Dialogue Notations and Design

Overview

Dialogue Notations

- Diagrammatic
  - ○ state transition networks
  - ○ JSD diagrams
  - ○ Flow charts
- Textual
  - ○ formal grammars
  - ○ production rules
  - ○ CSP

Dialogue Analysis

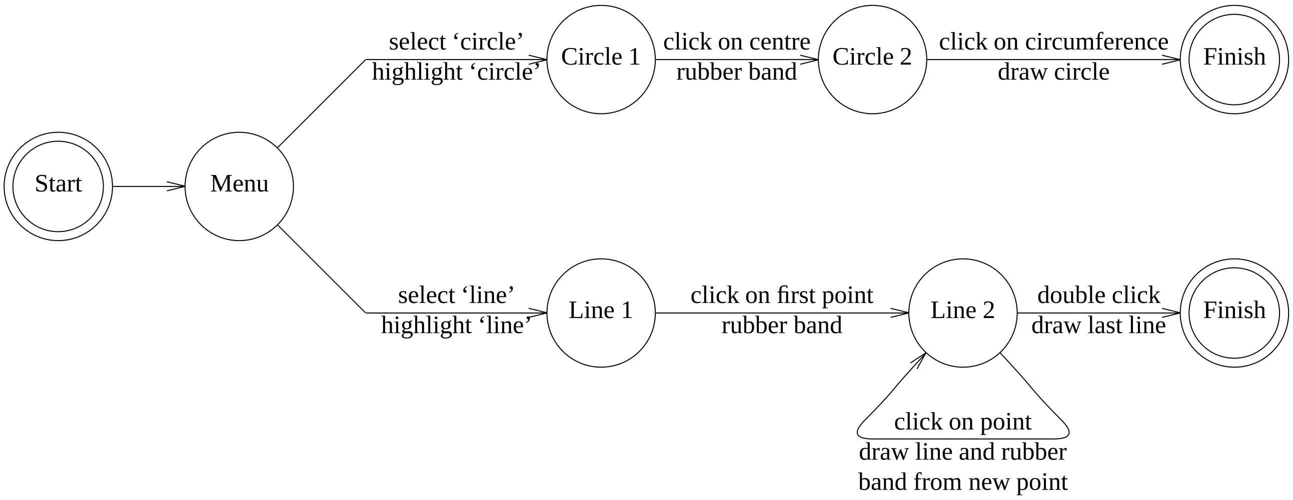
- Semantics and dialogue
- Properties of dialogue
- Presentation and lexical issues

Example

- Digital watch

State transition networks

circles – states
arcs – actions/events



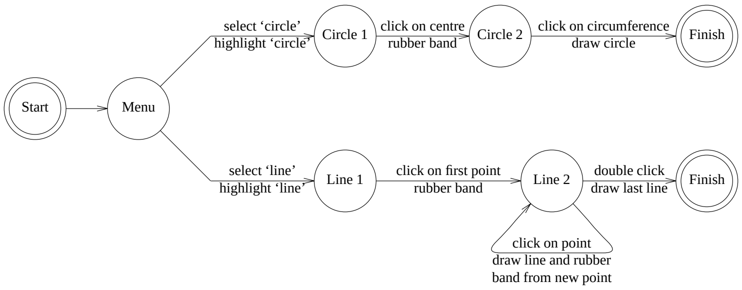
Arc labels a bit cramped because:

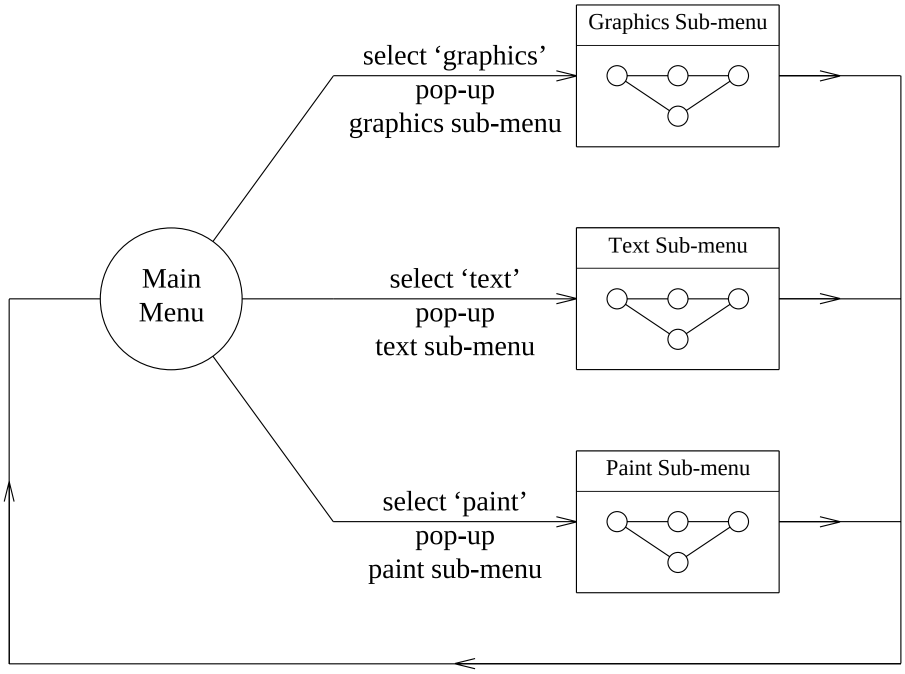
- notation is 'state heavy'
- the events require most detail

Hierarchical STNs

managing complex dialogues

named sub-dialogues

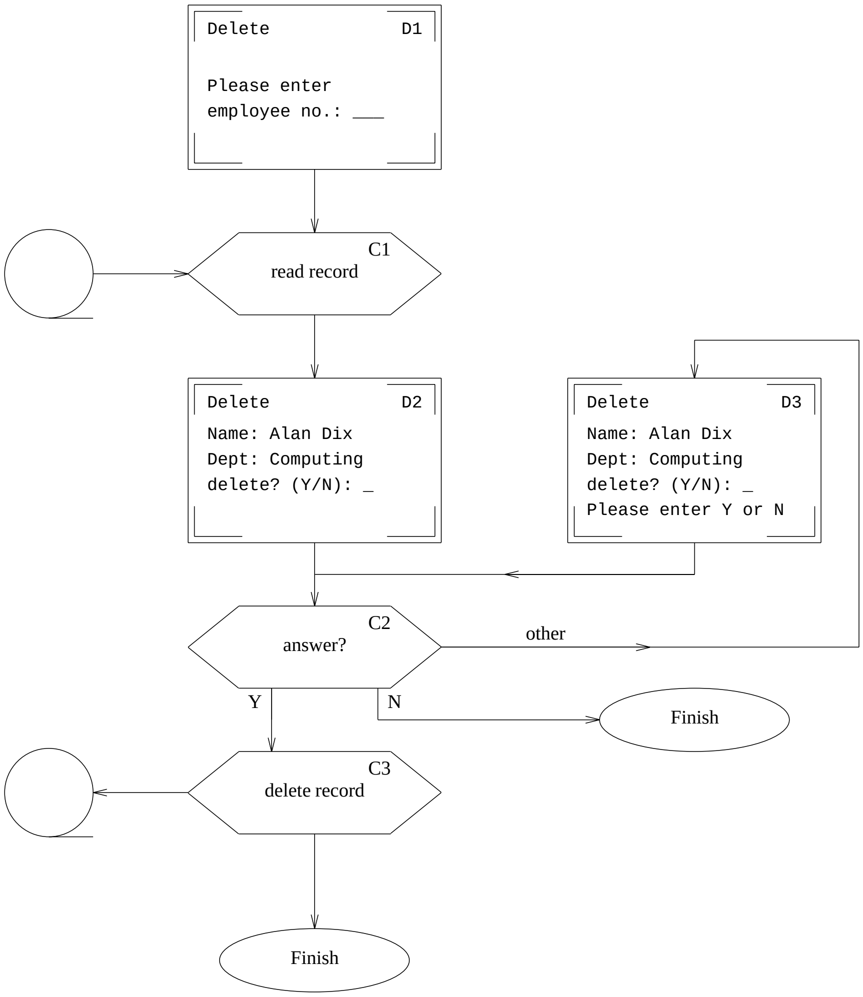




Flowcharts

familiar to programmers

boxes – process/event **not** state



Delete D1

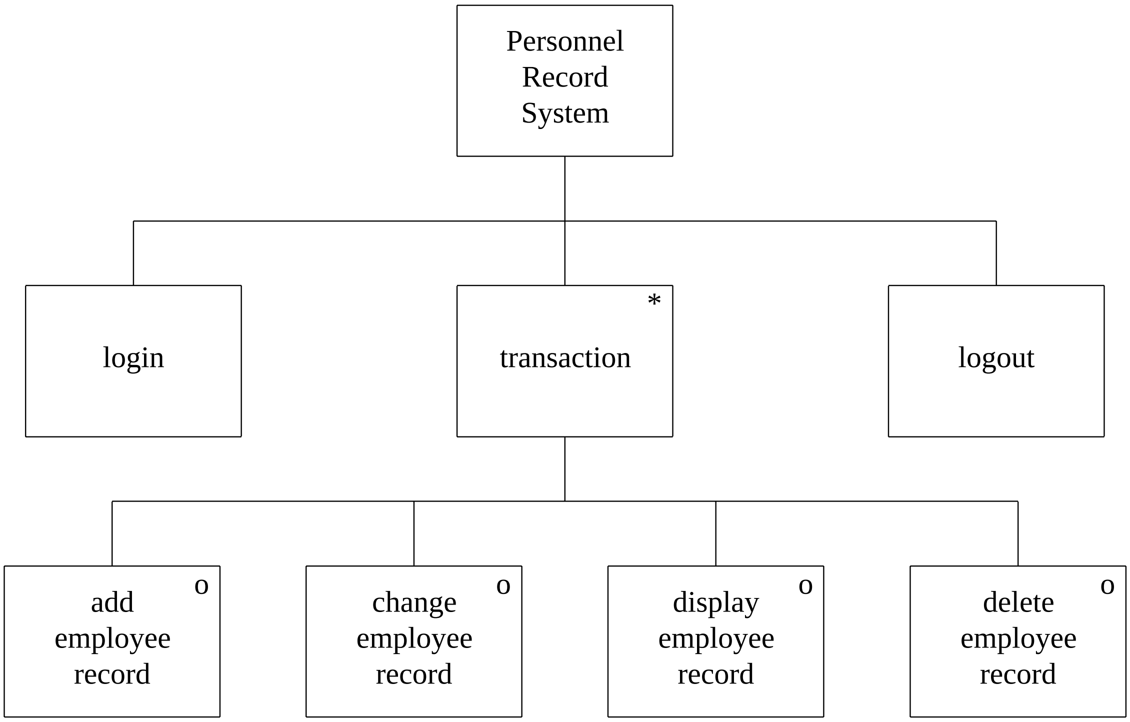
Please enter
employee no.: ___

Delete D2
Name: Alan Dix
Dept: Computing
delete? (Y/N): _

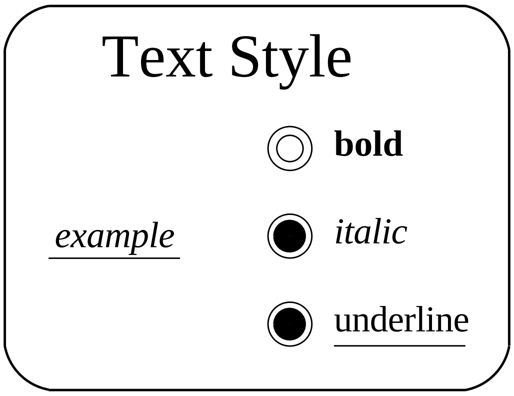
Delete D3
Name: Alan Dix
Dept: Computing
delete? (Y/N): _
Please enter Y or N

JSD diagrams

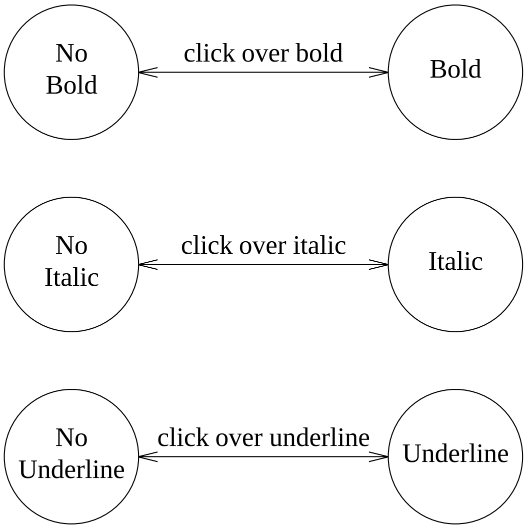
- for tree structured dialogues
  - less expressive
  - greater clarity



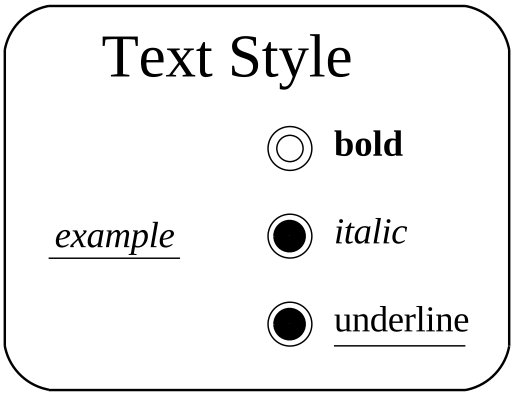
Concurrent dialogues (i)



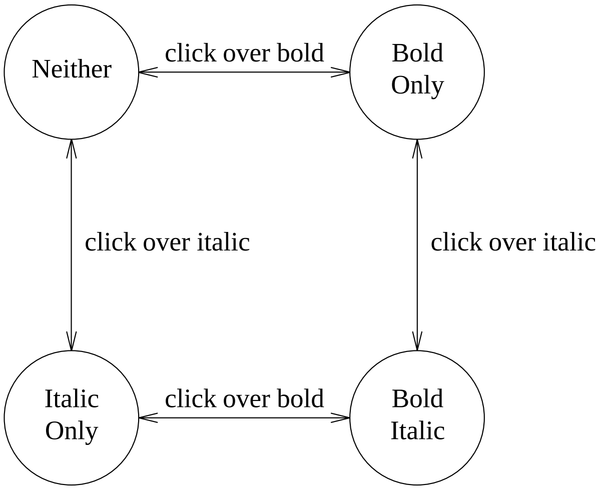
three toggles – individual STNs



Concurrent dialogues (ii)

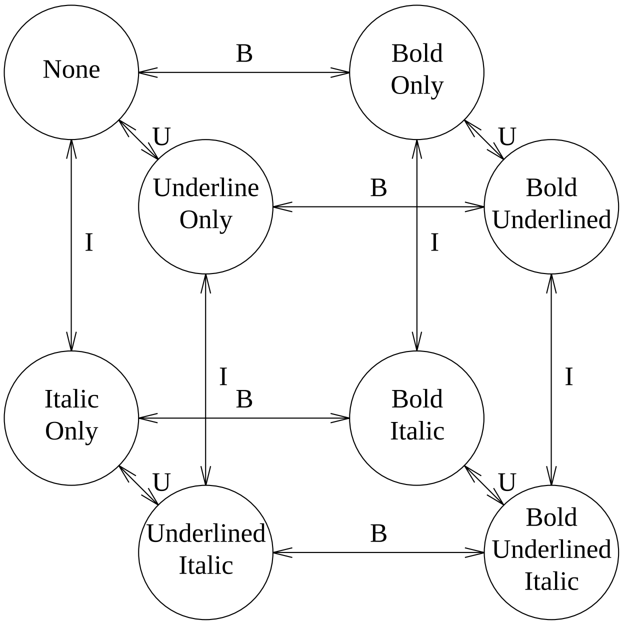


bold and italic combined



Concurrent dialogues (iii)

- combinatorial explosion
  - n toggles
  - 2^n states



Textual – Grammars

Regular expressions

```
   sel-line click click* dble-click
```

- compare with JSD
  - same computational model
  - different notation

BNF

```
expr  ::=   empty
          | atom expr
          | ‘(’ expr ‘)’ expr
```

- more powerful than regular exp. or STNs

Still NO concurrent dialogue

Production rules

if *condition* then *action*

Good for concurrency

Event based production rules

```
Sel-line        →  first
C-point first   →  rest
C-point rest    →  rest
D-point rest    →  <draw line>
```

Bad for sequence

Bad at state!

Propositional Production System

State based

Attributes:

Mouse: { mouse-off, select-line,
click-point, double-click }

Line-state: { menu, first, rest }

Rules (feedback not shown):

select-line	→	mouse-off first
click-point first	→	mouse-off rest
click-point rest	→	mouse-off
double-click rest	→	mouse-off menu

Bad at events!

CSP and process algebras

used in Alexander's SPI, and Agent notation

good for sequential dialogues

$$\begin{aligned}
\text{Bold-tog} \quad &= \quad \text{select-bold?} \rightarrow \text{bold-on} \\
&\qquad\quad \rightarrow \text{select-bold?} \rightarrow \text{bold-off} \\
&\qquad\qquad \rightarrow \text{Bold-tog} \\
\text{Italic-tog} \quad &= \quad \ldots \\
\text{Under-tog} \quad &= \quad \ldots
\end{aligned}$$

and concurrent dialogue

Dialogue-box = Bold-tog || Italic-tog ||
Under-tog

but causality unclear

Dialogue Notations — Summary

Diagrammatic

- STN
- JSD
- Flow charts

Textual

- grammars
- production rules
- CSP

Issues

event base vs. state based
power vs. clarity
model vs. notation
sequential vs. concurrent

Semantics – Alexander's SPI (i)

Two part specification:

EventCSP – pure dialogue order

EventISL – target dependent semantics

Centralised dialogue description

Tolerable syntactic/semantic trade-off

Semantics – Alexander's SPI (ii)

EventCSP

$$
\begin{array}{lcl}
\text{Login} & = & \text{login-mess} \rightarrow \text{get-name} \rightarrow \text{Passwd} \\
\text{Passwd} & = & \text{passwd-mess} \rightarrow (\ \text{invalid} \rightarrow \text{Login} \\
 & & \qquad\qquad\qquad [\,]\ \text{valid} \rightarrow \text{Session})
\end{array}
$$

EventISL

```
event: login-mess
        prompt: true
        out: "login:" event: get-name
uses: input
        set: user-id = input event: valid
uses: input, user-id, passwd-db
        when: passwd-id = passwd-db(user-id)
```

Semantics – code

Event loop for word processor

Distributed dialogue description

Terrible syntactic/semantic trade-off

```
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 */
```

Action properties

completeness

- missed arcs
- unforeseen circumstances

determinism

- several arcs for one action
- deliberate: application decision
- accident: production rules, nested escapes

consistency

- same action, same effect?
- modes and visibility

Checking properties (i)

Completeness:

double-click in circle states?

Reversibility:

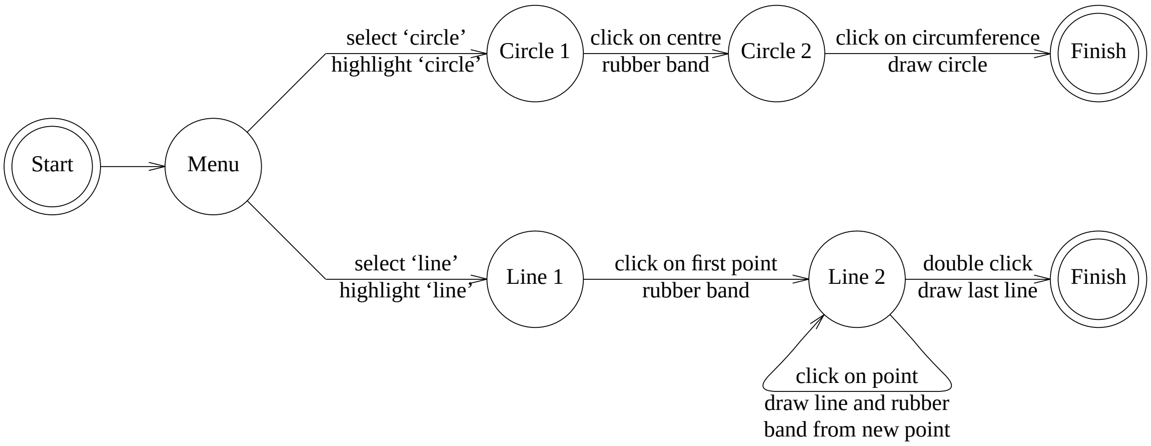
to reverse select ‘line’ from graphics Menu

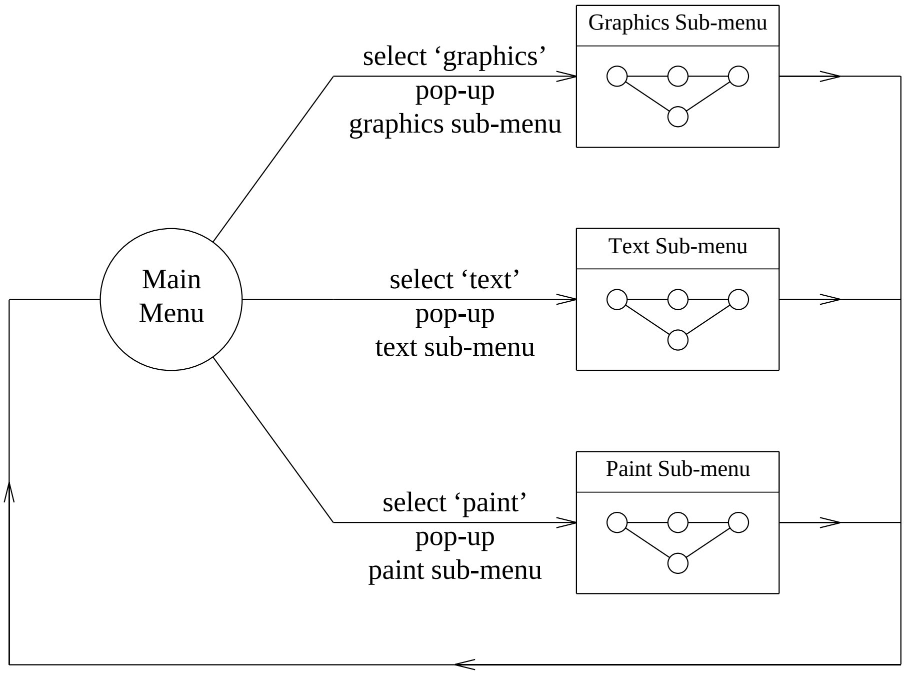
click – double click – select ‘graphics’

(3 actions)

N.B. not undo

Checking properties (ii)





State properties

reachability

- can you get anywhere from anywhere?
- and how easily

reversibility

- can you get to the previous state?
- but NOT undo

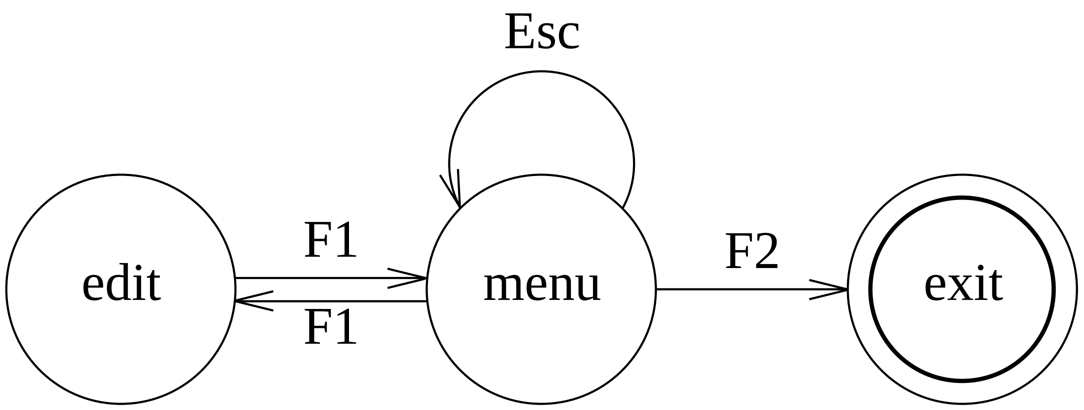
dangerous states

- some states you don't want to get to

Dangerous states (i)

Word processor: two modes and exit

F1	–	changes mode
F2	–	exit (and save)
Esc	–	no mode change



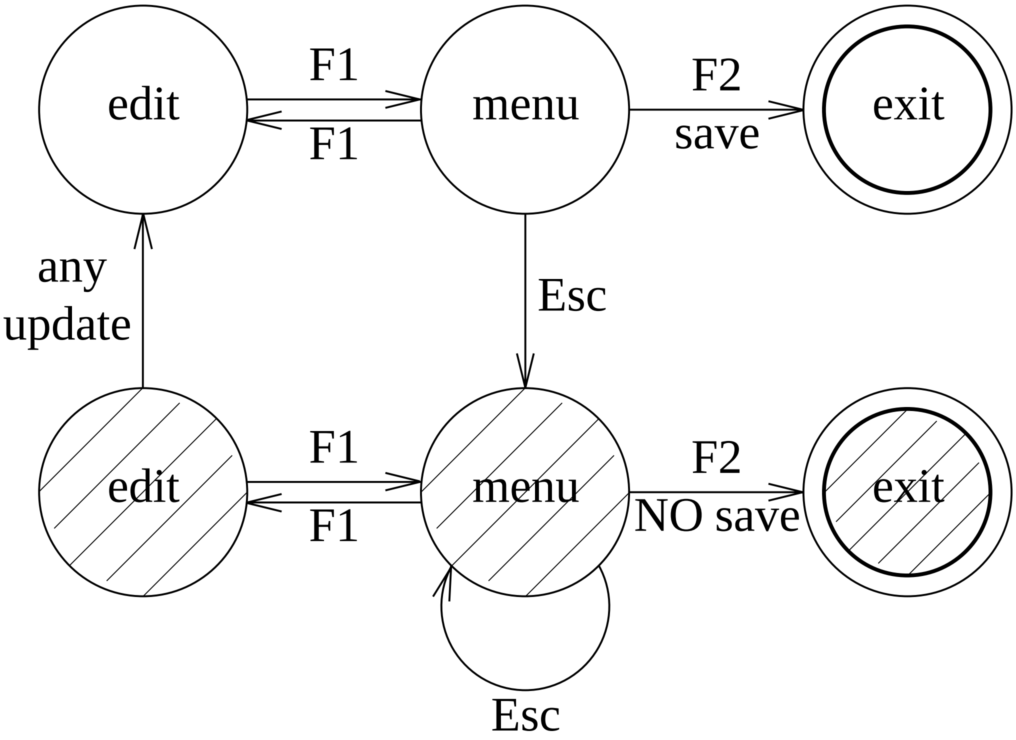
but. . .

Esc resets autosave

Dangerous states (ii)

exit with/without save → dangerous states

duplicate states – semantic distinction



F1-F2 – exit with save

F1-Esc-F2 – exit *no* save

Lexical issues

visibility

- differentiate modes and states
- annotations to dialogue

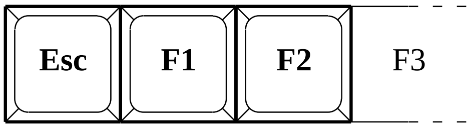
style

command	–	verb noun
mouse-based	–	noun verb

layout

dangerous states (previous slide)

old keyboard	–	OK
new keyboard	–	disaster



Dialogue Analysis — Summary

Semantics and dialogue

- attaching semantics
- distributed/centralised dialogue description
- maximising syntactic description

Properties of dialogue

- action properties: completeness, determinism, consistency
- state properties: reachability, reversibility, dangerous states

Presentation and lexical issues

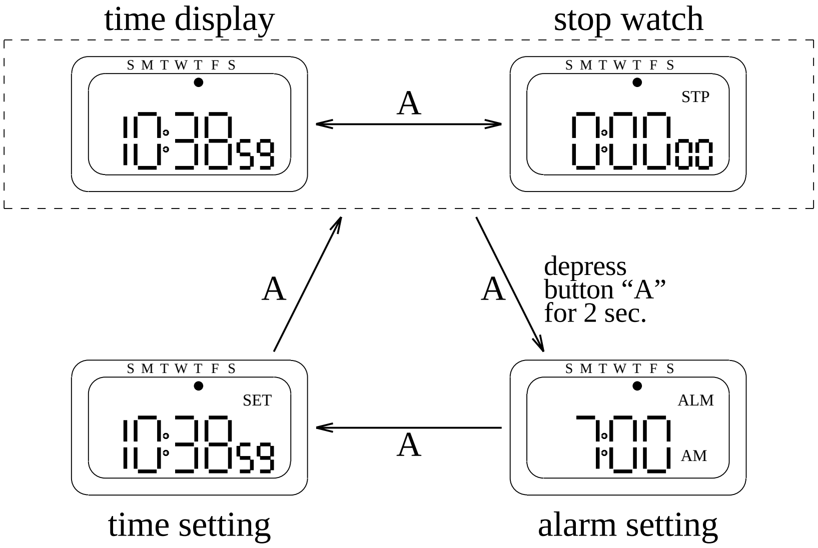
- visibility
- style
- layout

N.B. not independent of dialogue

Digital watch – User's instructions

limited interface – 3 buttons

button A moves between main modes



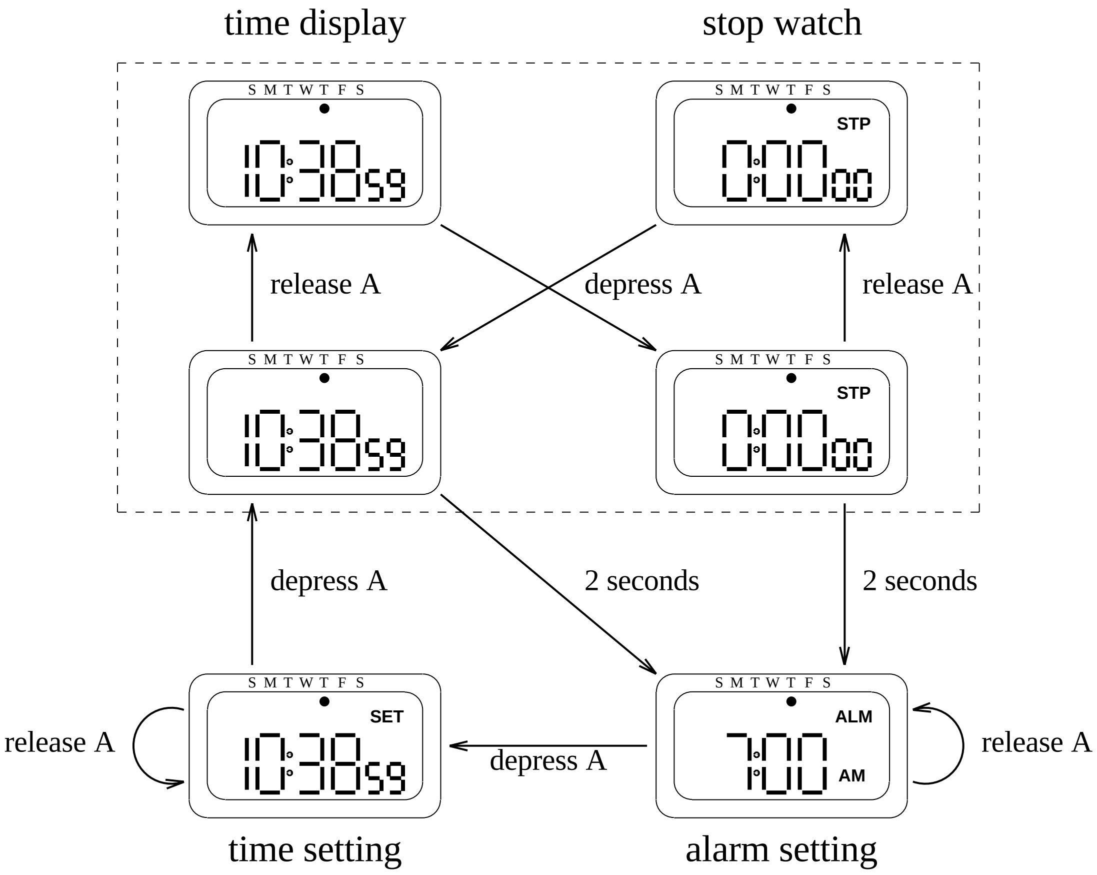
dangerous states

- guarded by two second hold

completeness

- distinguish depress A from release A
- what do they do in all modes?

Digital watch – Designer's instructions



and that's only one button!