MVC AND MULTIPLE VIEWS

CMPT 381

Overview

Review of MVC

Listener-based view updates

Example 1: direct connection

Multiple view systems

Example 2: listener, one view

Example 3: listener, two views

Example 4: listener, three views

Storing the selection in the model

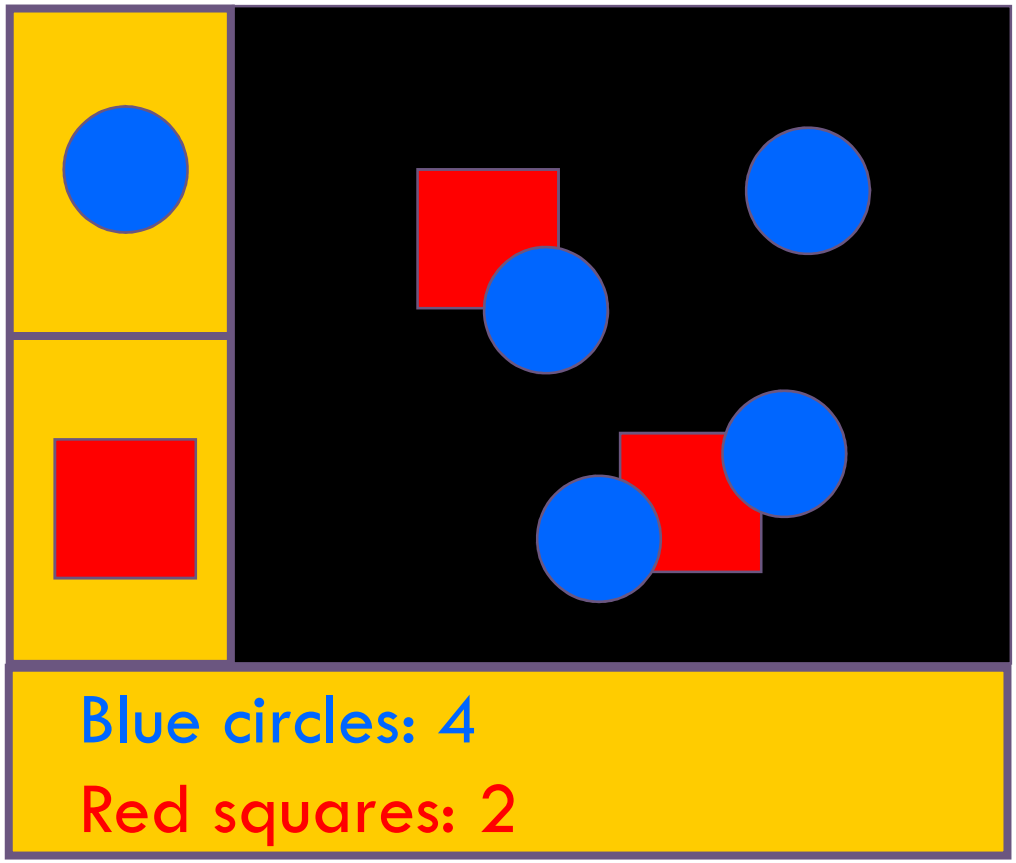
Easy

```
listbox .list
.list insert 0 {saskatoon 36} {regina 18} \
       {yorkton 7}  {aberdeen 40}
```

But now…

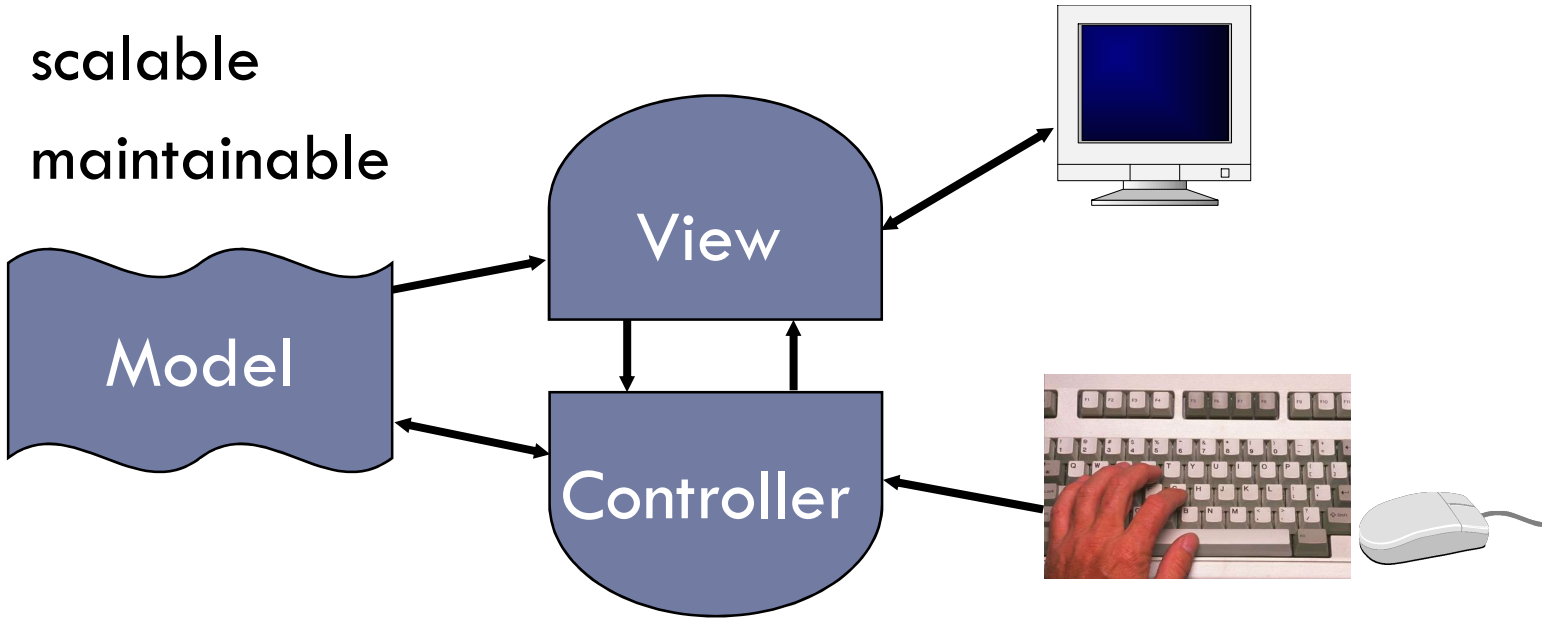
- Show the names in sorted order
- Show the names sorted by temperature
- Show a map view in addition to the list
- Show only the map view

How to store this data in the UI?



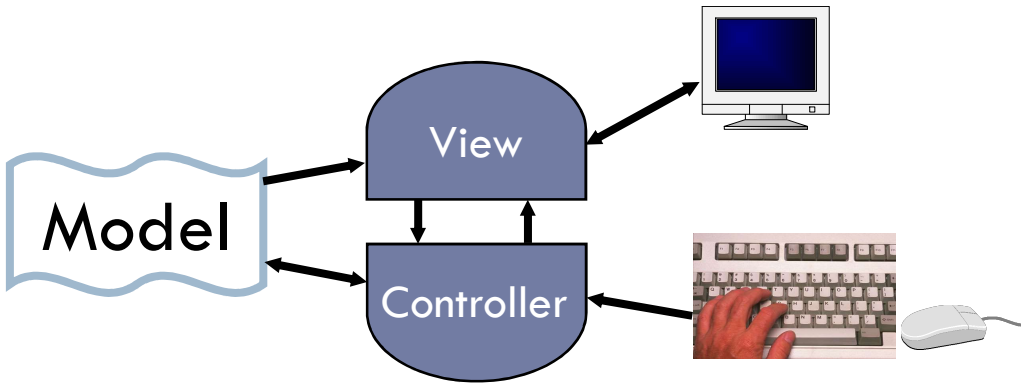
Model-View-Controller

- An architecture for interactive applications
  - introduced by Smalltalk developers at PARC
- Partitions application so that it is:
  - scalable
  - maintainable



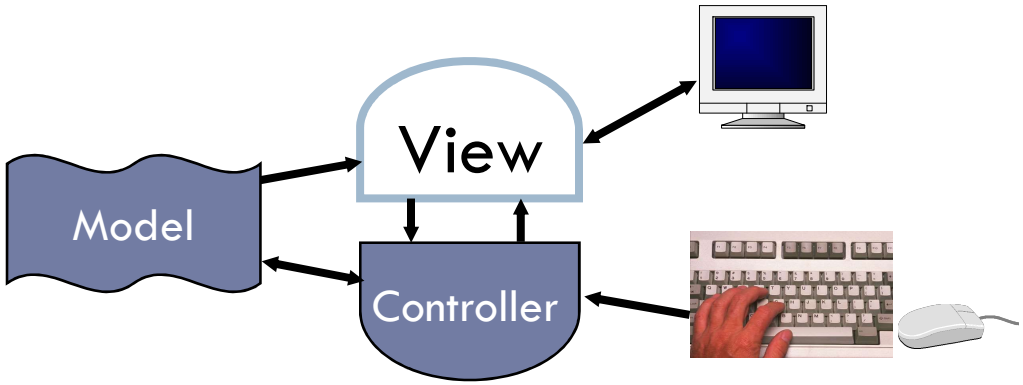
The model

- The information that the application manipulates
- "The data"
  - E.g. the circuit in a design program
    - Logic gates and wires connecting them
  - E.g. a drawing in a drawing program
    - Shapes, locations, colour

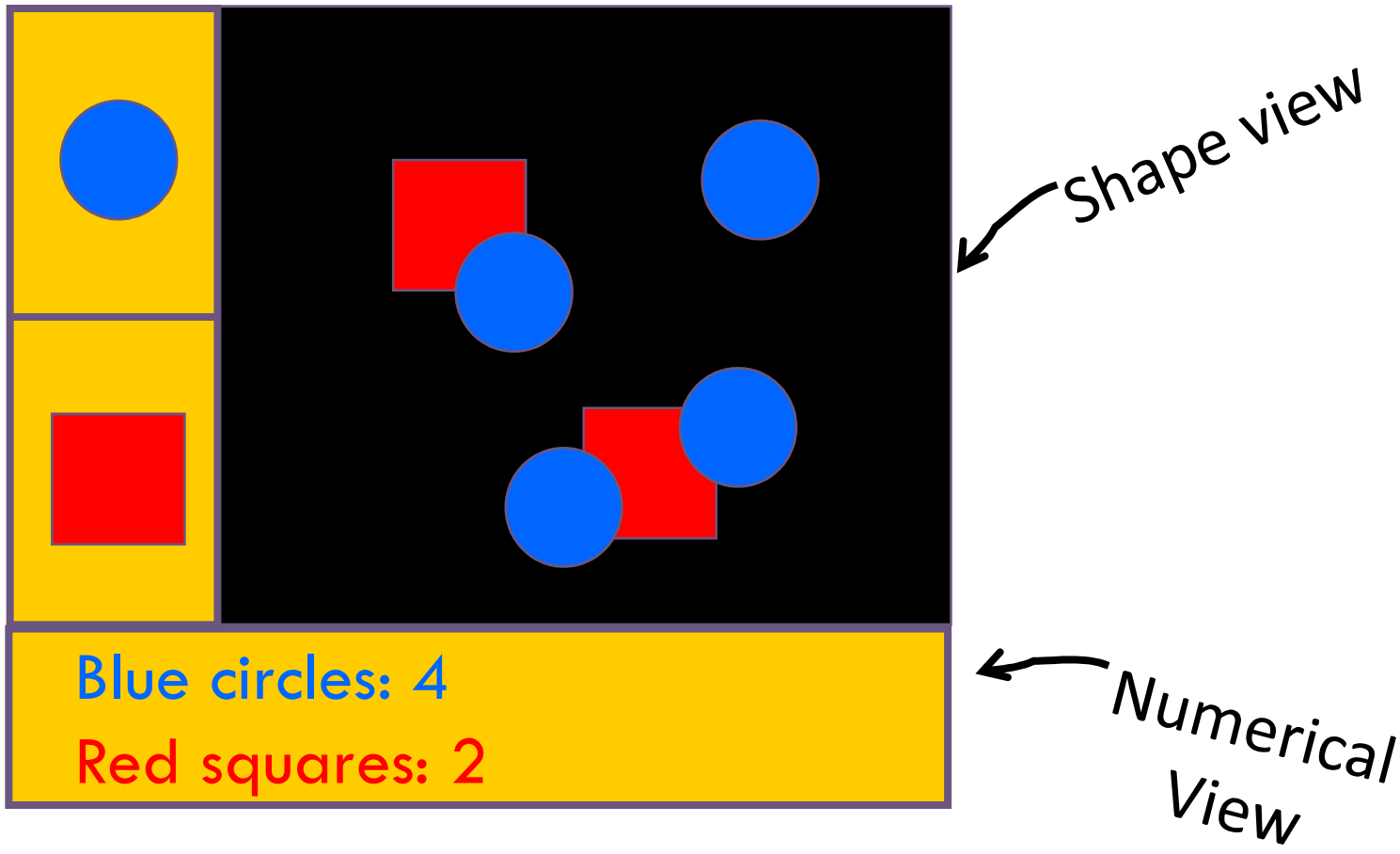


The view

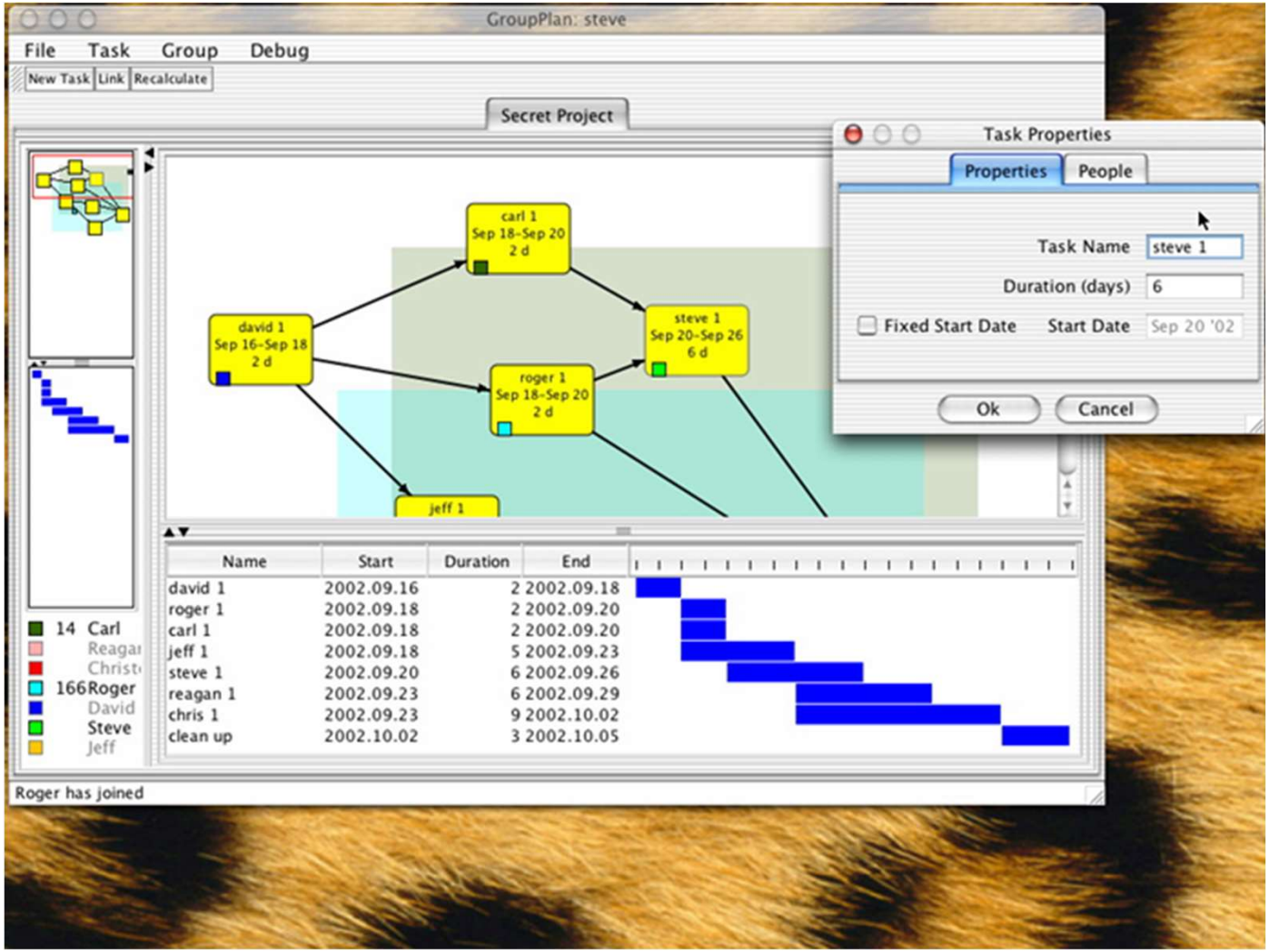
- A visual display of the model
- There may be multiple views
- View is redrawn when the model changes



Multiple views

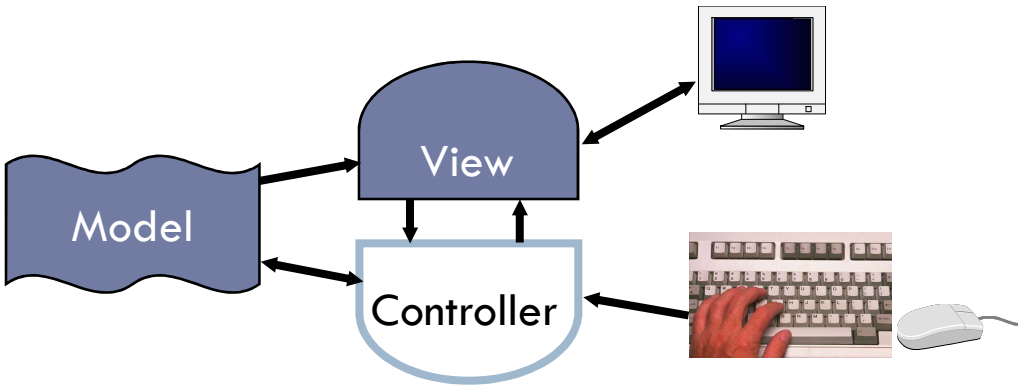


Multiple views



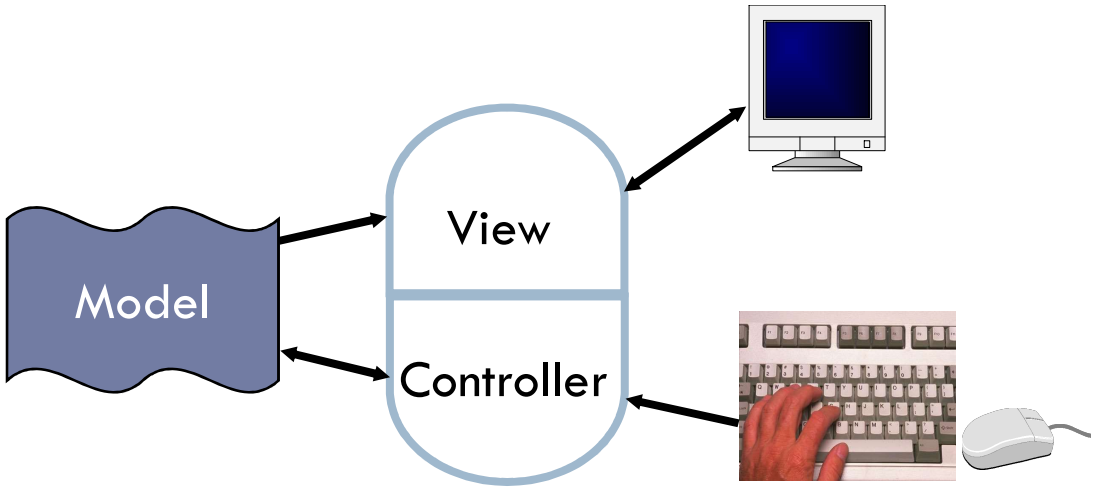
The controller

- Deals with application-level input events
- Communicates with view
  - e.g. which object was selected with mouse click
- Calls model methods to make changes



Combined view and controller

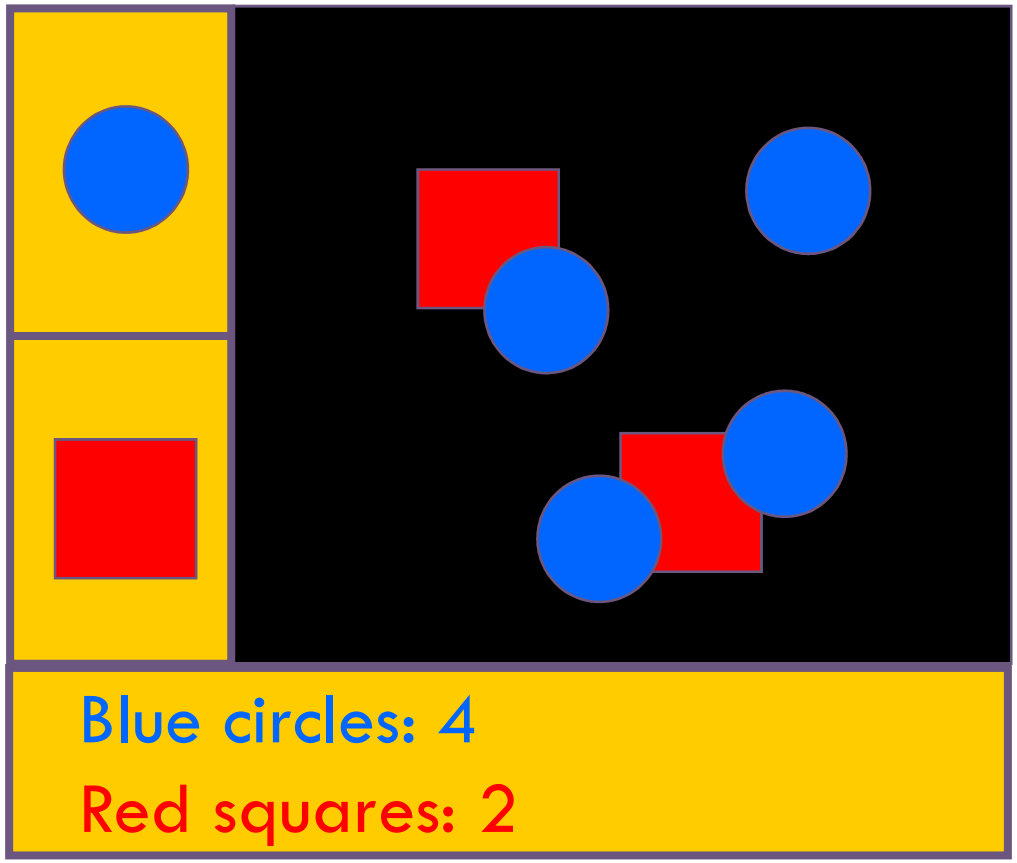
- View and controller are tightly coupled
- Almost always occur in pairs
  - each view needs a separate controller
- Some architectures combine them into one class

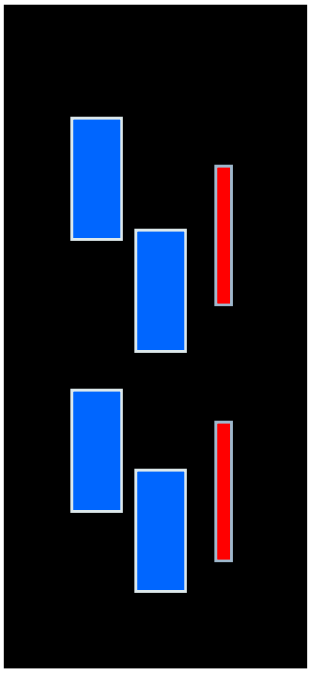


Why MVC?

- Alternate (bad) approaches
  - Storing your data in your UI
  - Combining all of MVC into one class
  - Using global variables
- Separation simplifies scalability
  - A model may need/want more than one view
- Separation simplifies maintenance
  - Adding new views or changing views
  - Adding to or changing the model

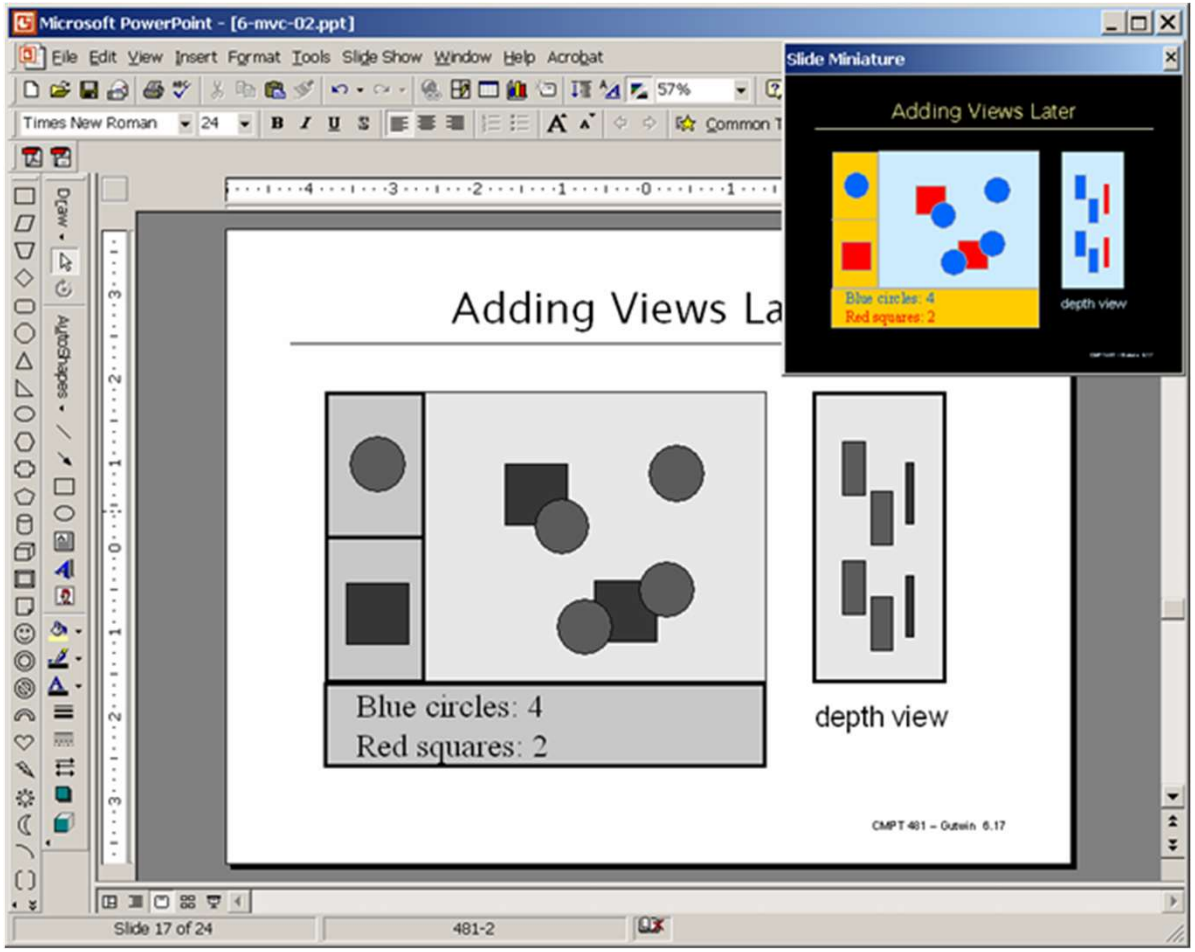
Adding views later



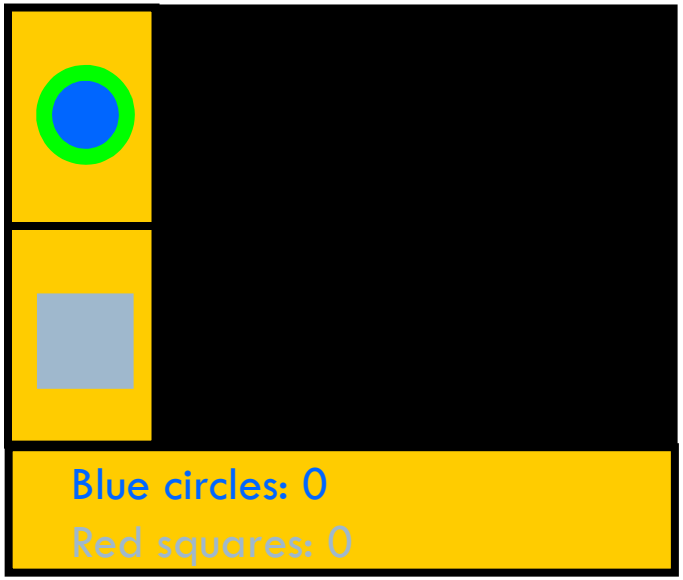


depth view

Adding views later



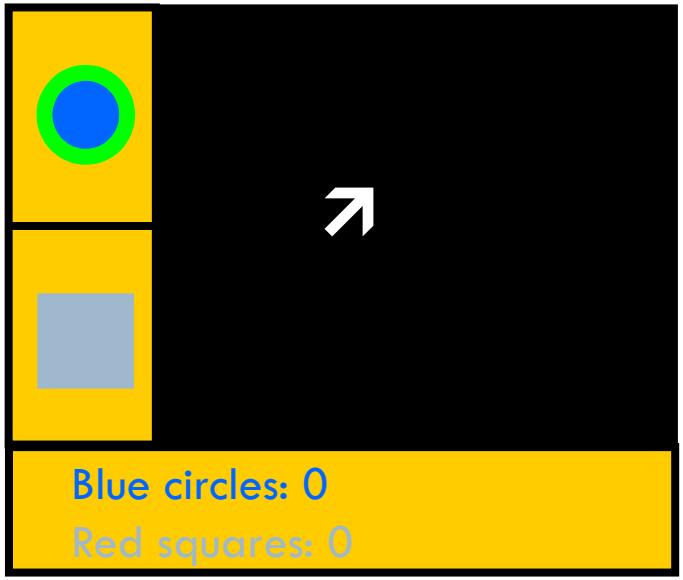
MVC event flow



- Creating a new shape
- Assume “circle tool” selected

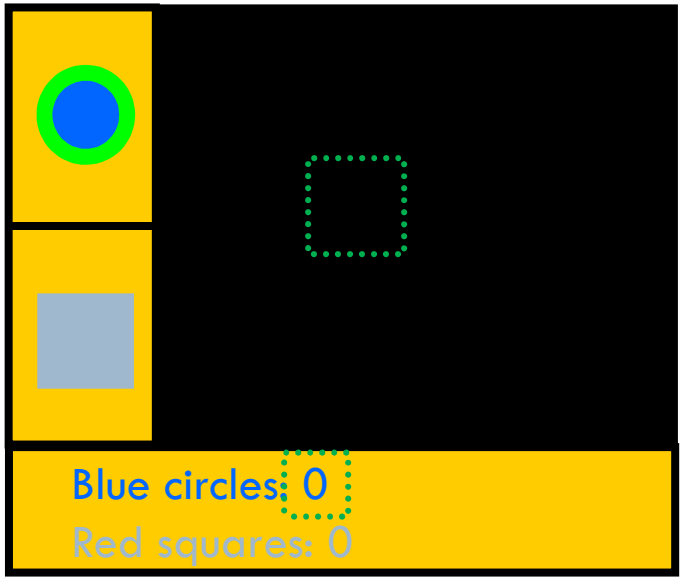
- User:
- Controller:
- View:
- Model:
- Toolkit:

MVC event flow



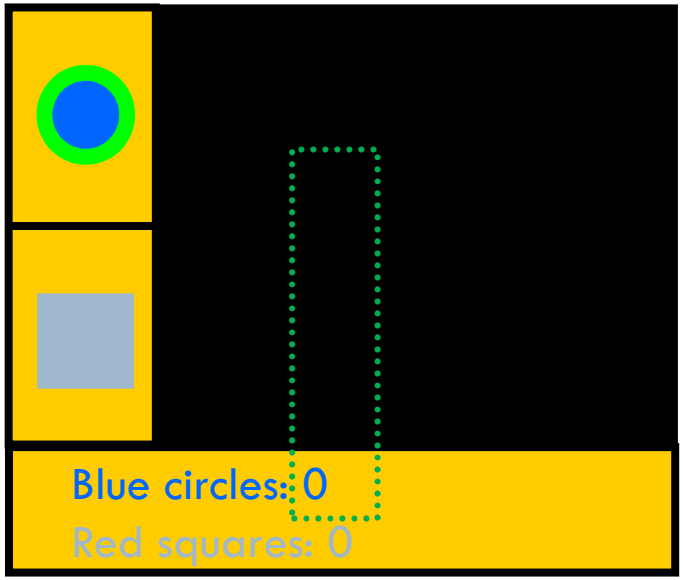
- User:
  - click mouse at location
- Toolkit:
  - forward event to handler
- Controller:
  - receive mouse click event
  - check mode → "circle"
  - call model.addCircle(x,y)

MVC event flow



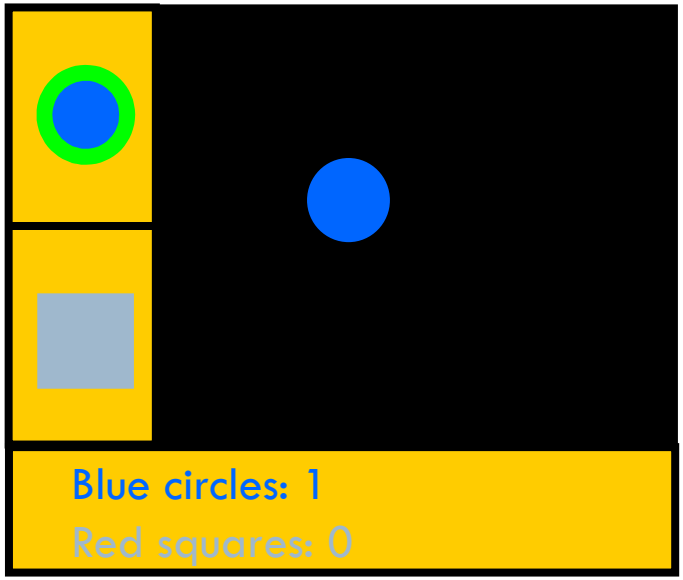
- Model:
  - model.addCircle adds the shape to a data structure
  - model notifies its list of views that a change has occurred
    - drawing area view
    - text summary view
- View:
  - call toolkit.repaint( ) or toolkit.repaint (rectangle)

MVC event flow



- View:
  - returns to model
- Model:
  - returns to controller
- Controller:
  - returns to toolkit
- Toolkit:
  - notices repaint request
  - is the area visible?
  - schedules call to view's paint method

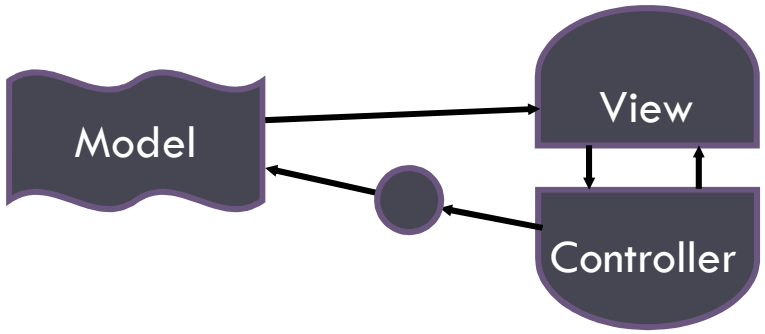
MVC event flow



- View:
  - request needed information from model
  - redraw view
- Toolkit:
  - bitblt rectangle onto screen

Controller-Model communication

- Direct connection
  - UI controller has visibility to model
- Do we want real model-view separation?
  - Changing the model
- Controller pattern
  - A gatekeeper for talking to the model
  - UI controller can only see the gatekeeper



Model-View communication

- Direct connection
  - Model or controller calls view methods directly
- Publish-subscribe
  - Views register for notifications from model objects
- Event approach
  - Use the actual event system to do the communication