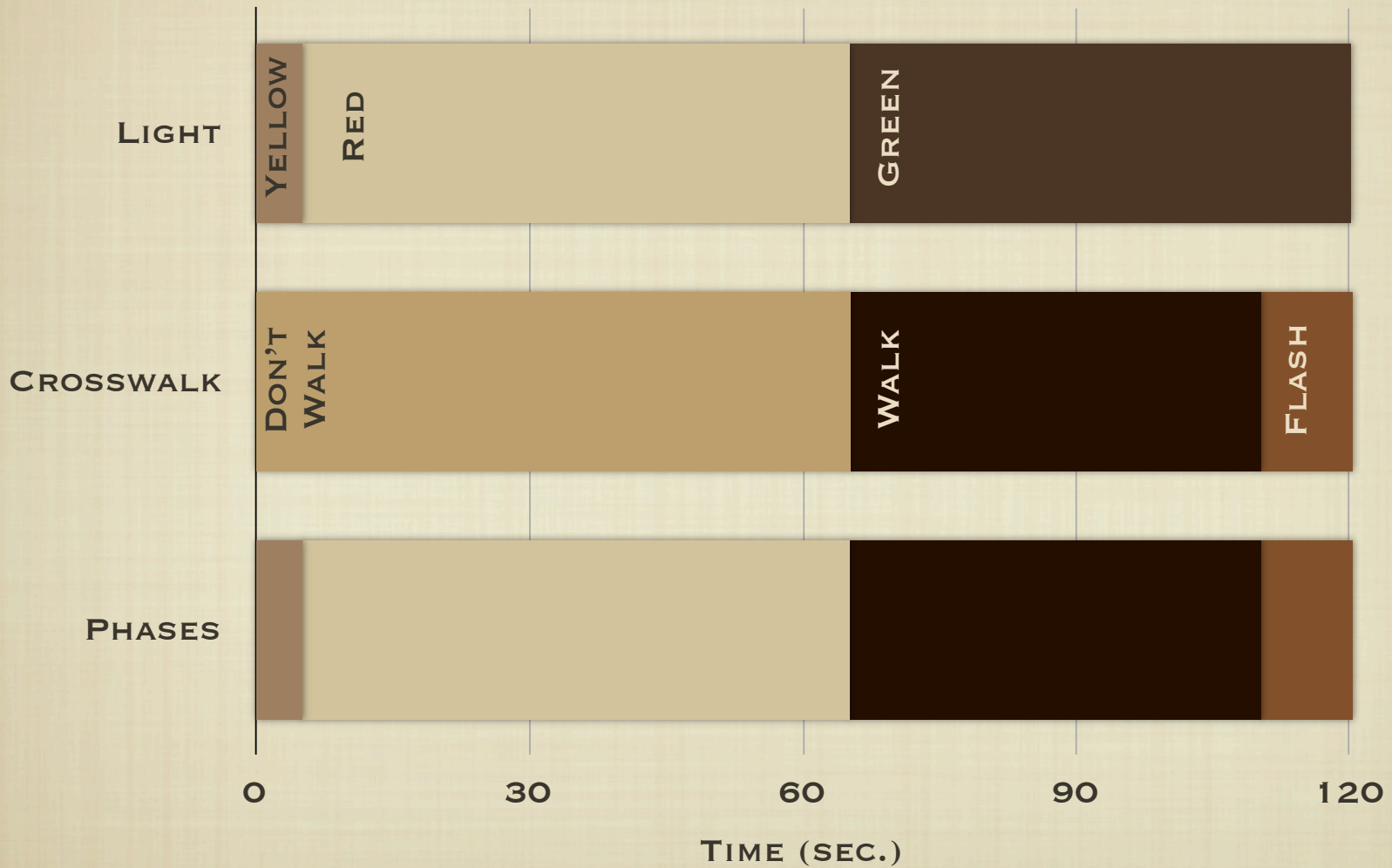


HIGHER-ORDER STATECHARTS

CURT CLIFTON
ROSE-HULMAN INSTITUTE OF TECHNOLOGY

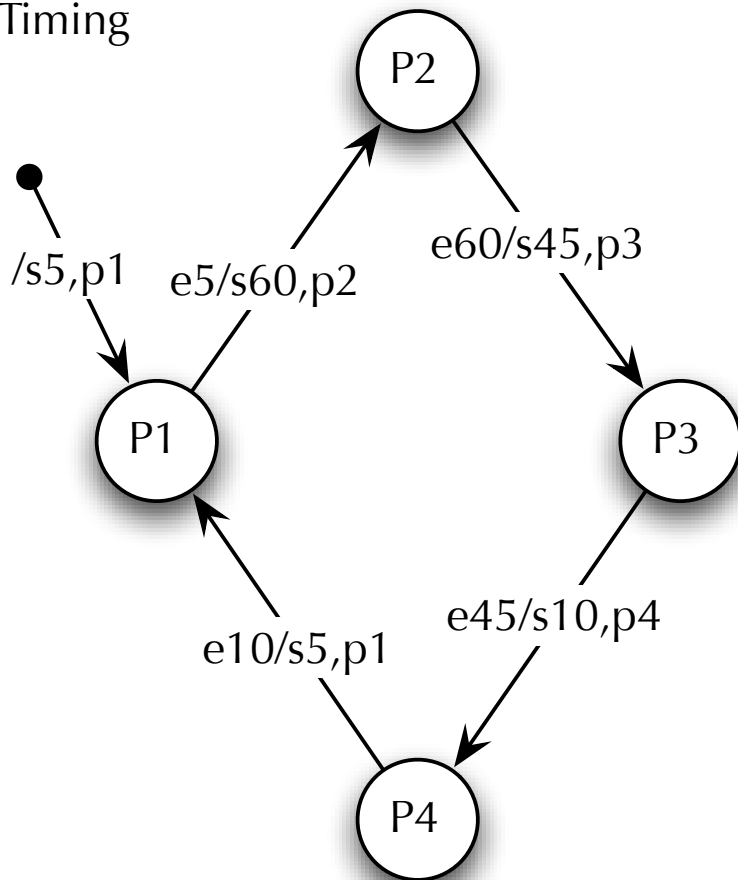
QUIZ 19 SOLUTION-1/2



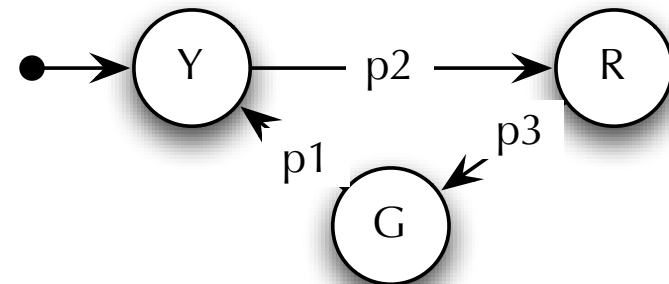
QUIZ 19 SOLUTION-2/2

Signals

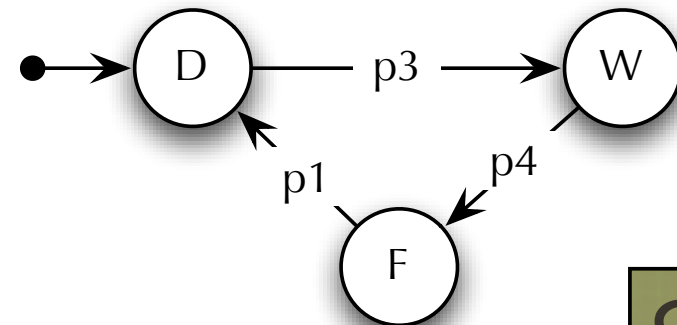
Timing



Light



Crosswalk



Q1

COMMON ACTIONS

- WHAT IF MULTIPLE TRANSITIONS TO A STATE SHOULD HAVE COMMON ACTION?
- CAN LIST ACTIONS INSIDE STATE
- CAN ALSO QUALIFY THOSE ACTIONS:

- down/arrivedAt3

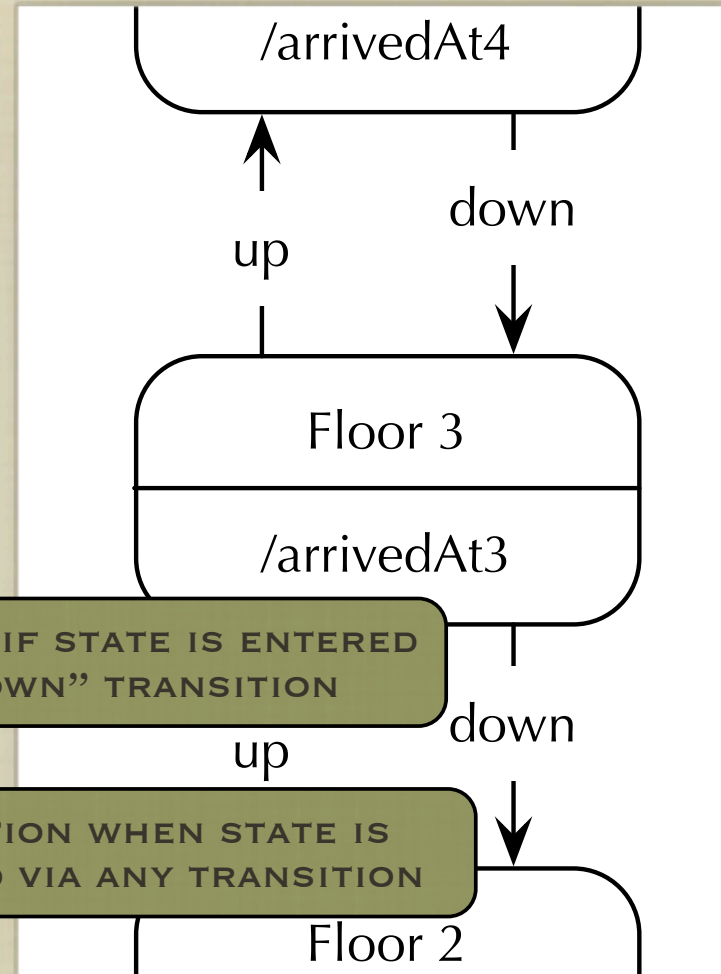
- entry/openDoors

- exit/closeDoors

DO ACTION WHEN STATE IS EXITED VIA ANY TRANSITION

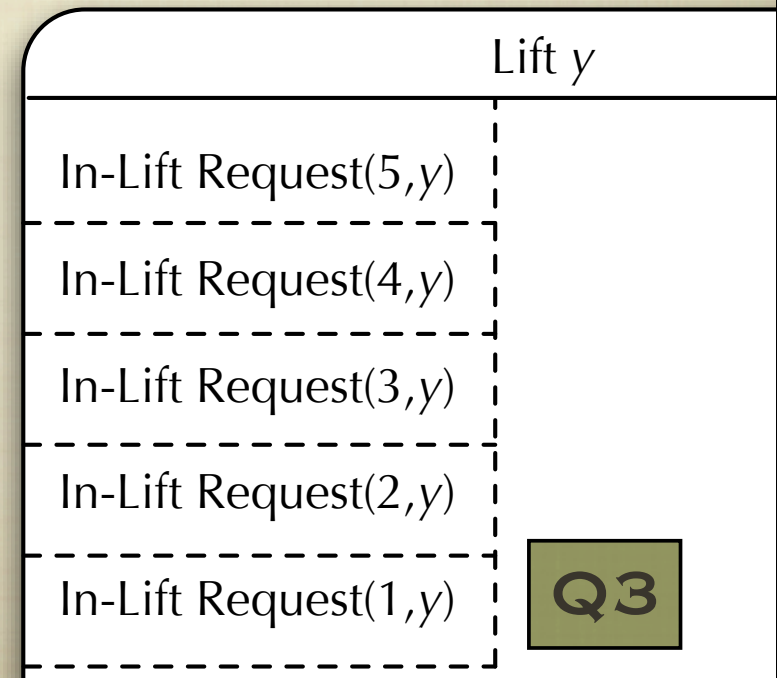
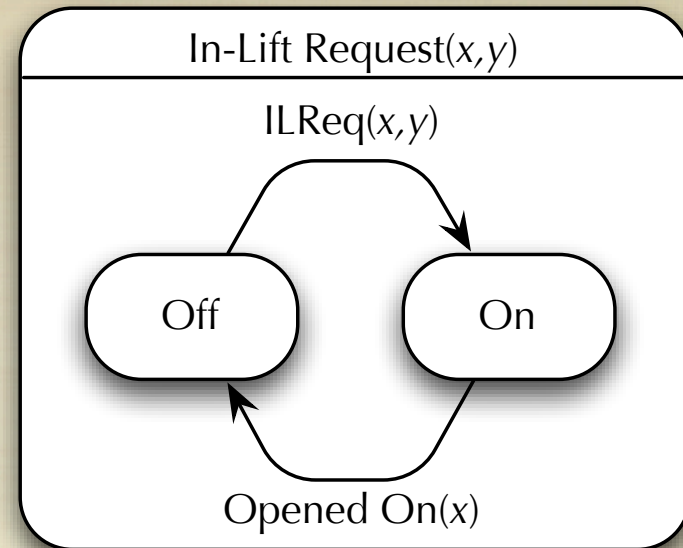
DO ACTION IF STATE IS ENTERED VIA "DOWN" TRANSITION

DO ACTION WHEN STATE IS ENTERED VIA ANY TRANSITION



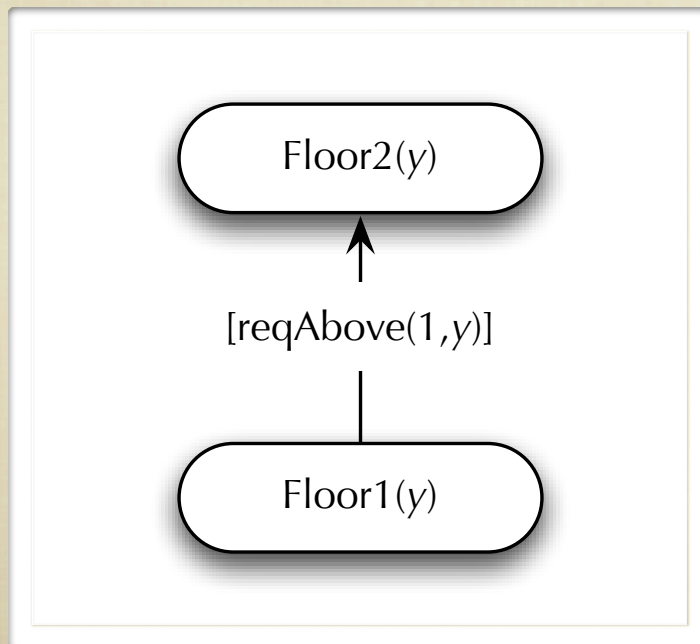
ABSTRACTION

- SOMETIMES WE NEED MULTIPLE NEARLY IDENTICAL SUBSTATES
- CONSIDER:
IN-LIFT FLOOR REQUESTS



ABSTRACT GUARDS

- CAN DEFINE PREDICATES TO USE IN GUARDS
- E.G., USING ALLOY NOTATION:
 - $\text{reqAbove}(f,l) = (\text{some } f' > f \mid \text{in InLiftRequest}(f',l).\text{On})$



NOT SUFFICIENT
FOR P4!

SOME DESIGN GUIDELINES

<http://www.agilemodeling.com/style/stateChartDiagram.htm>

STATES

- **IDENTIFY THE STATES FIRST**
- **KEEP NAMES SHORT BUT DESCRIPTIVE**
- **BEWARE OF:**
 - **BLACK HOLES – NO ARROWS OUT**
 - **MIRACLES – NO ARROWS IN**

LAYOUT

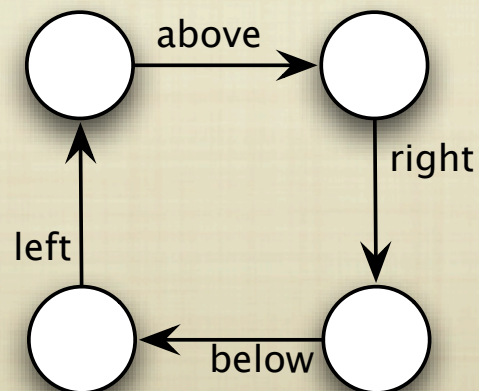
- FAVOR PUTTING INITIAL STATE IN TOP-LEFT CORNER

SUBSTATES

- USE NESTED SUB-STATES FOR COMMON TRANSITIONS
- FROM MANY STATES TO ONE STATE, OR
- FROM ONE STATE TO MANY
- USE ORTHOGONAL MACHINES FOR “PIECES” THAT RUN IN PARALLEL

TRANSITIONS/ACTIONS

- USE “RECURSIVE TRANSITIONS” ONLY FOR EXITING AND RE-ENTERING THE STATE
- NAME TRANSITION EVENTS IN PAST TENSE
- PUT TRANSITION LABELS NEAR SOURCE STATE
- SUGGESTED LABEL LOCATIONS:



GUARDS

- TO AVOID ACCIDENTAL NON-DETERMINISM, GUARD CONDITIONS SHOULD BE DISJOINT
- $[x > 0]$ AND $[x \leq 0]$, INSTEAD OF
- $[x \geq 0]$ AND $[x \leq 0]$

ITERATE!

- ADD BASIC FUNCTIONALITY FIRST
 - JUST MOVEMENT OF LIFTS BETWEEN FLOORS
- ITERATIVELY ADD FEATURES
 - IN-LIFT REQUESTS
 - DOORS
 - ARROWS ...

TOOLS

EXPERIMENT WITH TOOLS EARLY!
MAKE SURE YOU CAN DRAW
SUBSTATES AND EXPORT TO PDF.

- **HW11: SCANS OF NEAT, HAND-DRAWN SKETCHES ARE OK**
- **P4: MUST USE A SOFTWARE TOOL FOR DRAWING**
 - **VISIO – GOOGLE FOR STATECHART STENCILS**
 - **OMNIGRAFFLE – ON LAB MACS**
 - **OTHERS?**
 - **AVOID MS PAINT**
(UNLESS YOU ALREADY HATE LIFE)