Designing Interactive Systems I
Lecture 12: Petri Nets

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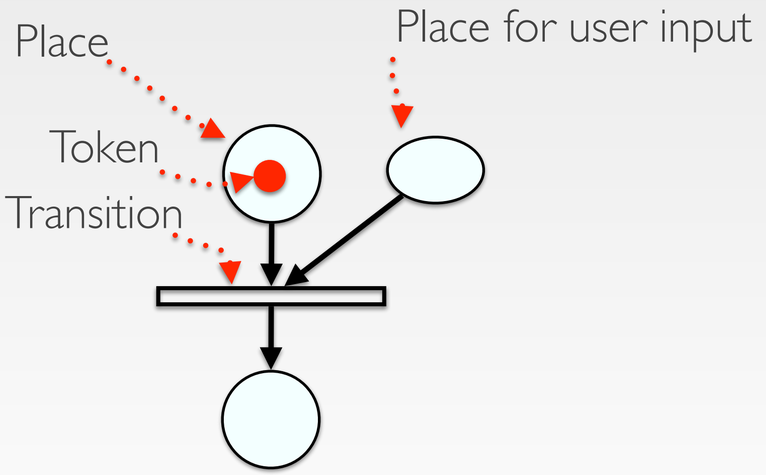
http://hci.rwth-aachen.de/dis

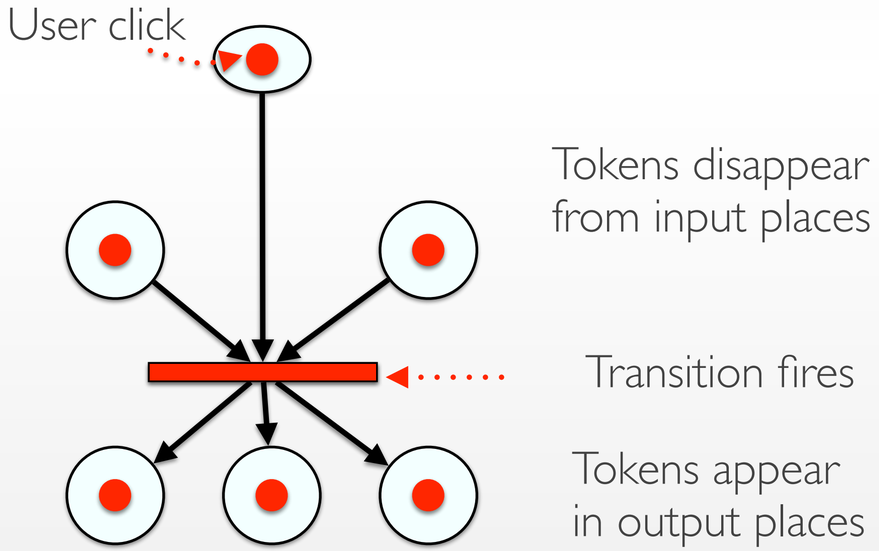
Petri Nets

- Better approach to dialogs that have several states at once
- But not better for sequential dialogs and mutually exclusive UI elements (radio buttons)
- Relatively old formalism to model concurrency

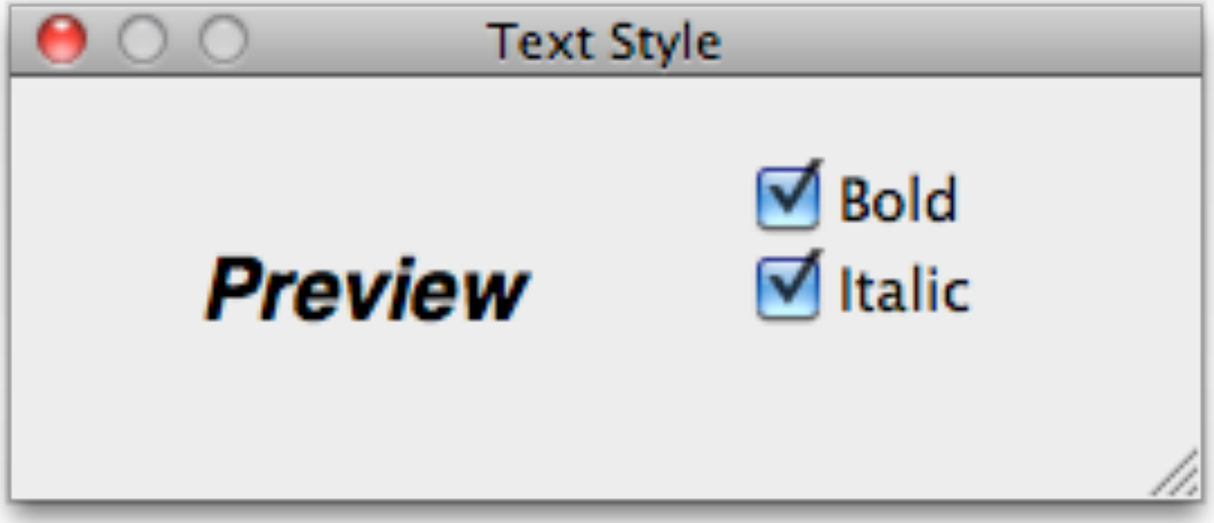
Petri Nets



- Transition fires when all input places have one or more token
  - A token is produced in each output place
- Positions of all tokens represent the current state
  - NOTE: This is different from state machines

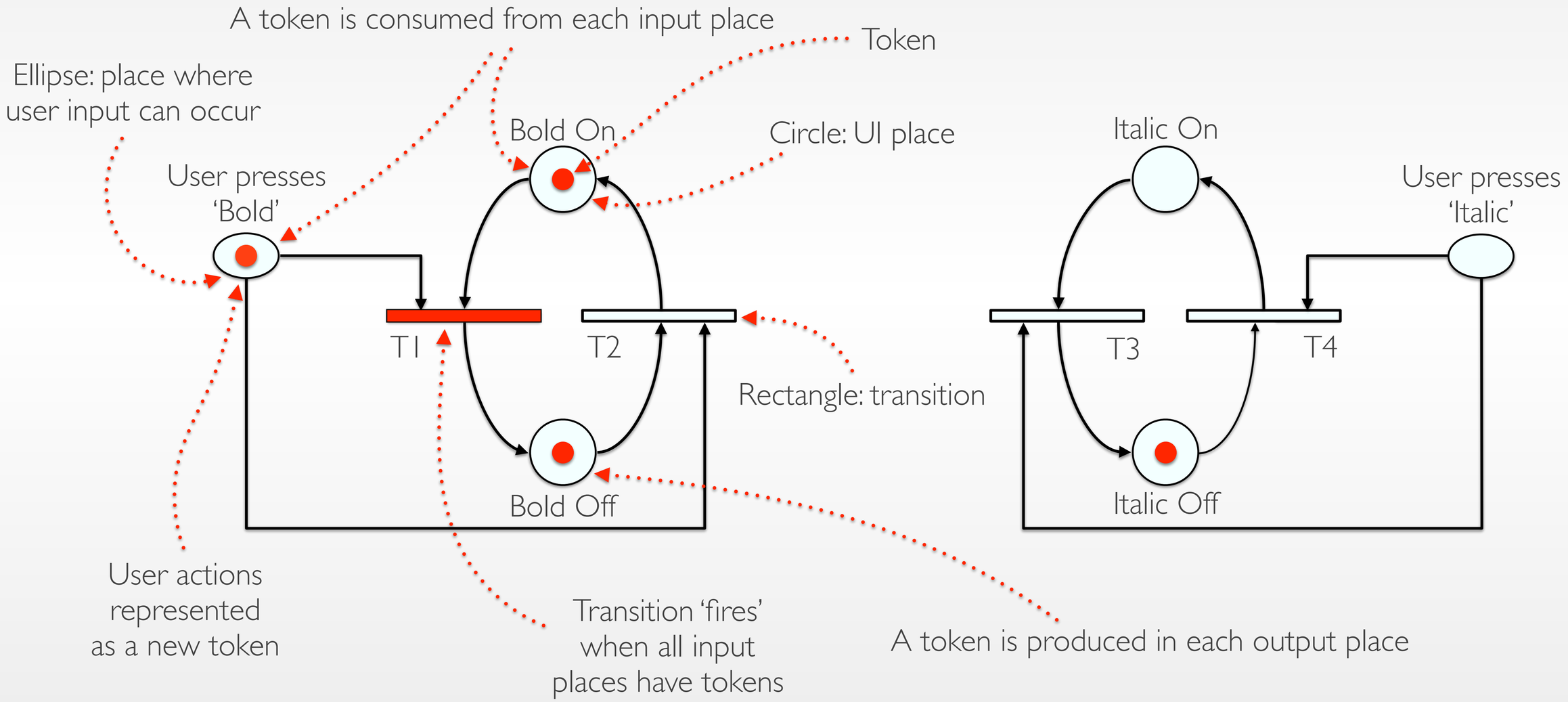


In-Class Exercise



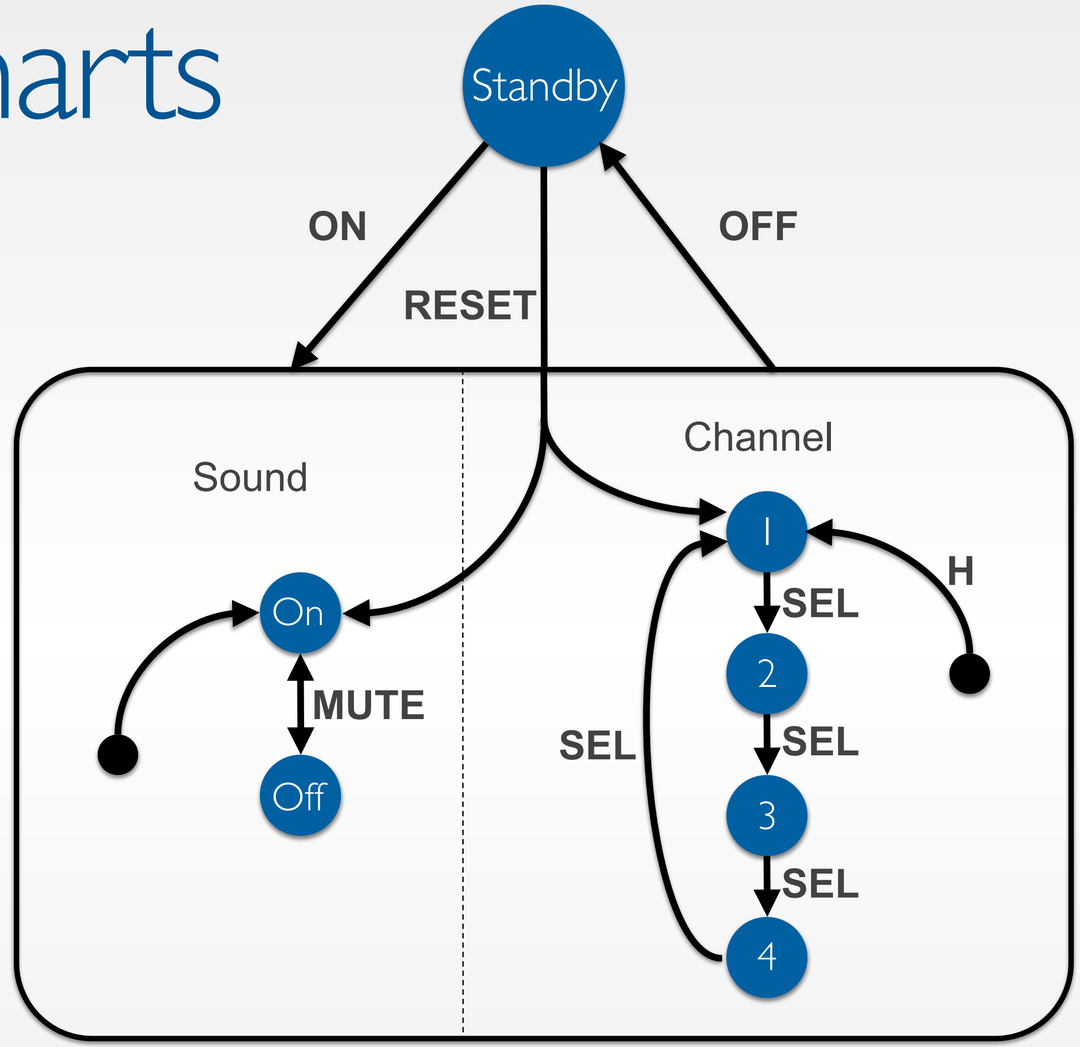
- Draw the Petri net for our dialog box with concurrent "Bold" and "Italic" options (ignore "Underline" for now)

Petri Net For "Bold & Italic" Dialog



State Charts

- By Harel; used in UML
- Example: TV Control Panel
- State Charts extend STNs
  - Hierarchy
  - Concurrent sub-nets
    - ON resumes both state machines
  - Escapes
    - OFF always active
  - History
    - Link marked "H" goes back to last state on re-entering subdialog

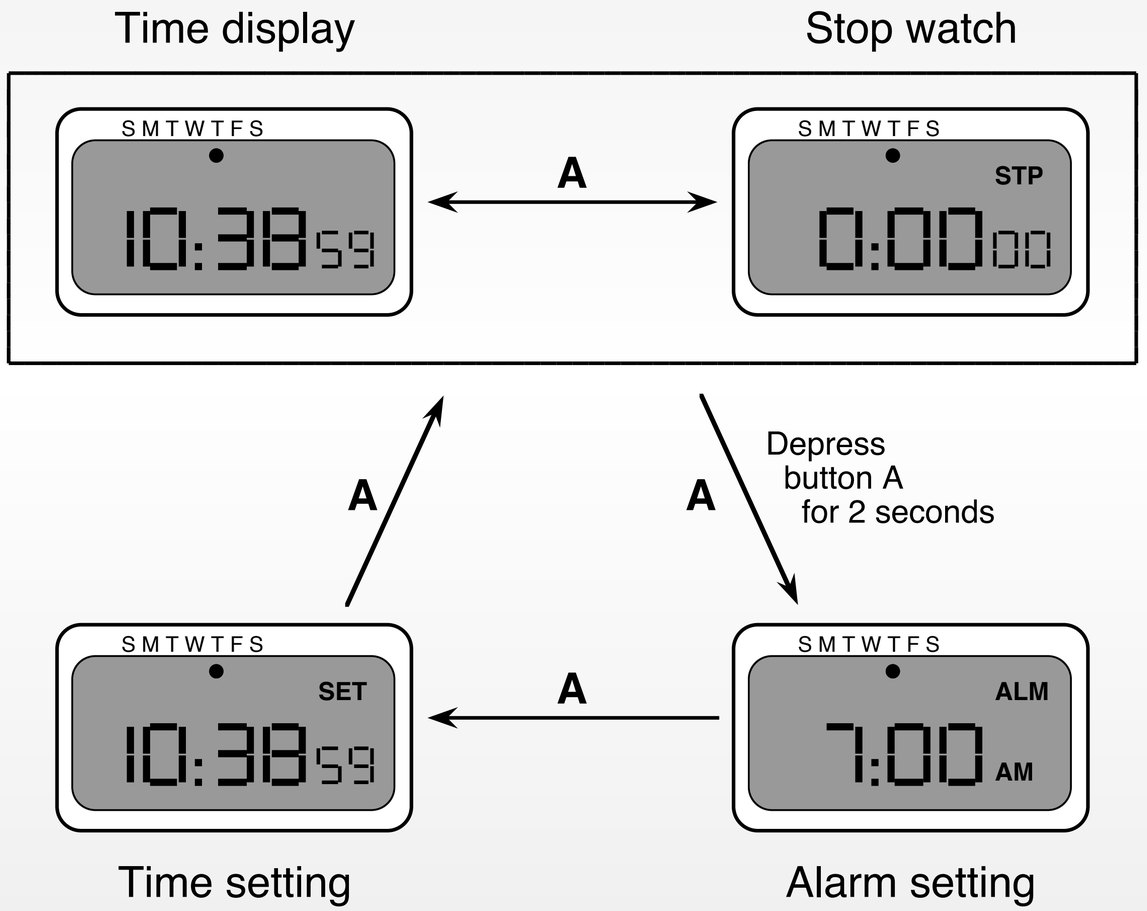


Diagrams For User Documentation

- Some dialog descriptions are clear enough to serve as user documentation (similar to GOMS)
- Especially if description uses screen shots and is semi-formal

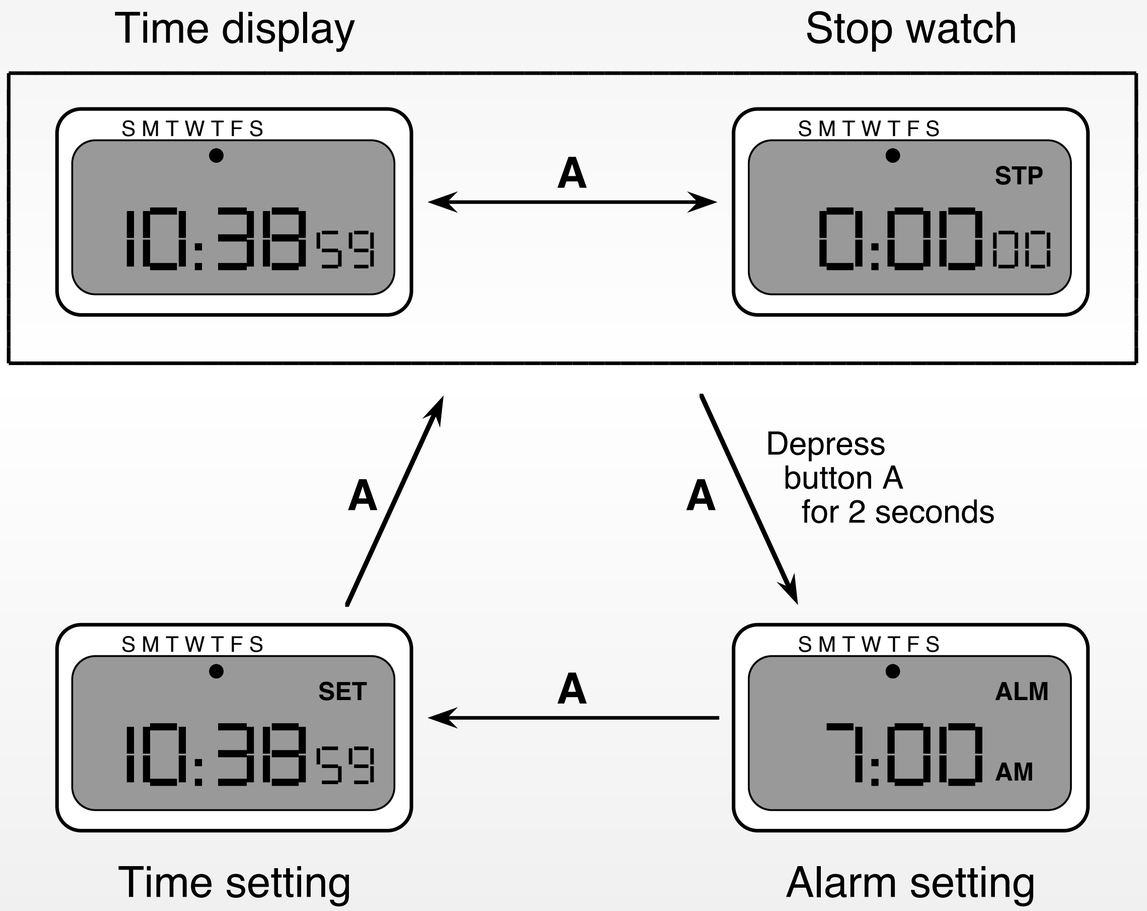
Digital Watch – User Instructions

- Two main modes
- Limited interface
  - 3 buttons
- Button A changes mode



Digital Watch – User Instructions

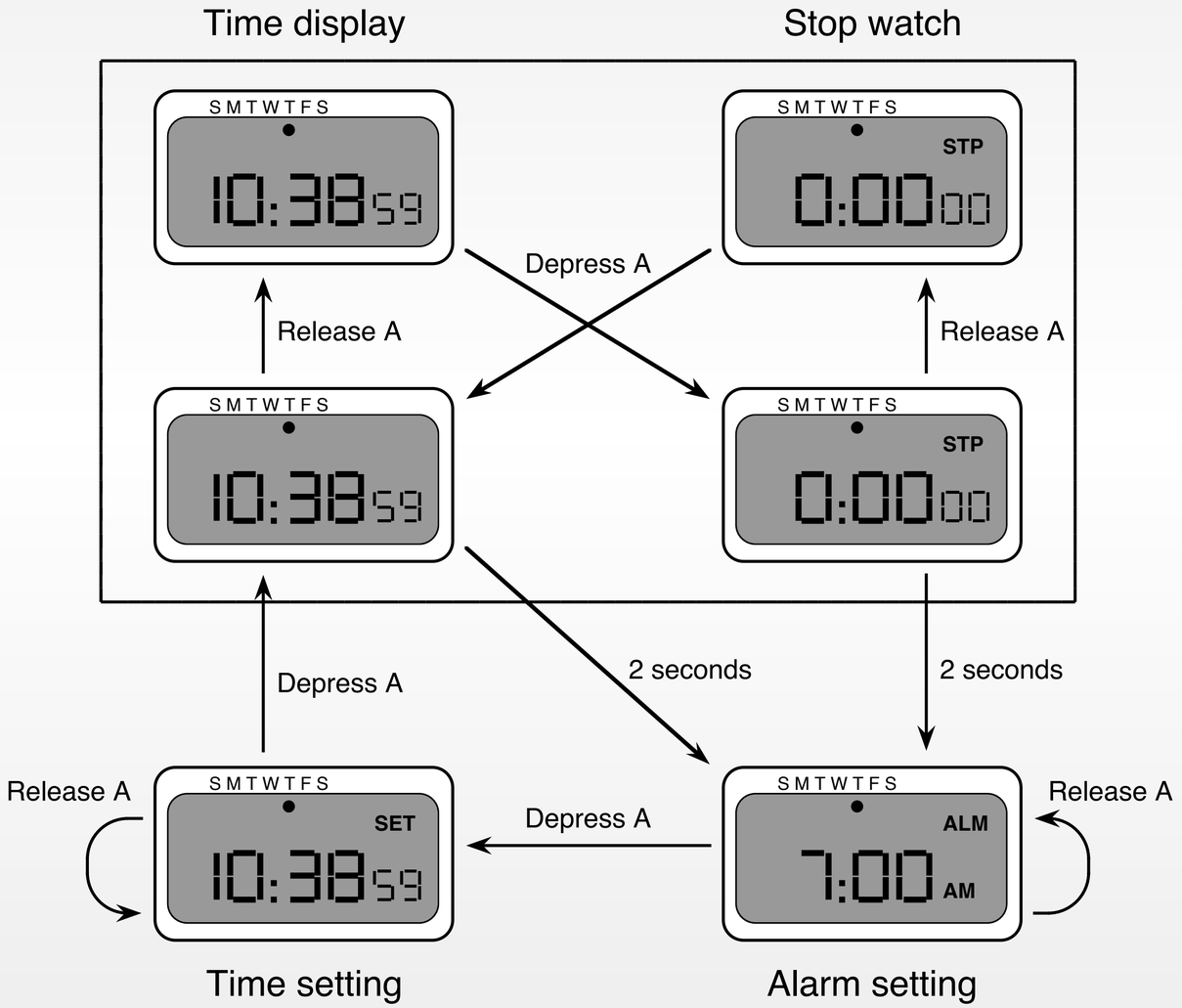
- Dangerous states
- Completeness
  - Distinguish depress A and release A
  - What do they do in all modes?



Digital Watch – User Instructions

and …

that's just one button



Semantics - Raw Code

- Event loop for word processor
- Dialogue description
  - Very distributed
- Syntactic/semantic trade-off
  - Terrible!

```
switch ( ev.type ) {
  case button_down:
    if ( in_text ( ev.pos ) ) {
        mode = selecting;
        mark_selection_start(ev.pos);
    }
    ...
  case button_up:
    if ( in_text ( ev.pos )
                && mode == selecting ) {
        mode = normal;
        mark_selection_end(ev.pos);
    }
    ...
  case mouse_move:
    if (mode == selecting ) {
        extend_selection(ev.pos);
    }
    ...
} /* end of switch */
```

Design In The World Of Business

Competitive Forces

- A competitive market encourages changes and sacrifices the iterative design process
- Need for speed
- Cost reduction
- Featurism
- Satisfying several classes of customers

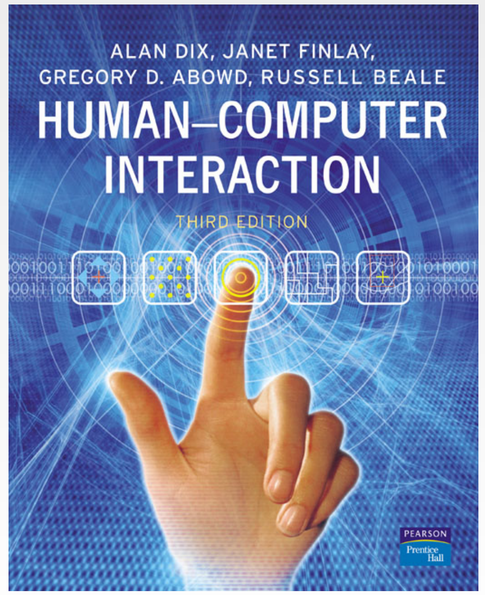
Life-cycle of Products

- Months to move from invention to production, but decades until product acceptance
- For example, gestural interfaces took 30 years to move from research labs to commercial products
  - Goals: affordable and reliable
- Small companies and startups can take more innovation risks compared to larger companies
- Cases: VideoPhone (p. 270-274) or Keyboards (p. 274-279)

Incremental and Radical Innovation

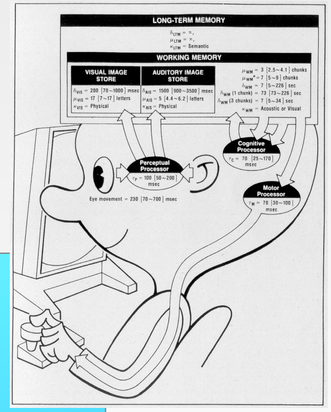
- Incremental innovation–slow and natural evolution process
  - Significant changes overtime; make exiting product better
  - Hill climbing analogy
  - E.g., automobile evolution, radical idea but then slow development
- Radical innovation–fast and based on new technologies
  - Changes paradigms
  - E.g., television and music industries
- With technologies becoming more available and less expensive, such as 3-D printers and open-source code, anyone can realise their ideas now. DIY communities are rising rapidly and transforming people from being passive consumers to proactive

Further Reading



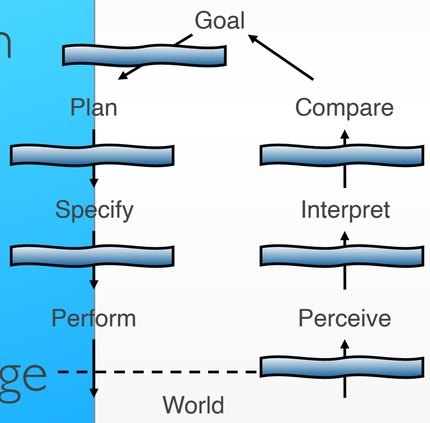
- Alan Dix et al.: Human-Computer Interaction, 3rd ed. (2003), Chapter 16
- Ben Shneiderman: Designing The User Interface, 5th ed. (2009), esp. chapter 5

Roadmap



Cognition

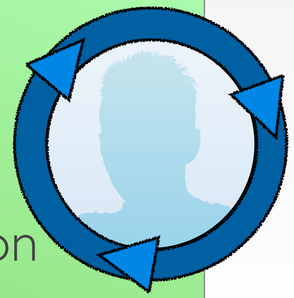
- Performance
- Models of interaction
  - Affordances
  - Mappings
  - Constraints
  - Types of knowledge
  - Errors
- Design principles



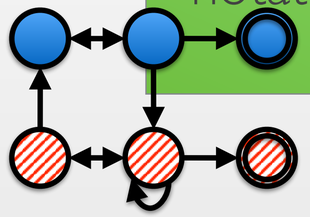
History

- History of HCI
- Visions
- Phases of Technology

Design Process



- Iterative design
- User observation
- Ideation
- Prototyping
- User studies and evaluation
- Interaction design notation



What's Next?

Interested in a HiWi position or B.Sc./M.Sc. thesis?
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- Designing Interactive Systems 2 6ECTS
  hci.rwth-aachen.de/dis2
  - What makes a UI tick?
  - Technical concepts, software paradigms and technologies behind HCI and user interface development
- Current Topics in HCI 6ECTS
  hci.rwth-aachen.de/cthci
  - Understand & practice ways to do research in HCI
  - Learn about up-to-date developments in HCI and interactive multimedia from new books and recent conference/journal articles