CS 428/528 Lecture 16: Statecharts

March 7, 2024

Based on the SCP87 and LICS87 paper by Harel et al

Limitations of State Machines

» They are too flat (no depth, hierarchy, or modularity; no support for stepwise, top-down, or bottom-up development)

» They are uneconomical when modeling transitions (e.g., high-level interrupt)

» Infeasible because of too many states

» No support for concurrency

Statecharts

» Statecharts = state-diagrams + depth + orthogonality + broadcast communications

Depth

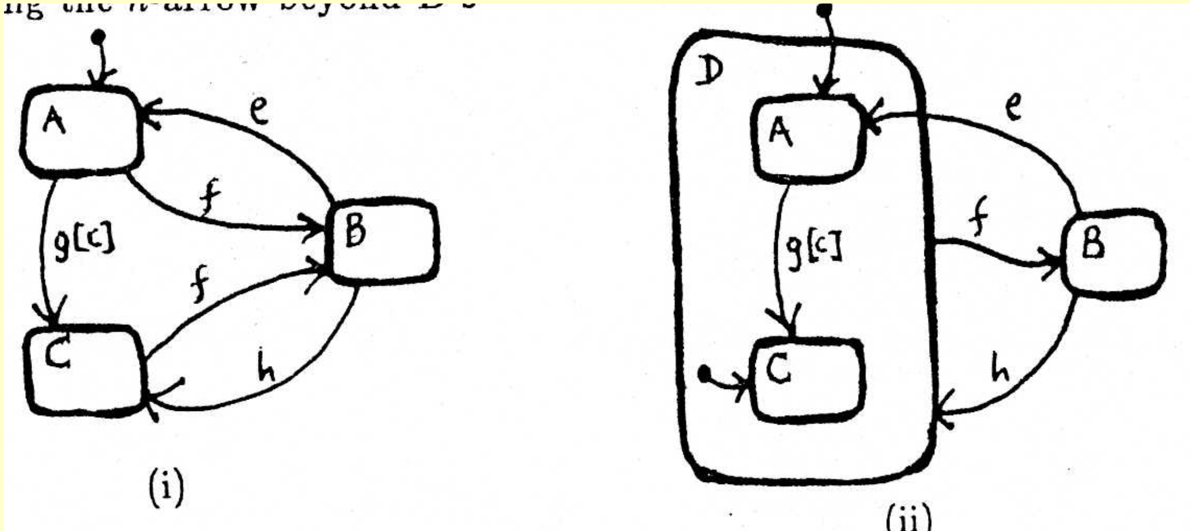


Figure 1

Depth + Stepwise Refinement

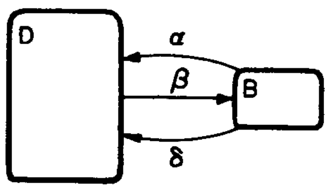


Fig. 3.

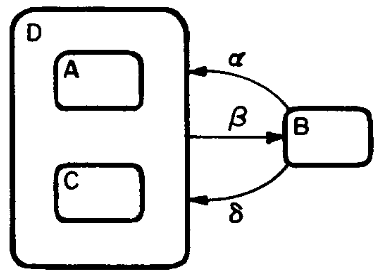


Fig. 4.

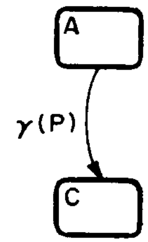


Fig. 5.

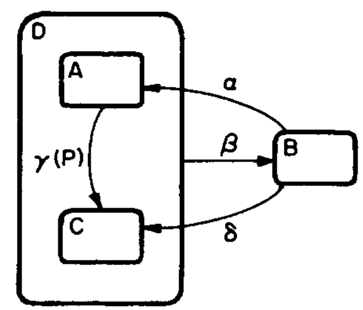


Fig. 2.

Depth: Default State & Enter-by-History

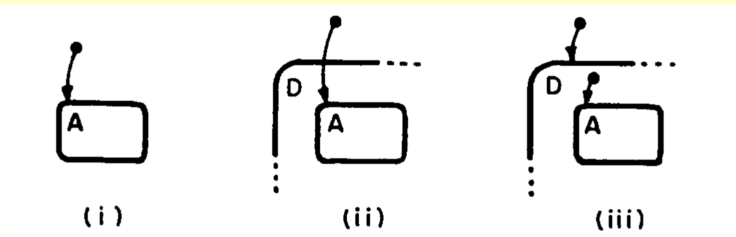
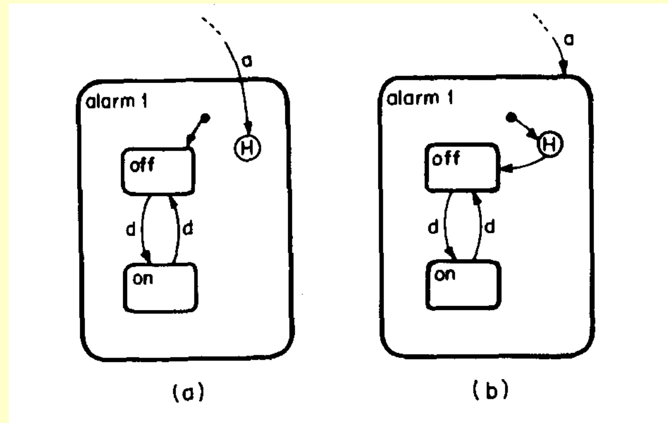


Fig. 6.



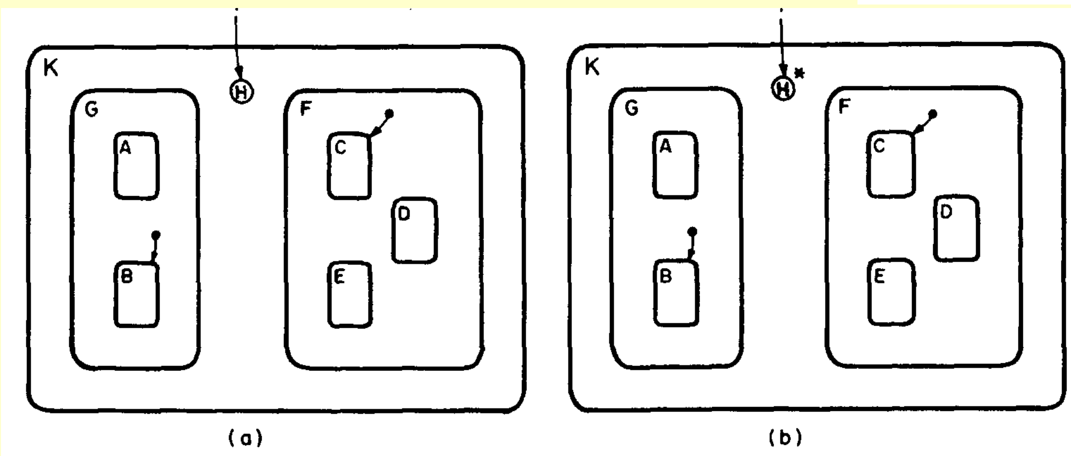
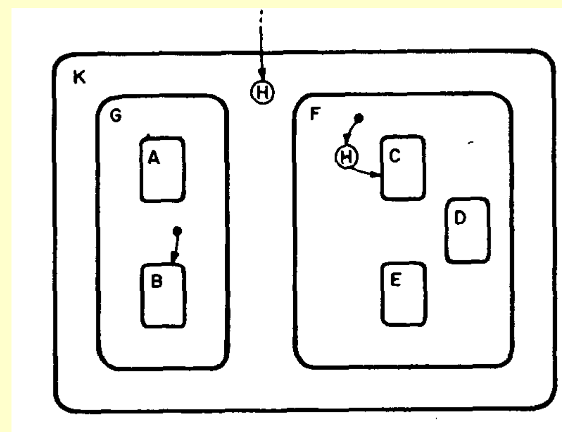
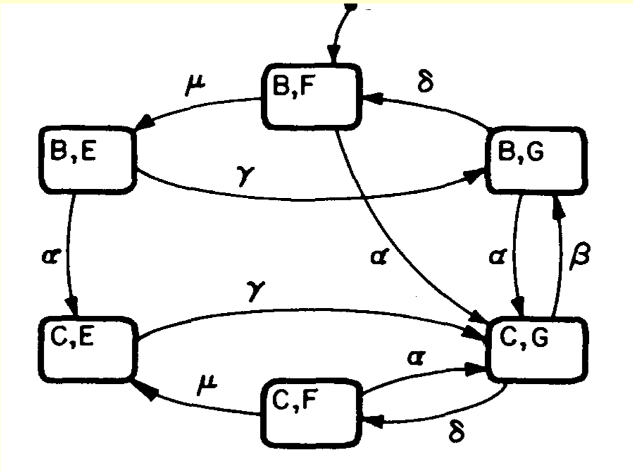
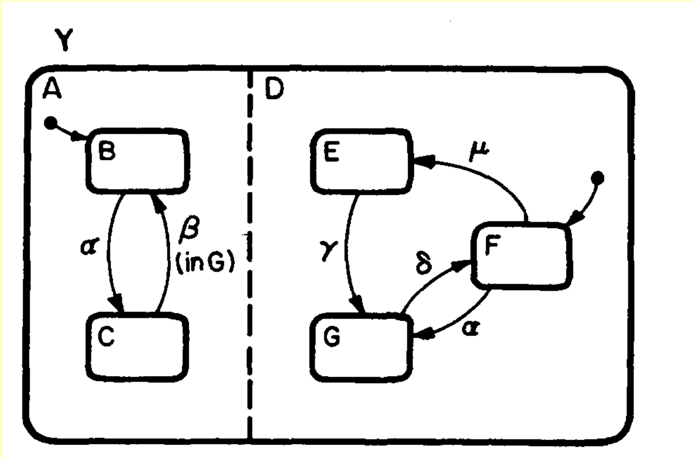


Fig. 11

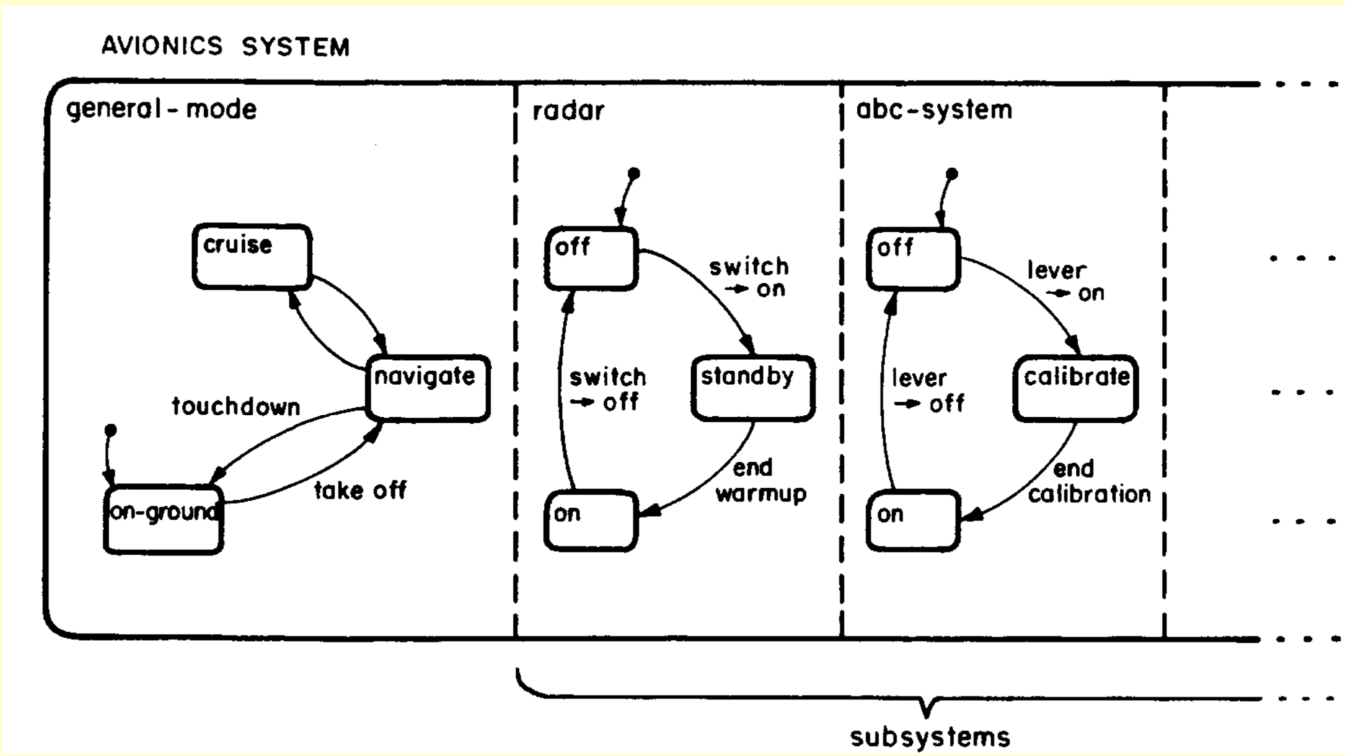


Orthogonality (or Concurrency)

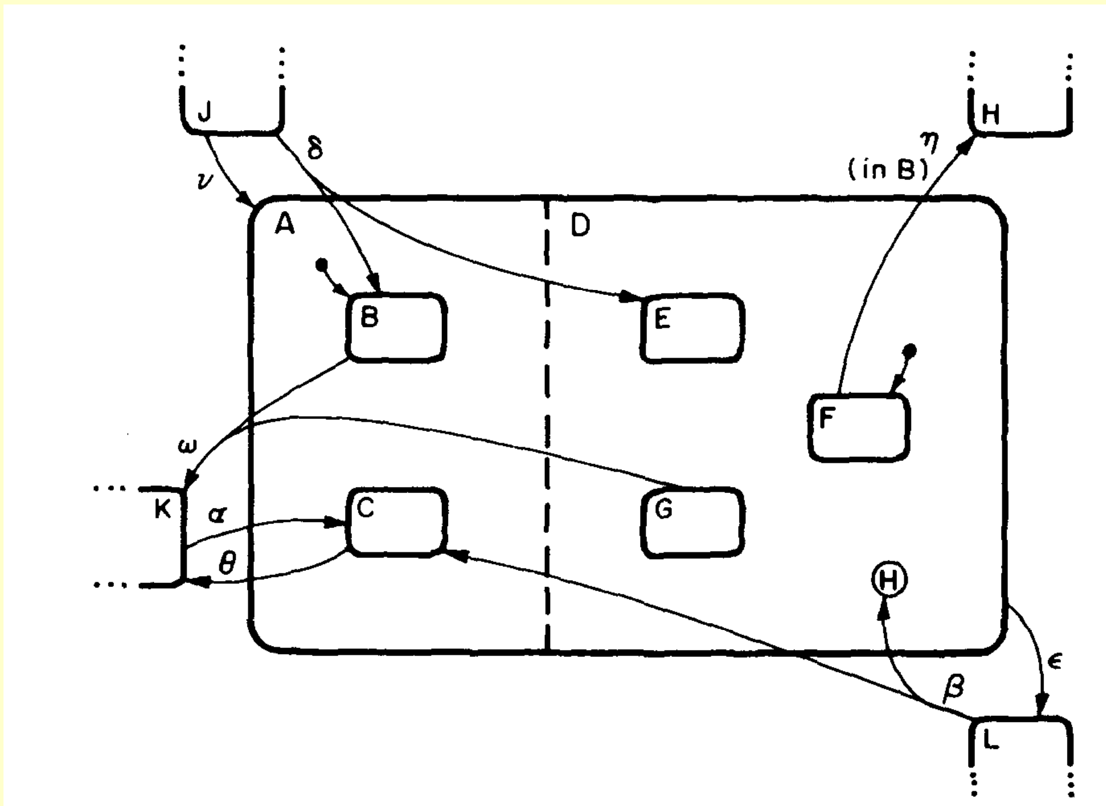




Orthogonality (or Concurrency)



Orthogonality (or Concurrency)



Broadcast Communication

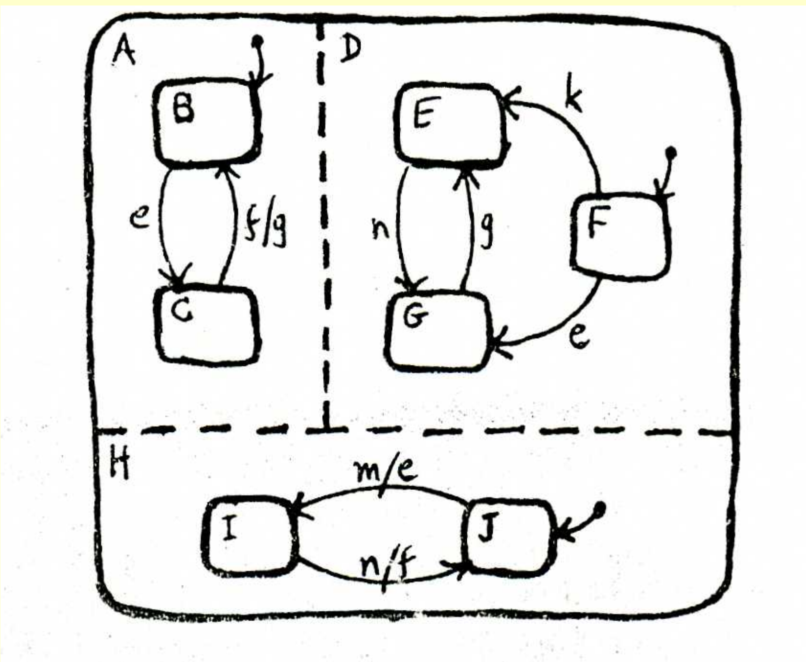


Fig. 4 shows a simple example of this. If we are in (B, F, J) and along comes the external event m, the next configuration should be (C, G, I), by virtue of e being generated in H and triggering the two transitions in components A and D. This is a *chain reaction* of length 2. If now external event n occurs, the new configuration will be (B, E, J), by virtue of a similar chain reaction of length 3.

Case Study: Citizens Watch

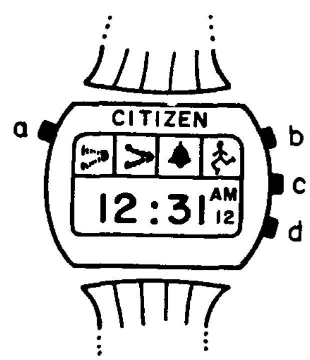


Fig. 7.

The main external events will be the depressing and releasing of buttons (e.g., event "*a*" denotes button *a* being depressed, and "*â*" denotes it being released),

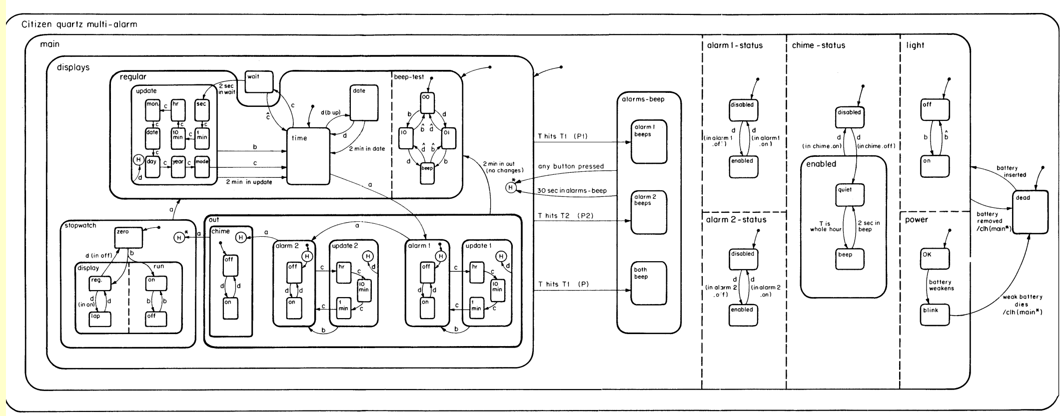


Fig. 31

Case Study: Citizens Watch

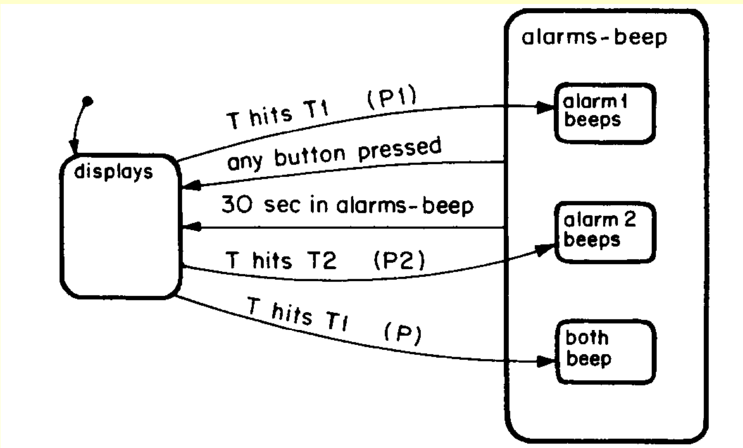


Fig. 8.

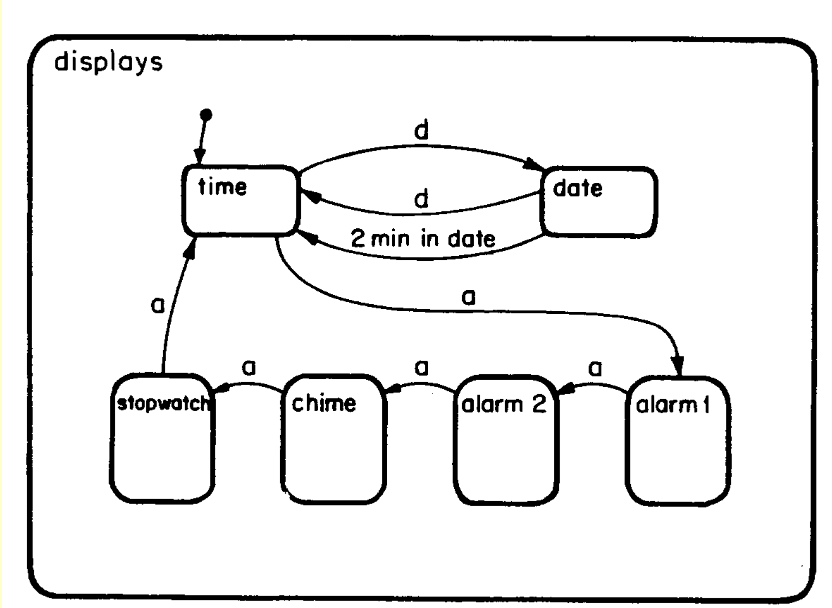
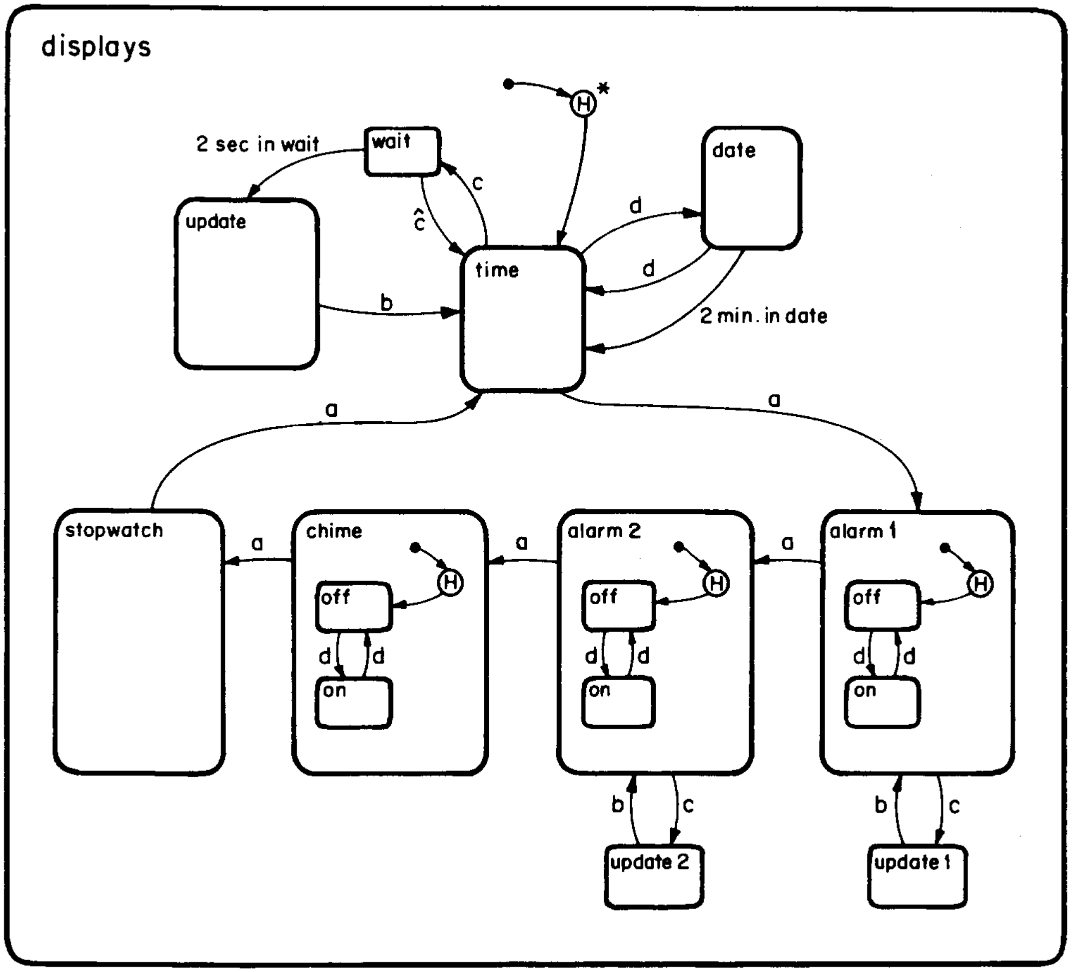
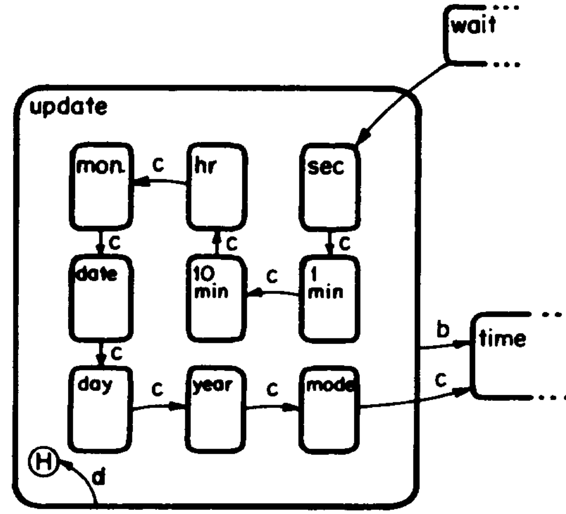
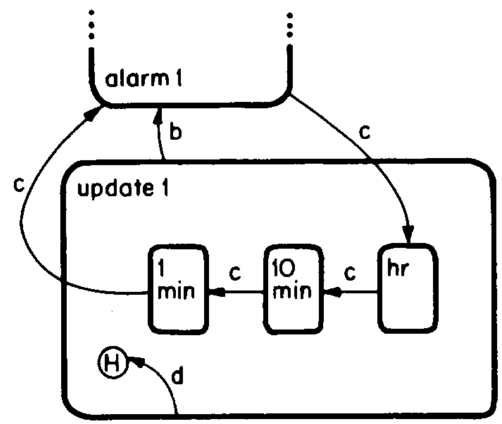


Fig. 9.

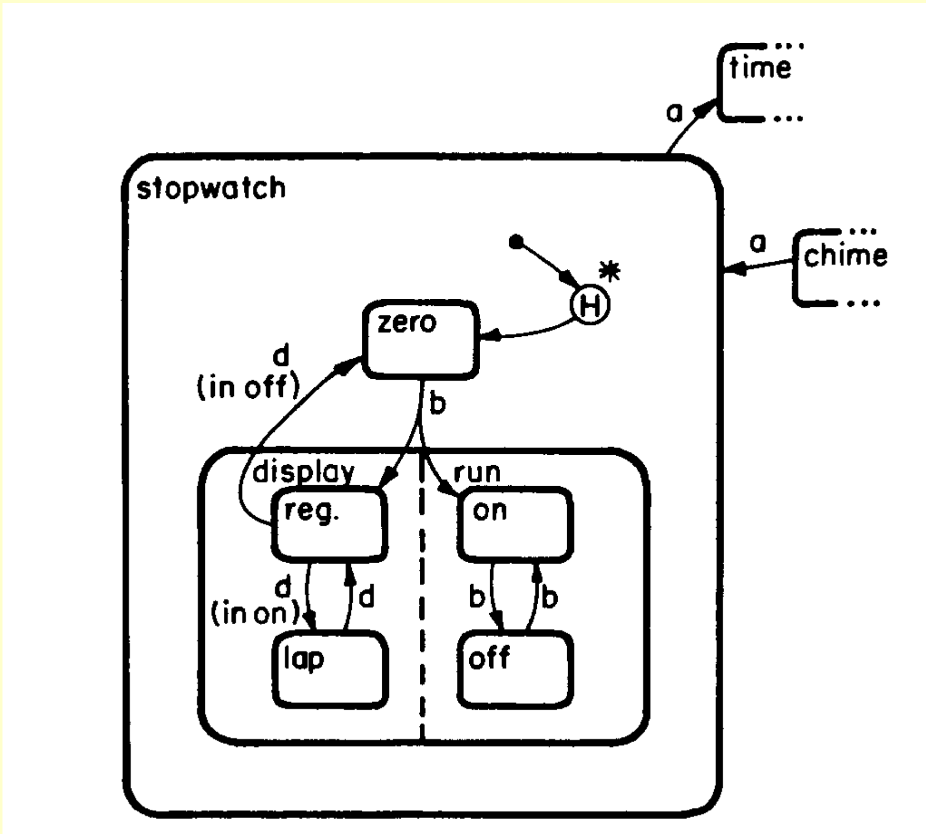
Case Study: Citizens Watch



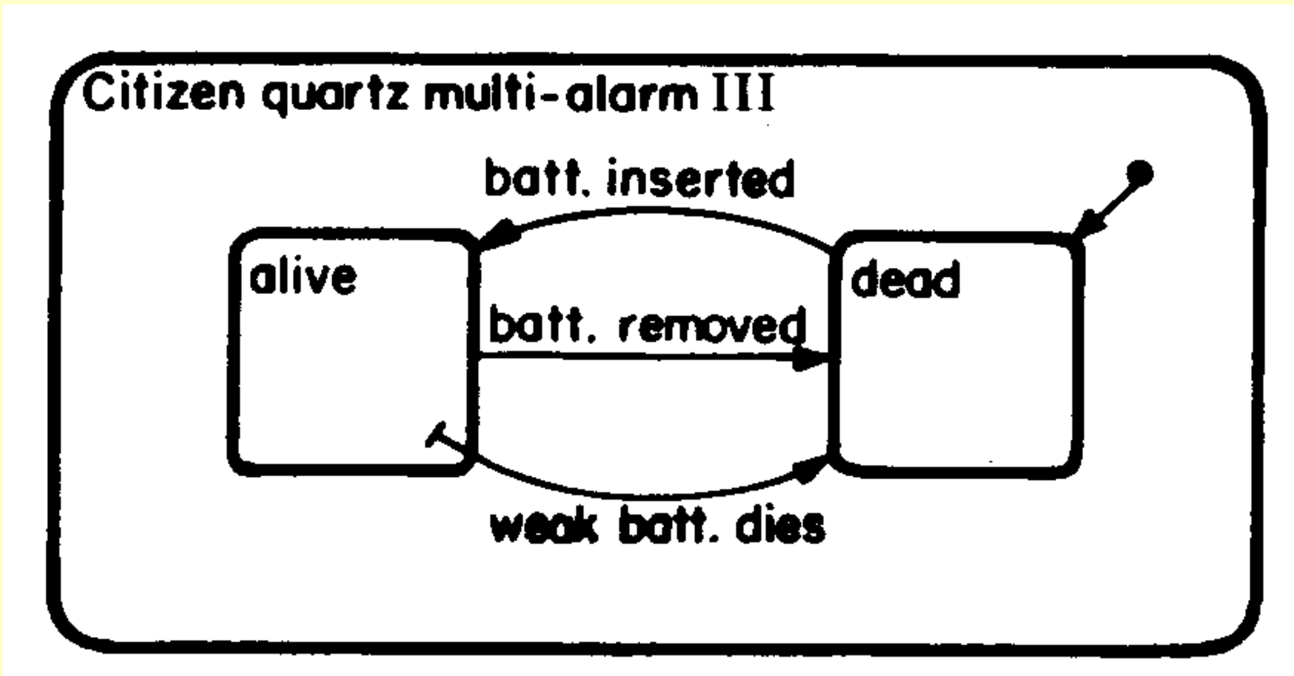




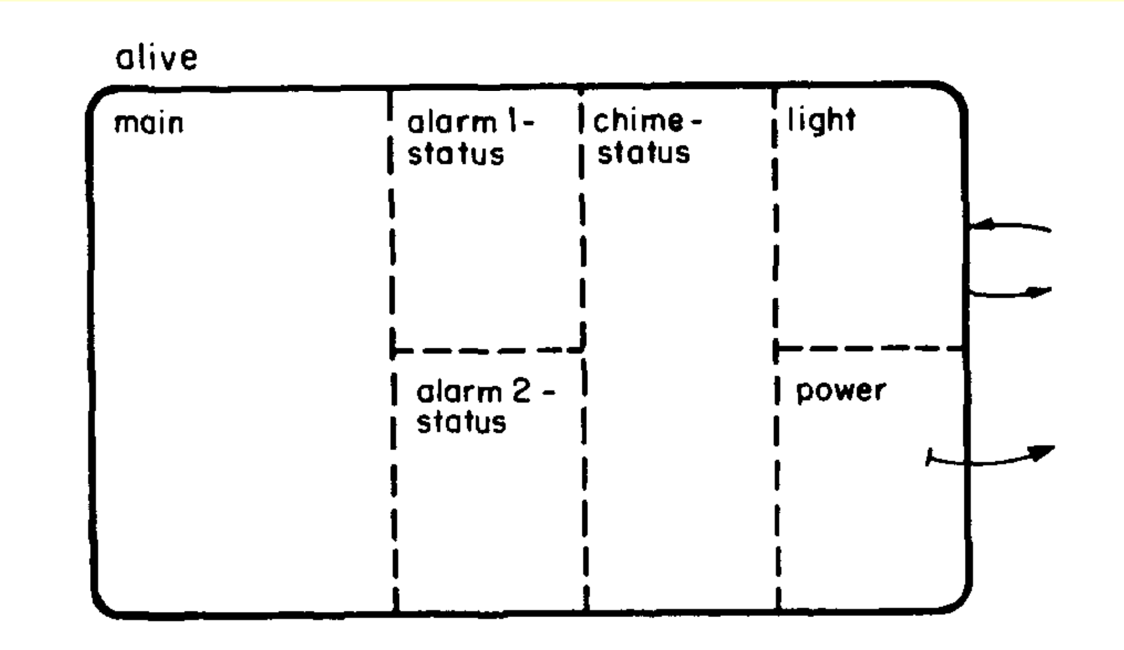
Case Study: Citizens Watch



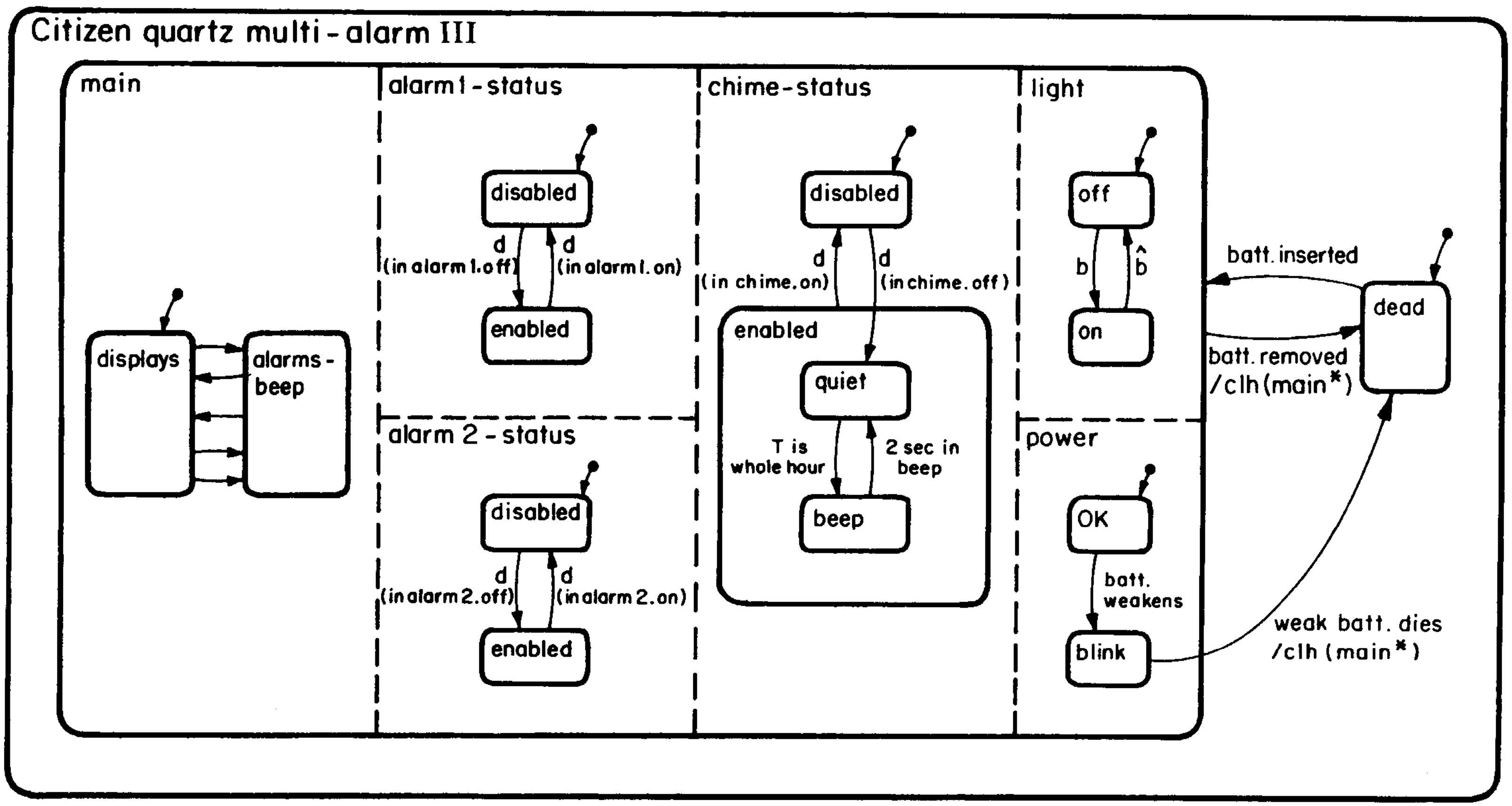
Case Study: Citizens Watch



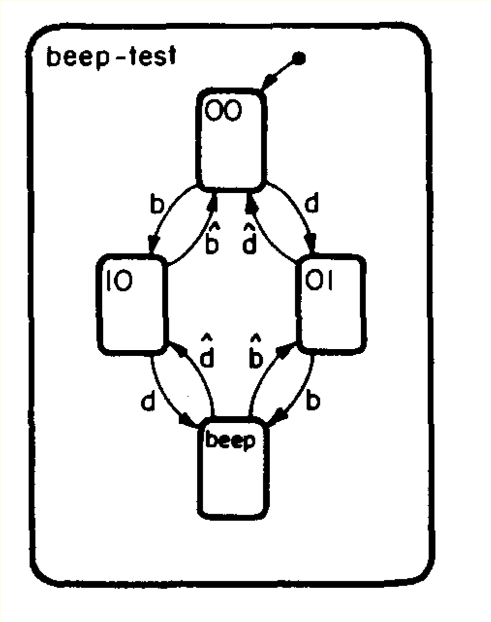
Case Study: Citizens Watch

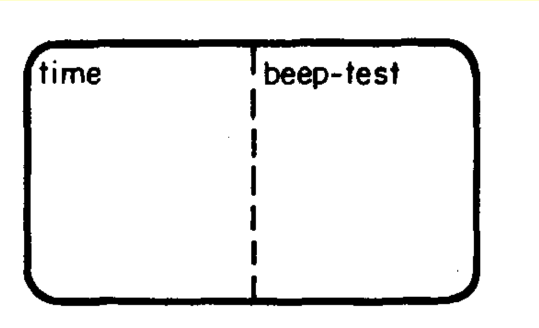


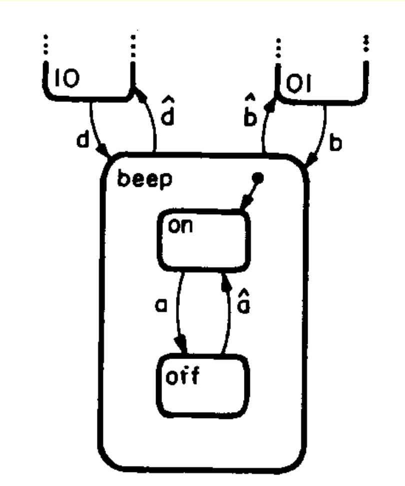
Case Study: Citizens Watch



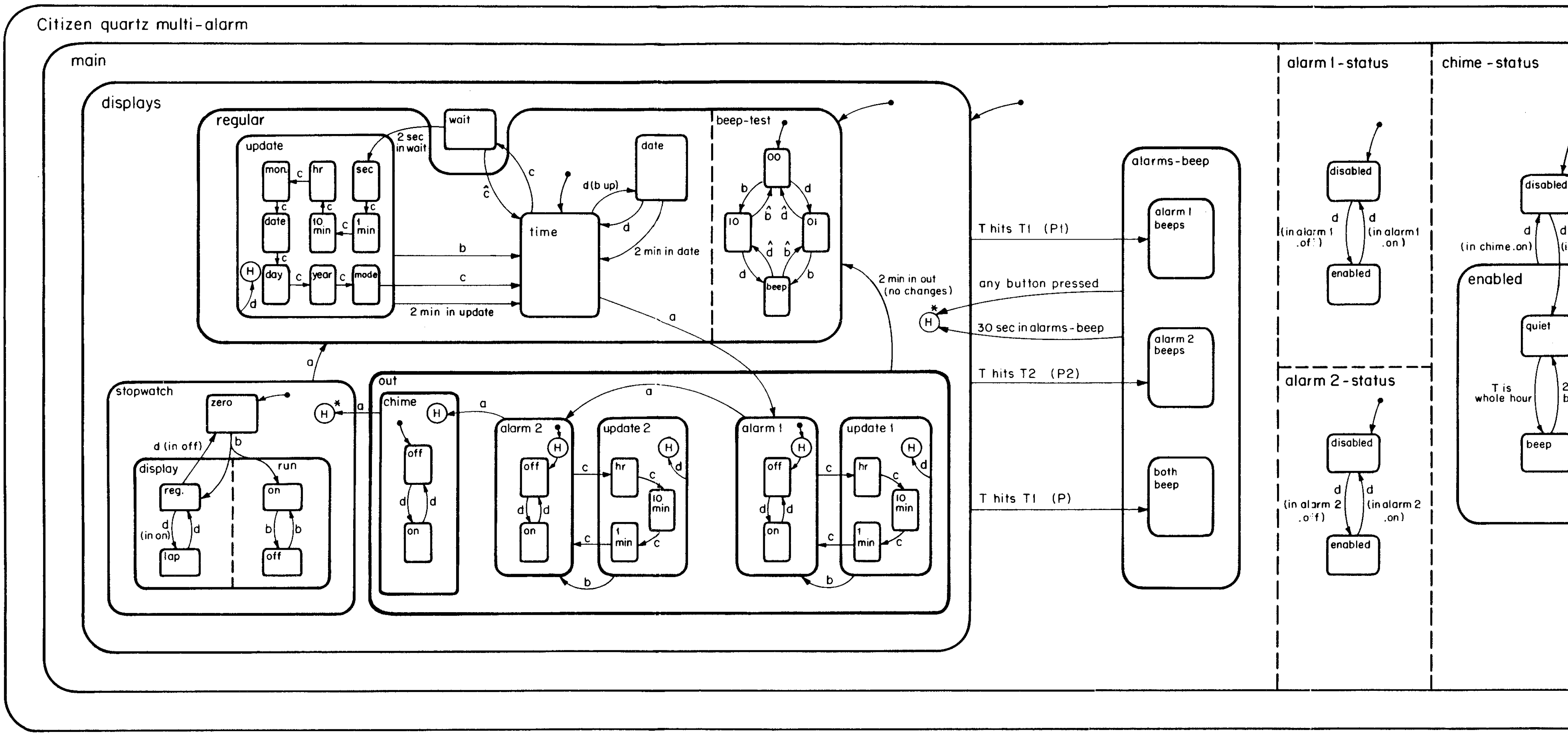
Case Study: Citizens Watch







Case Study: Citizens Watch



Case Study: Citizens Watch