



HUMAN-COMPUTER
INTERACTION

THIRD
EDITION

DIX
FINLAY
ABOWD
BEALE

chapter 8

implementation support

extract for MSc/MRes AISD

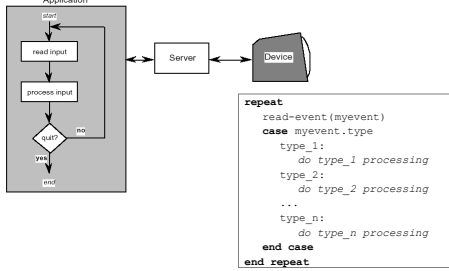


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Programming the application - 1
read-evaluation loop



```

repeat
  read-event(myevent)
  case myevent.type
    type_1:
      do type_1 processing
    type_2:
      do type_2 processing
    ...
    type_n:
      do type_n processing
  end case
end repeat

```



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Programming the application - 1
notification-based

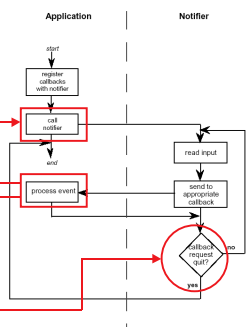
```

void main(String[] args) {
  Menu menu = new Menu();
  menu.setOption("Save");
  menu.setOption("Quit");
  menu.setAction("Save",mySave);
  menu.setAction("Quit",myQuit);
  ...
}

int mySave(Event e) {
  // save the current file
}

int myQuit(Event e) {
  // close down
}

```





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going with the grain

- system style affects the interfaces
 - modal dialogue box
 - easy with event-loop (just have extra read-event loop)
 - hard with notification (need lots of mode flags)
 - non-modal dialogue box
 - hard with event-loop (very complicated main loop)
 - easy with notification (just add extra handler)

beware!
if you don't explicitly design it will just happen
implementation should not drive design



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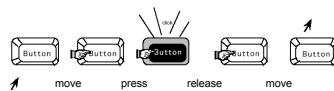
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Using toolkits

Interaction objects

- input and output intrinsically linked



Toolkits provide this level of abstraction

- programming with interaction objects (or techniques, widgets, gadgets)
- promote consistency and generalizability
- through similar look and feel
- amenable to object-oriented programming



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interfaces in Java

- Java toolkit – AWT (abstract windowing toolkit)
- Java classes for buttons, menus, etc.
- Notification based;
 - AWT 1.0 – need to subclass basic widgets
 - AWT 1.1 and beyond -- callback objects
- Swing toolkit
 - built on top of AWT – higher level features
 - uses MVC architecture (see later)

User Interface Management Systems (UIMS)

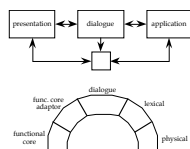
- UIMS add another level above toolkits
 - toolkits too difficult for non-programmers
- concerns of UIMS
 - conceptual architecture
 - implementation techniques
 - support infrastructure
- non-UIMS terms:
 - UI development system (UIDS)
 - UI development environment (UIDE)
 - e.g. Visual Basic

UIMS as conceptual architecture

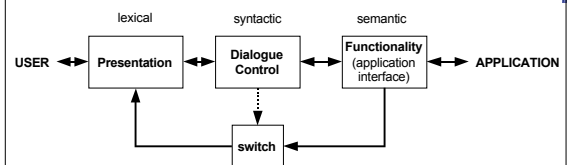
- *separation* between application semantics and presentation
- improves:
 - portability – runs on different systems
 - reusability – components reused cutting costs
 - multiple interfaces – accessing same functionality
 - customizability – by designer and user

UIMS tradition - interface layers / logical components

- linguistic: lexical/syntactic/semantic
- Seeheim:
- Arch/Slinky



Seeheim model



conceptual vs. implementation

Seeheim

- arose out of implementation experience
- but principal contribution is conceptual
- concepts part of 'normal' UI language

... because of Seeheim ...

... we think differently!

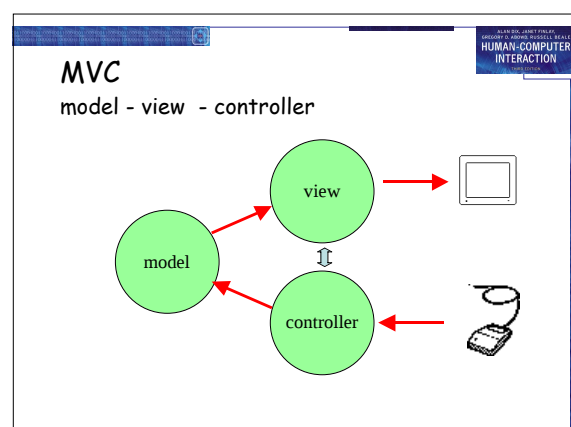
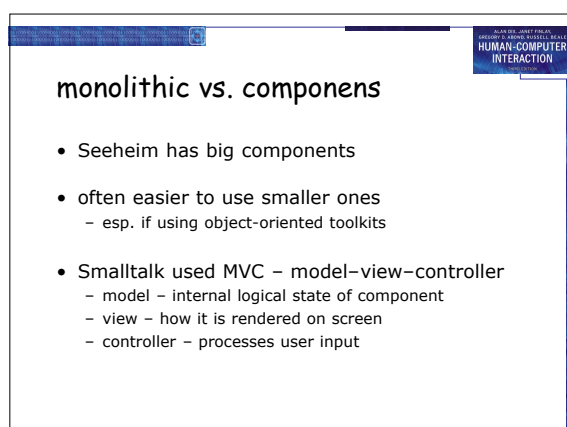
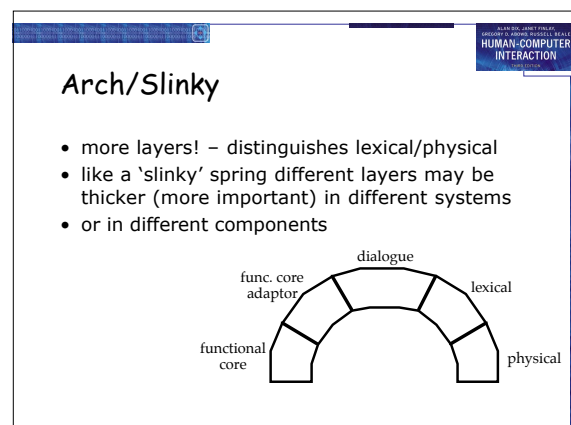
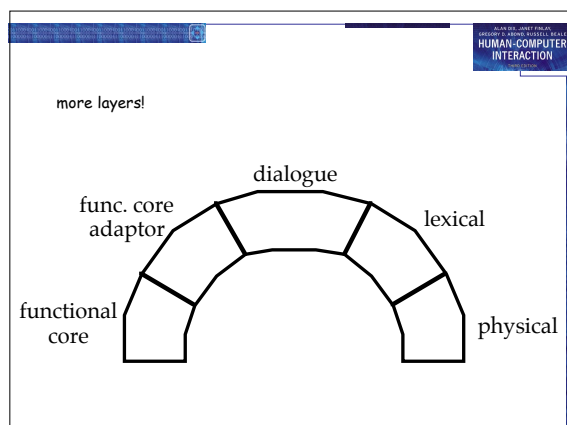
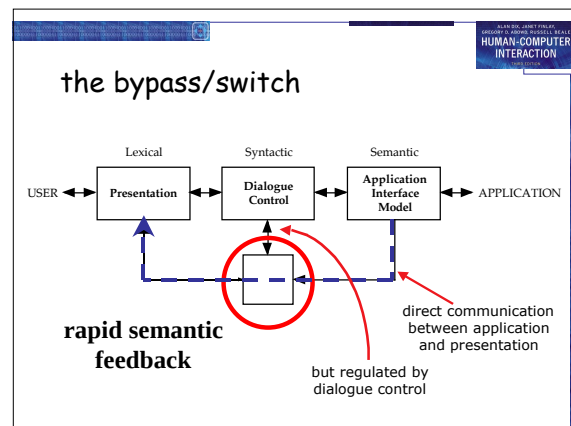
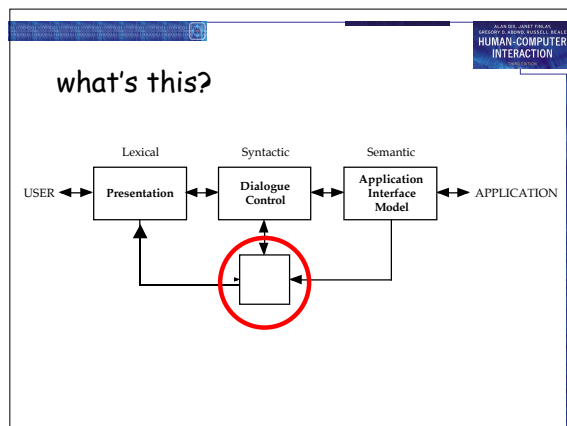
e.g. the lower box, the switch

- needed for implementation
- but not conceptual



semantic feedback

- different kinds of feedback:
 - lexical – movement of mouse
 - syntactic – menu highlights
 - semantic – sum of numbers changes
- semantic feedback often slower
 - use rapid lexical/syntactic feedback
- but may need rapid semantic feedback
 - freehand drawing
 - highlight trash can or folder when file dragged



MVC issues

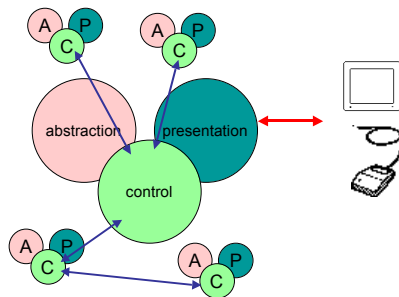
- MVC is largely pipeline model:
input → control → model → view → output
- but in graphical interface
 - input only has meaning in relation to output
e.g. mouse click
 - need to know *what* was clicked
 - controller has to decide what to do with click
 - but view knows what is shown where!
- in practice controller 'talks' to view
 - separation not complete

PAC model

- PAC model closer to Seeheim
 - abstraction – logical state of component
 - presentation – manages input and output
 - control – mediates between them
- manages hierarchy and multiple views
 - control part of PAC objects communicate
- PAC cleaner in many ways ...
but MVC used more in practice
(e.g. Java Swing)

PAC

presentation - abstraction - control



Implementation of UIMS

- Techniques for dialogue controller
 - menu networks
 - grammar notations
 - declarative languages
 - graphical specification
 - state transition diagrams
 - event languages
 - constraints
- for most of these see chapter 16
- N.B. constraints
 - instead of what *happens* say what should be *true*
 - used in groupware as well as single user interfaces
(ALV - abstraction-link-view)

see chapter 16 for more details on several of these

graphical specification

- what it is
 - draw components on screen
 - set actions with script or links to program
- in use
 - with raw programming most popular technique
 - e.g. Visual Basic, Dreamweaver, Flash
- local vs. global
 - hard to 'see' the paths through system
 - focus on what can be seen on one screen

The drift of dialogue control

- internal control
(e.g., read-evaluation loop)
- external control
(independent of application semantics or presentation)
- presentation control
(e.g., graphical specification)