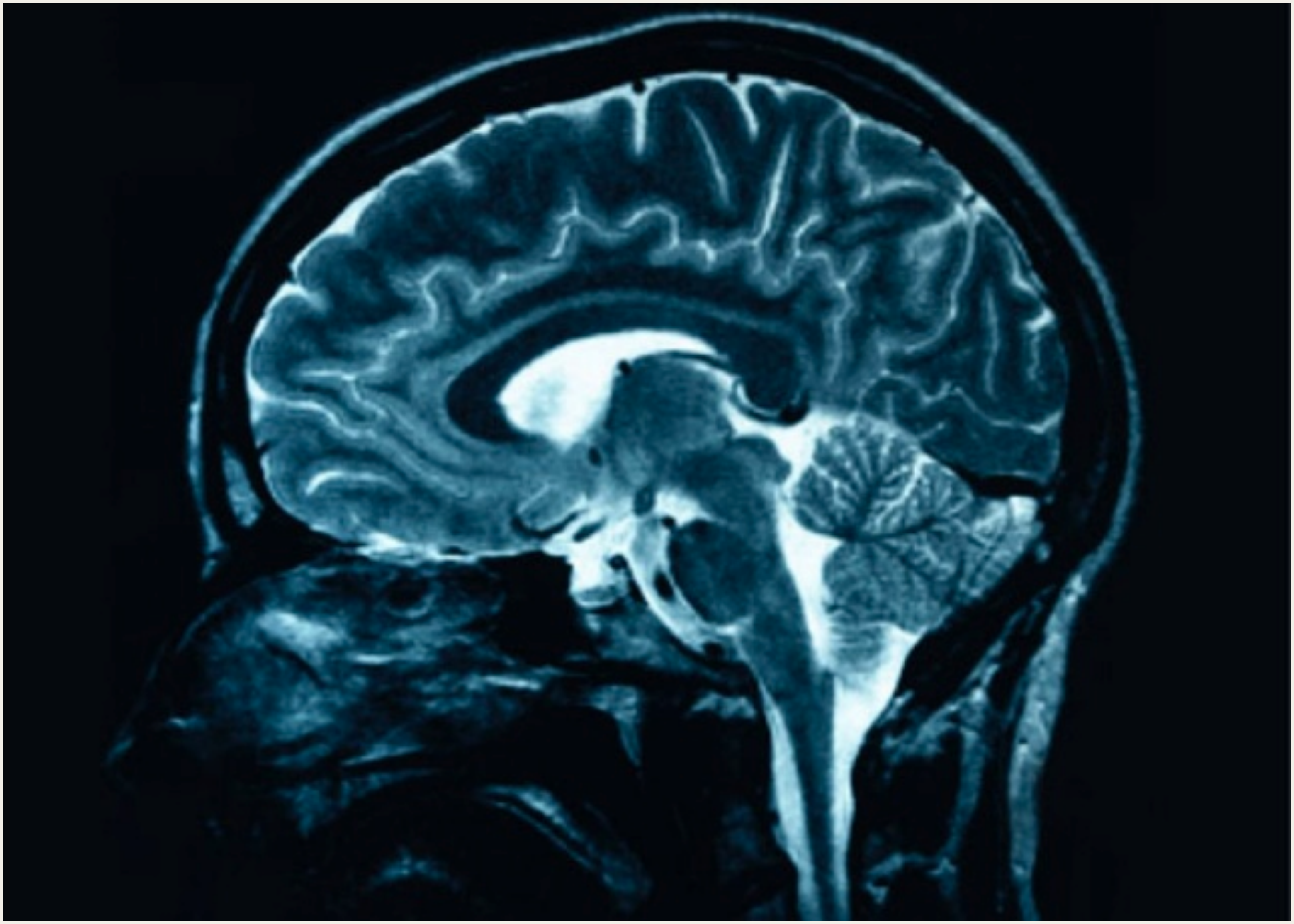
CHANGE

Intro to Iteration #3

CSCI-3081: Program Design and Development

No longer :(

Now

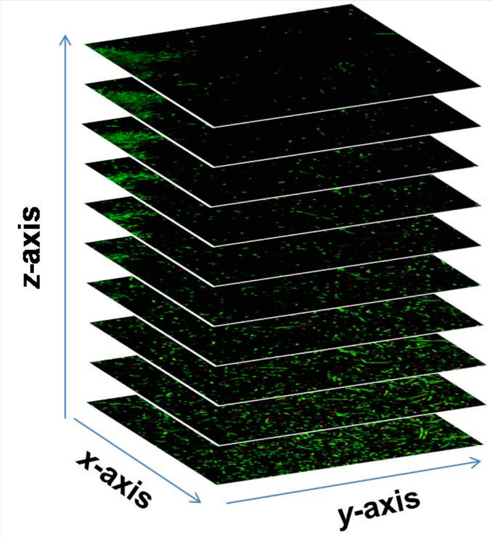


What? I can’t believe it… are these management guys complete idiots?

Why Medical Imaging (Maybe not complete idiots)

- Filters are important (e.g., quantize to segment into tissue types).
- “Painting” is important (e.g., annotate images).
- So, in theory… are code should be easy to apply to medical imaging.

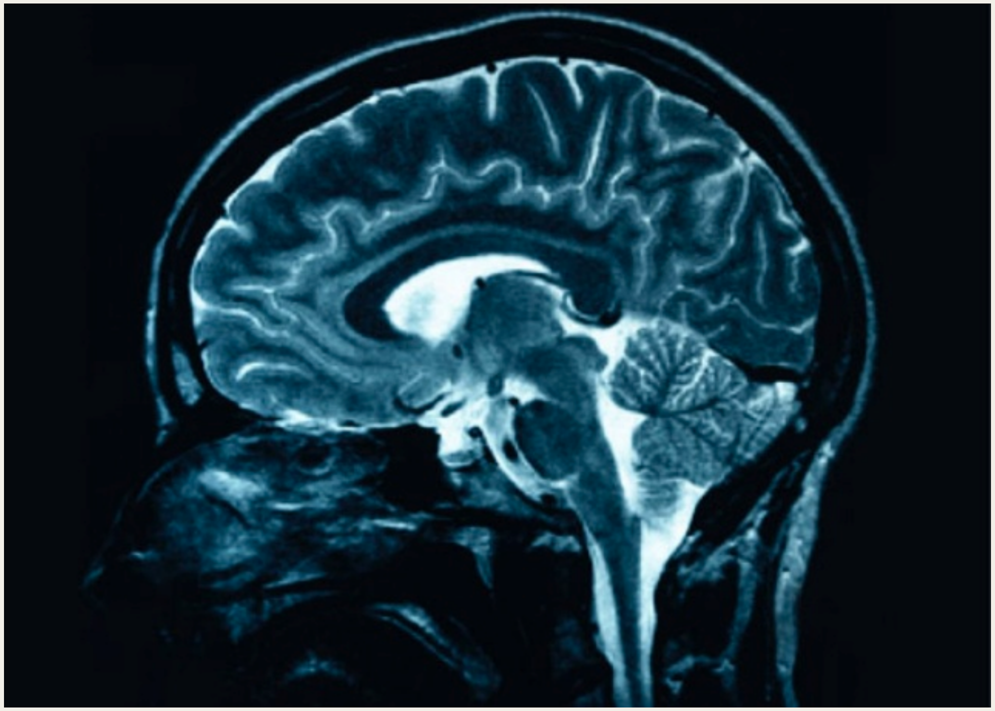
But, Medical Imaging is also different.



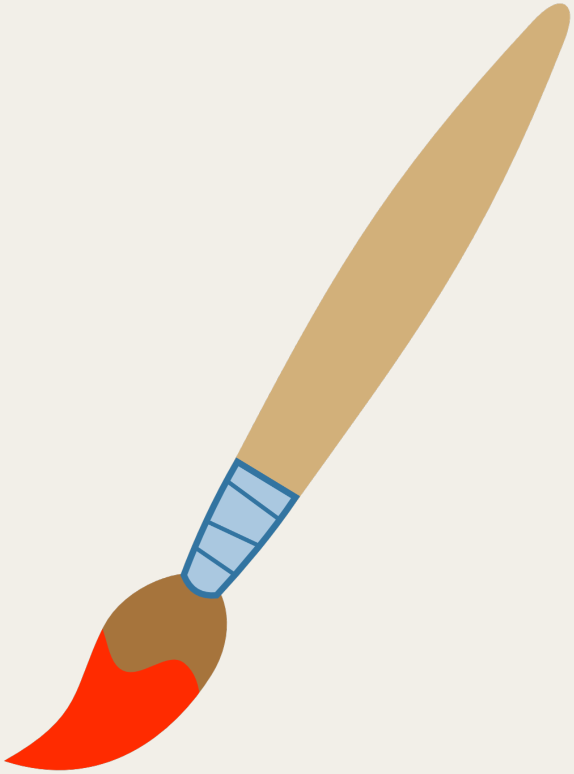
- Doctor’s don’t need / won’t put up with all of the customization provided in our artist-oriented software.
- For 3D imaging, we need to work with volume data, usually stored in stacks of images.
- Doctors/clinics need reproducible results and shortcuts (e.g., scripts) for common tasks.

Good News and Bad News…

1.



2.



This iteration is about 2 things:

1. Refactoring in response to change.

DID I REMEMBER TO TELL YOU BEFORE YOU FINISHED THE CODING THAT THE USER'S SPECIFICATIONS CHANGED?
AAAIII–YIIII–YIIII–YIIII–YIIIIII!!!!!!
SO, NO–ISH?
BAM! BAM! BAM!

Dilbert.com DilbertCartoonist@gmail.com

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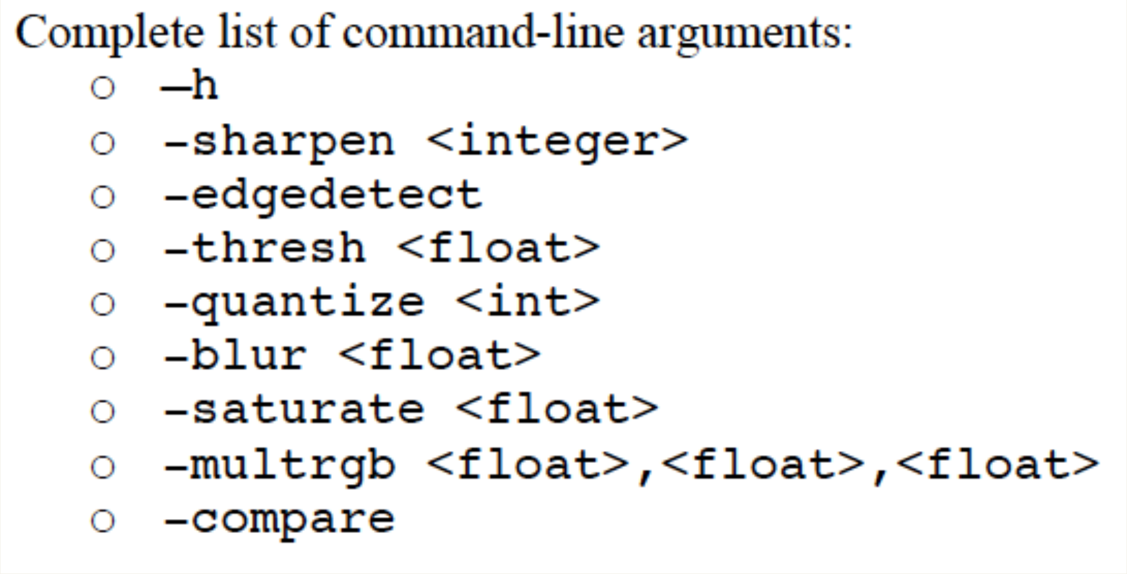
2. Polishing and releasing a project.

Let’s look at some specific requirements.

- Refactor:
  - a library + 2 applications (FlashPhoto and Mia), all in separate directories
  - no duplicate code
  - “make all” in the root directory builds the whole project
- Create the Mia application
  - A red arrow stamp and a red pen tool for annotating medical images
  - A subset of filters useful for medical imaging
  - File open and save now handle 3D “image stacks”
  - A command line mode that supports scripting.

Let's look at some specific requirements.

- Mia command line options



Complete list of command-line arguments:

- –h
- -sharpen <integer>
- -edgedetect
- -thresh <float>
- -quantize <int>
- -blur <float>
- -saturate <float>
- -multrgb <float>,<float>,<float>
- -compare

Let’s look at some specific requirements.

- Testing:
    - The command line options are also really useful for testing!
    - Can you figure out how?
    - What other forms of testing are needed?

Let’s look at some specific requirements.

- Writing: You tell me… what kind of writing is needed to “release” this project?

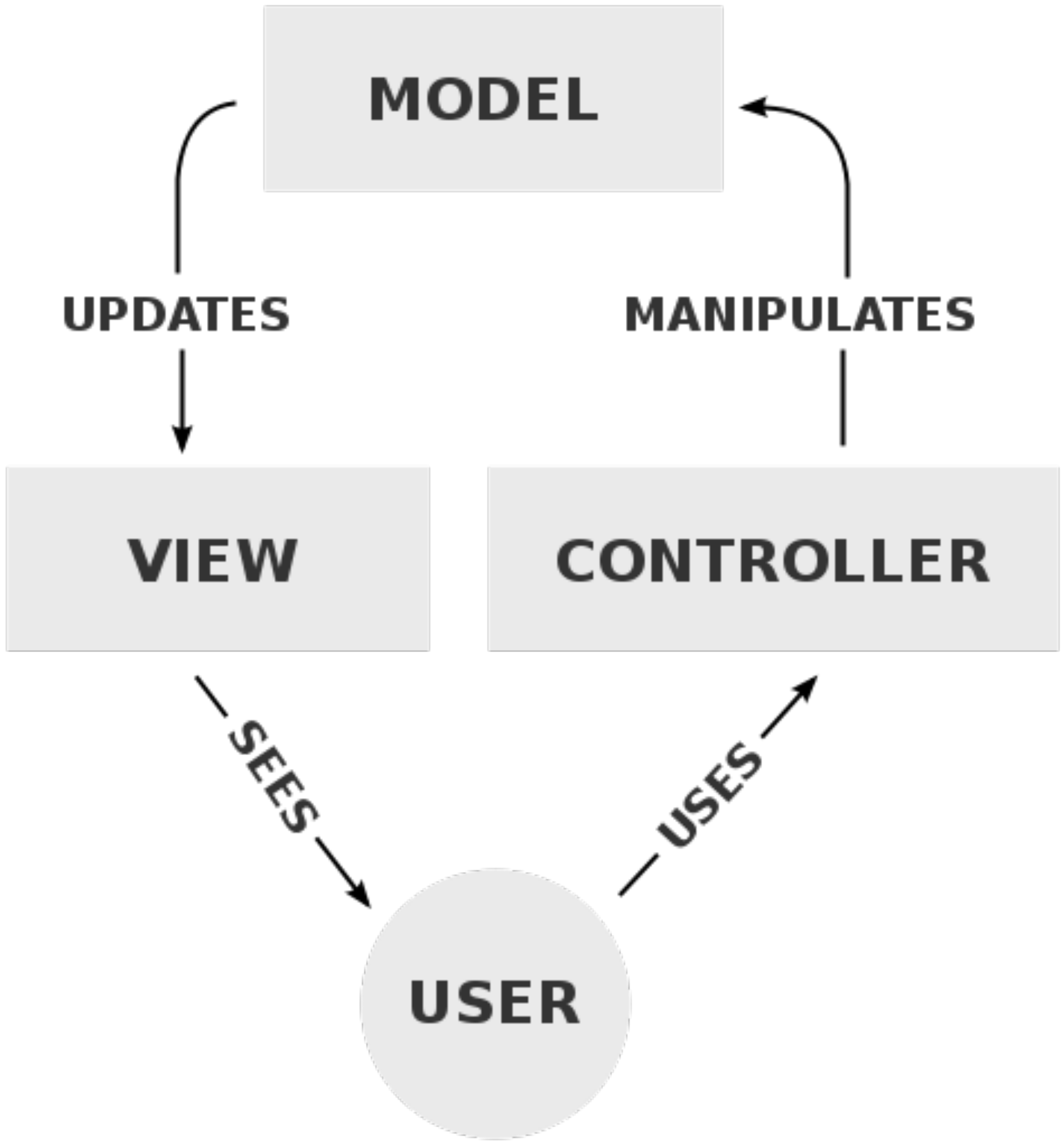
For the rest of class today, we'll discuss:

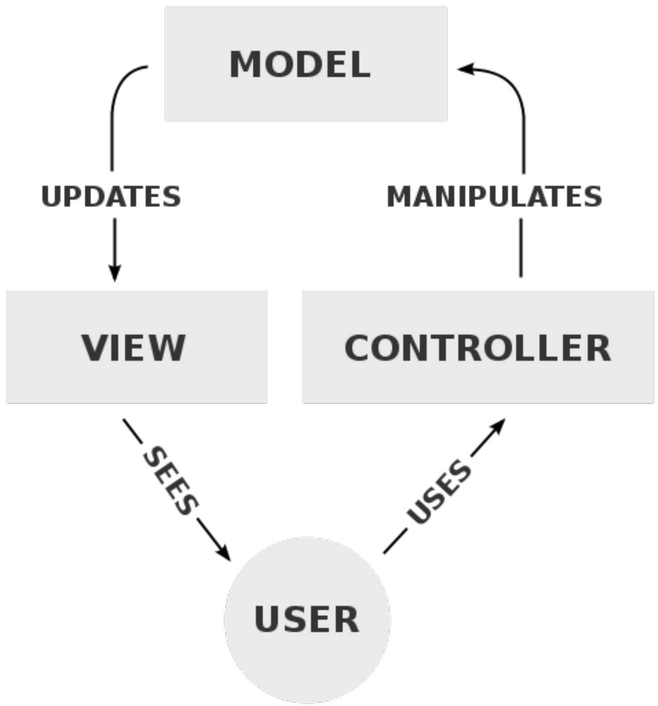
- How would you refactor / reorganize your code to support two applications?

CSCI-3081: Program Design and Development

THE MODEL VIEW CONTROLLER PARADIGM

* based on slides of Jeffrey Heer, Jake Wobbrock, James Landay, and Jeffrey Nichols


MODEL
UPDATES
MANIPULATES
VIEW
CONTROLLER
SEES
USES
USER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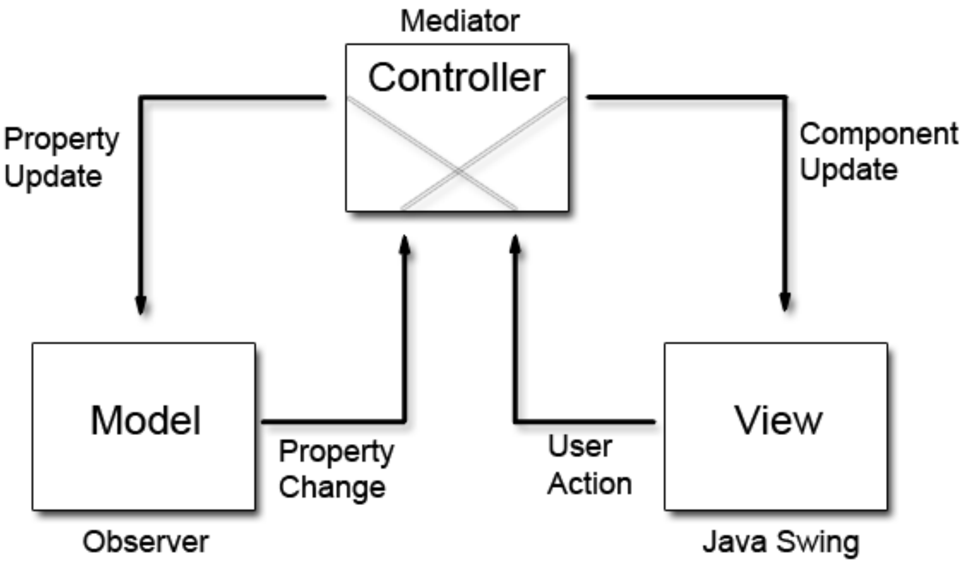
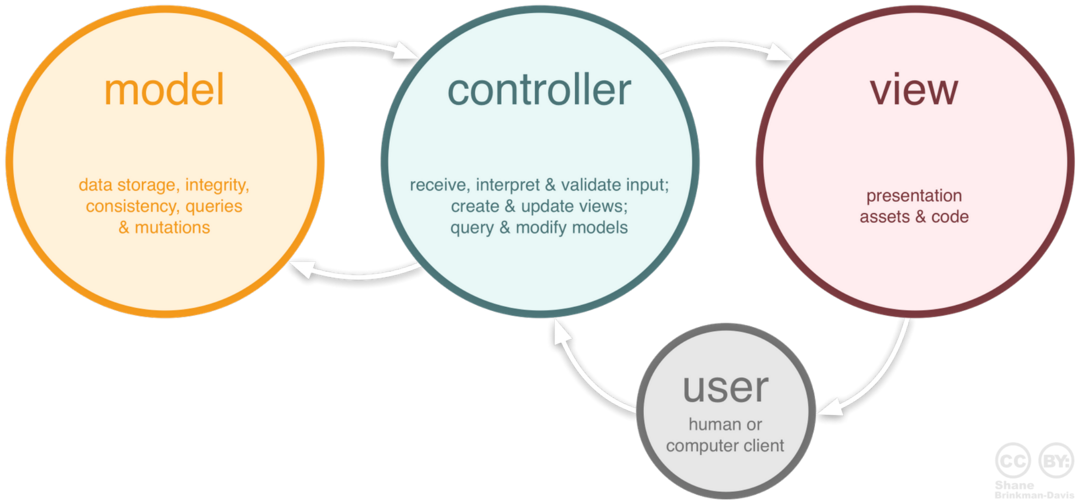
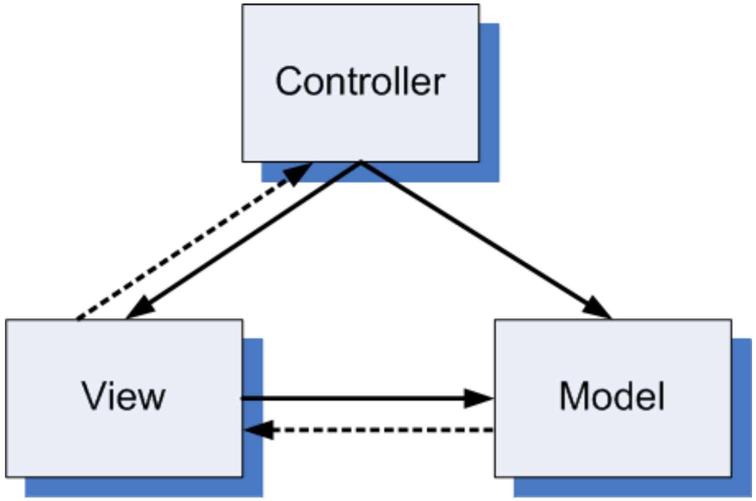
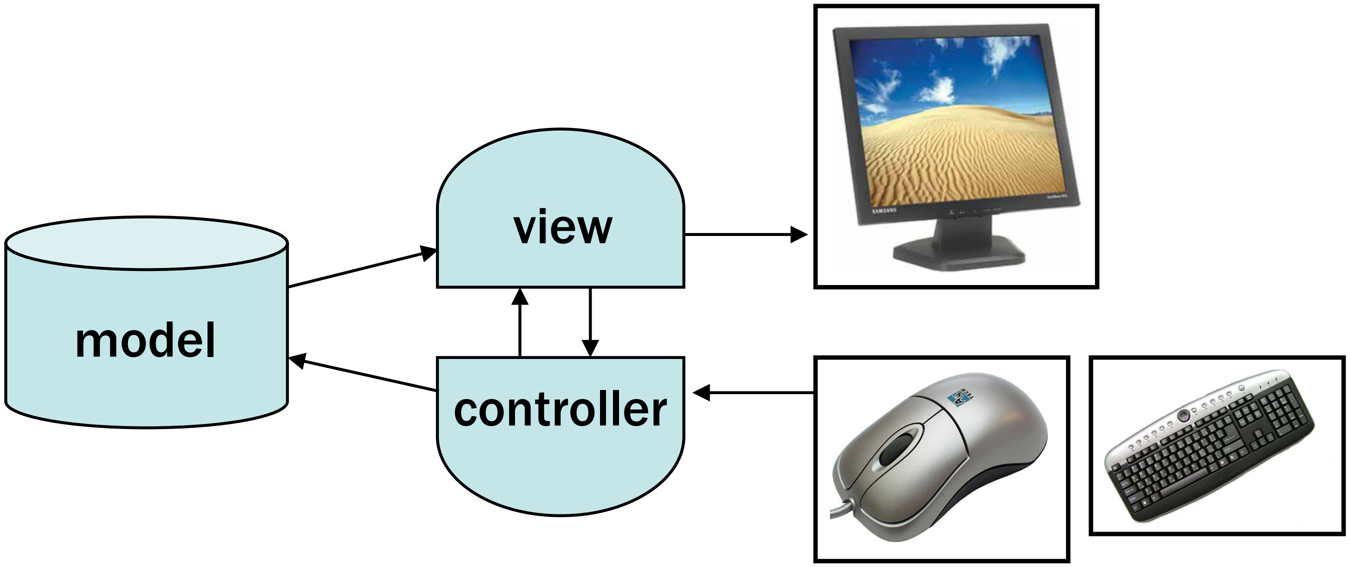

Mediator
Controller
Property Update
Component Update
Model
Property Change
User Action
View
Observer
Java Swing


model
data storage, integrity, consistency, queries & mutations
controller
receive, interpret & validate input; create & update views; query & modify models
view
presentation assets & code
user
human or computer client
Shane Brinkman-Davis


Controller
View
Model

Model--View--Controller (MVC)

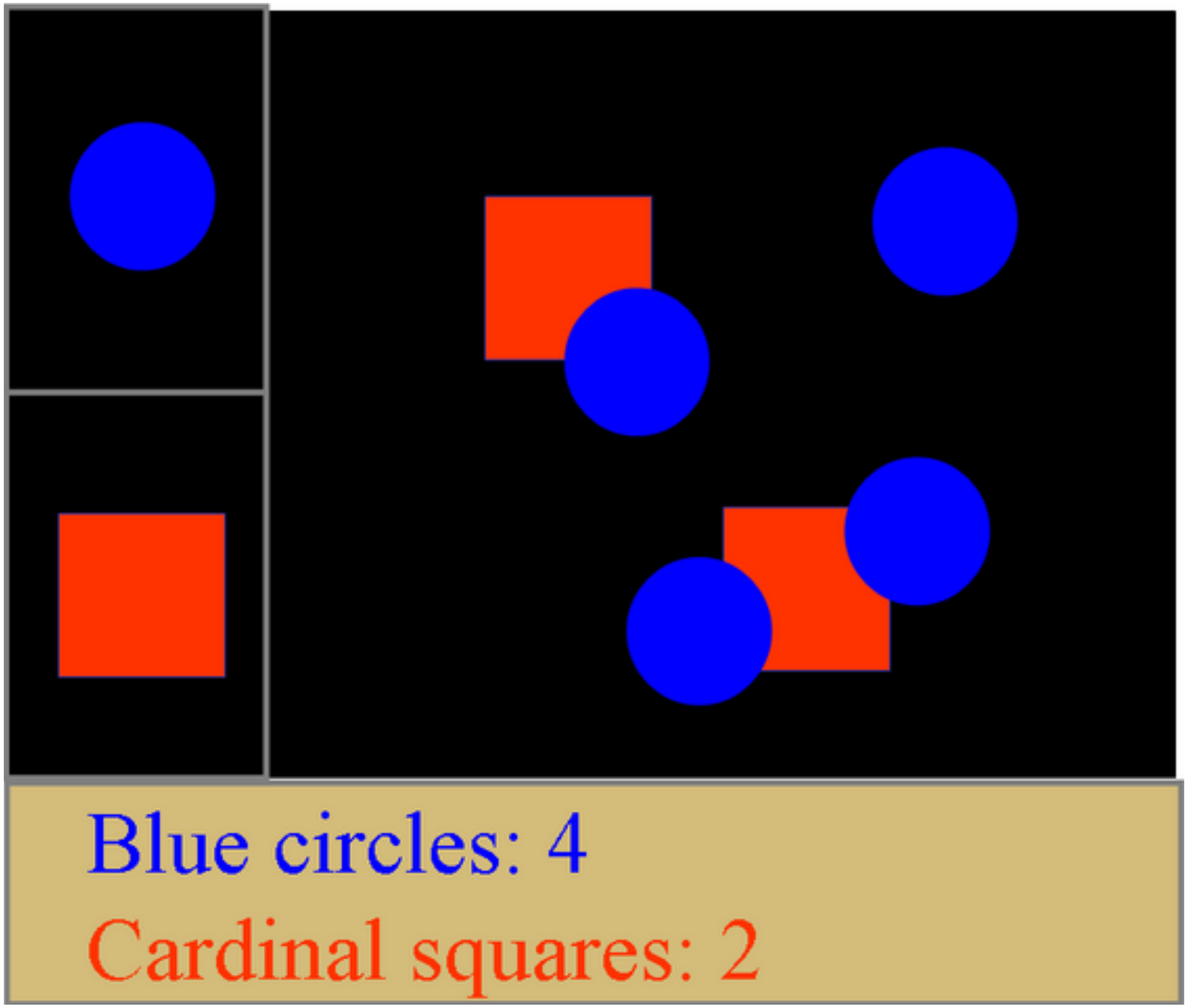
- An architecture for interactive applications
  - Introduced by Smalltalk developers at PARC
- Partitions the application in a way that is
  - Scalable
  - Maintainable



Example Application: A Drawing Program

Interactive Menu

2D View of the Drawing Canvas



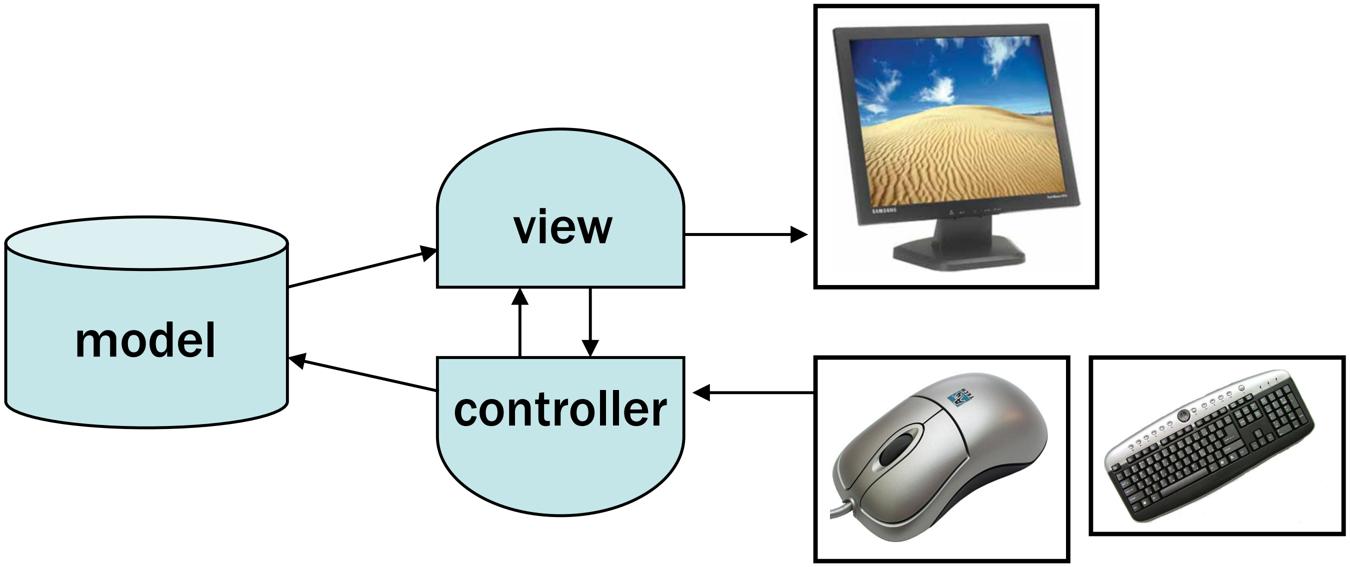
Blue circles: 4

Cardinal squares: 2

Text View of Properties of the Drawing

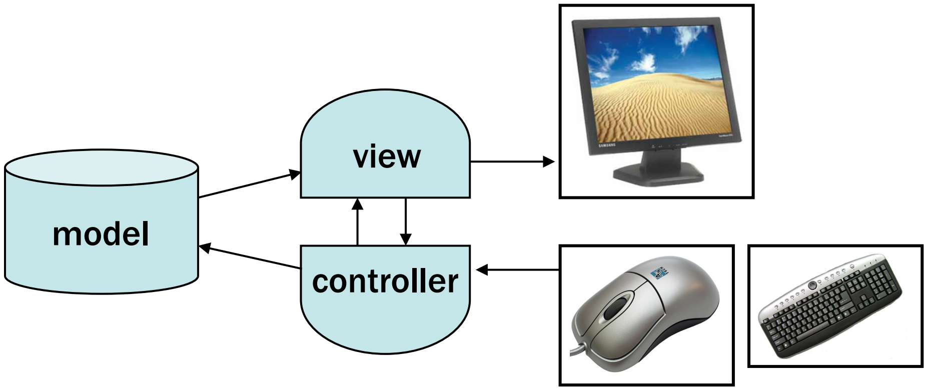
The Model

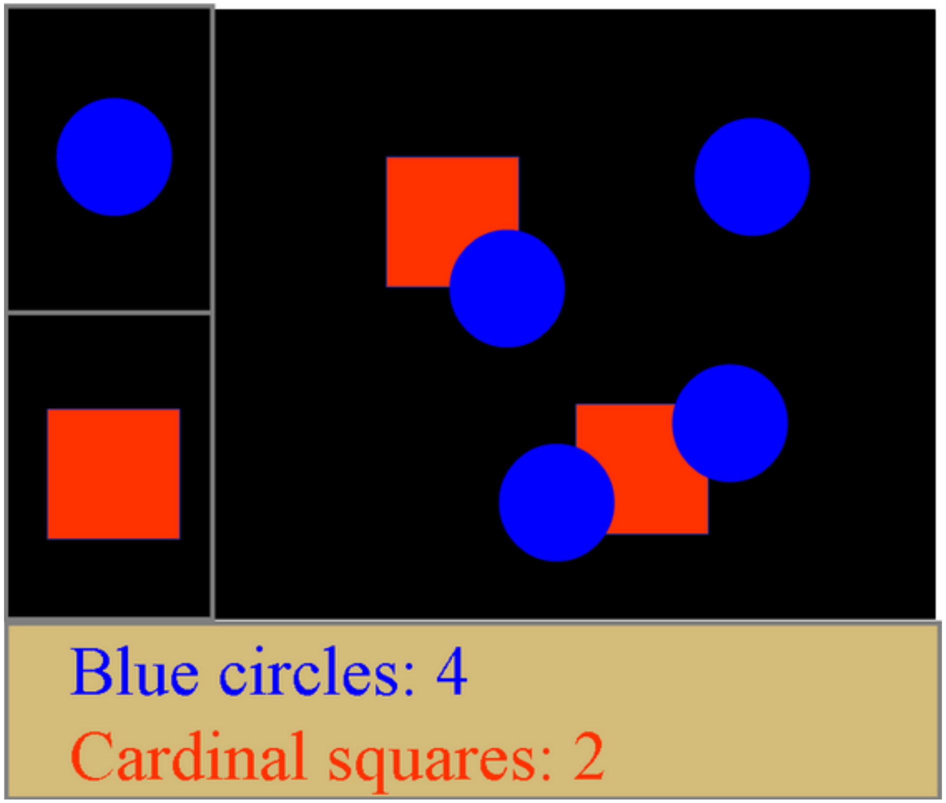
- Information the application is trying to manipulate
- Representation of real world objects
  - Circuit for a CAD program
  - Shapes in a drawing program
  - List of people in a contact management program
  - Teams and events in a basketball game



The View

- Implements a visual display of the model
- May have multiple views
  - E.g. shape view and numeric view
- Any time the model is changed, each view must be notified so that it can update

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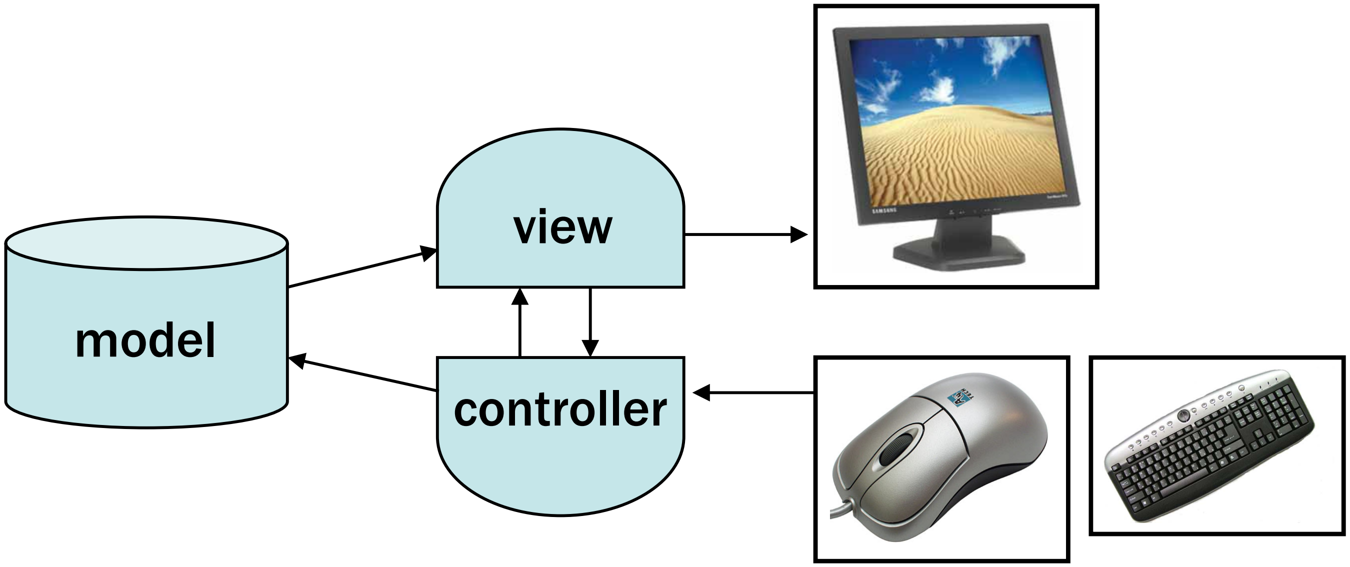
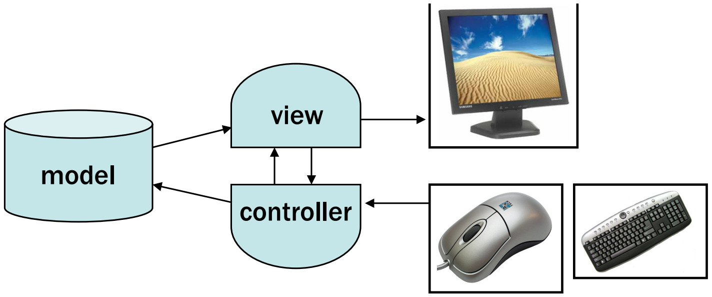
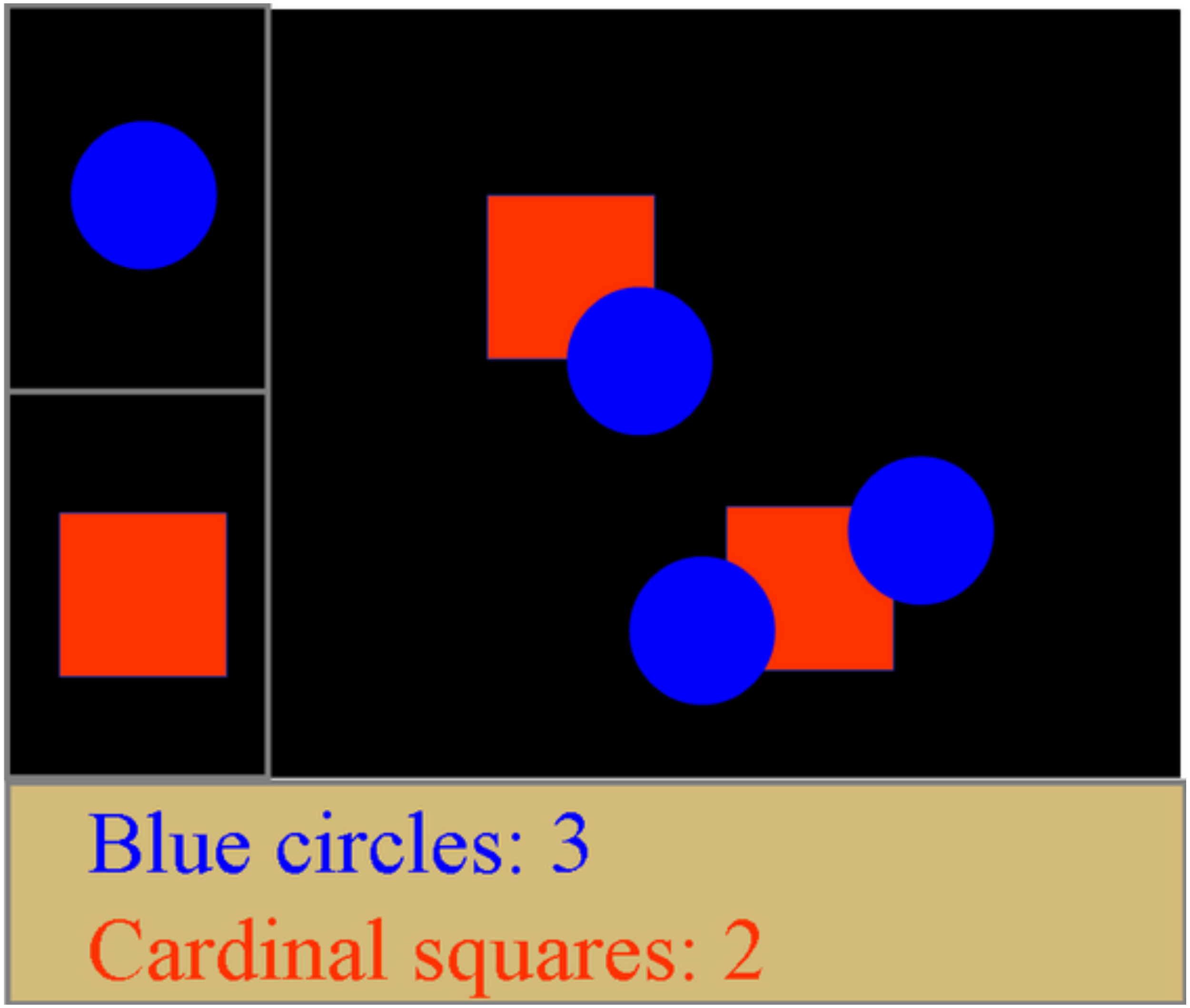
The Controller

- Receives all input events from the user
- Decides what they mean and what to do
  - Communicates with the view to determine the objects being manipulated (e.g. selection)
  - Calls model methods to make changes to objects



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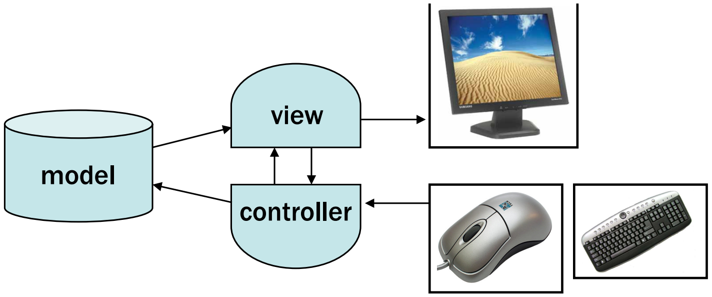

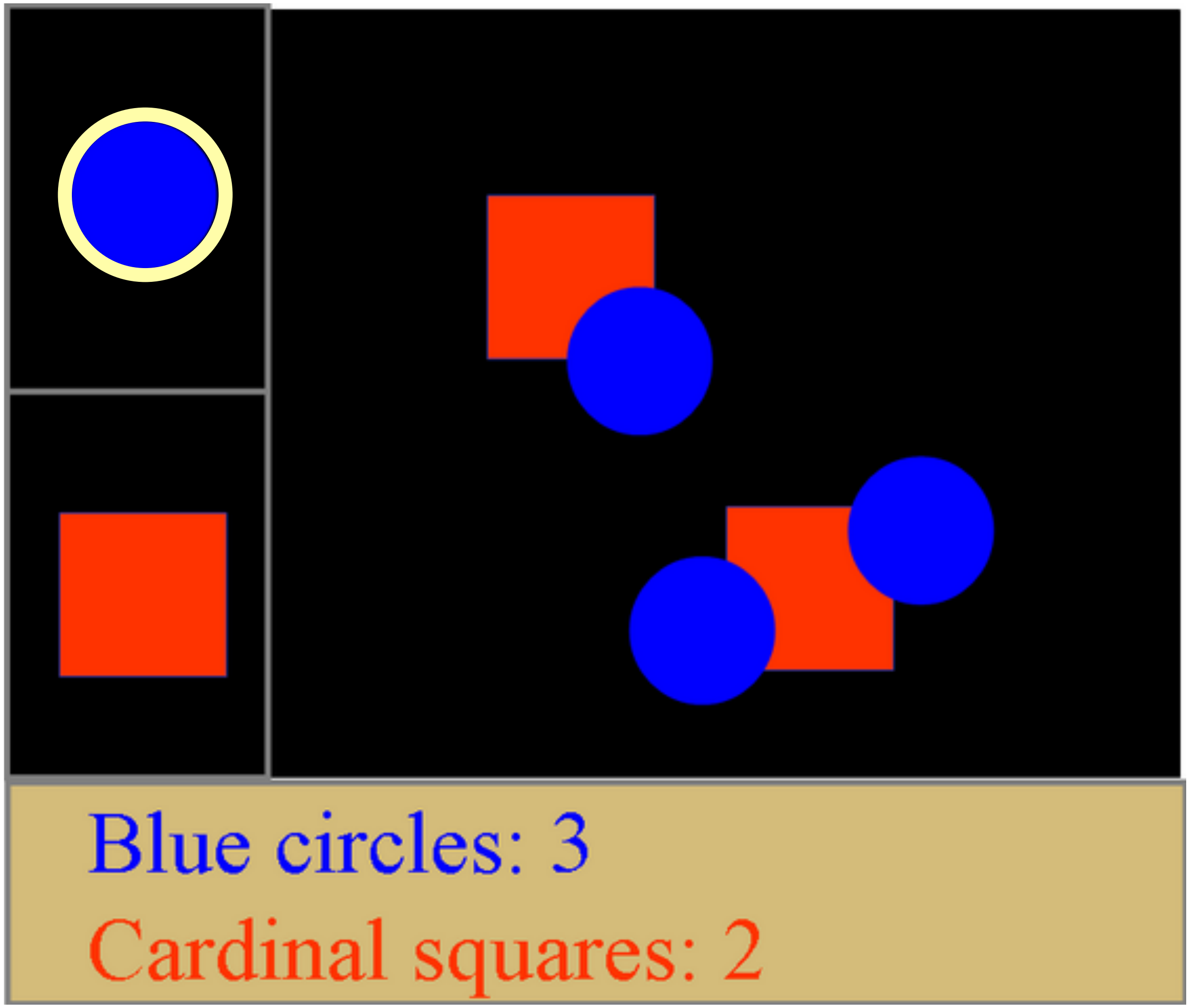
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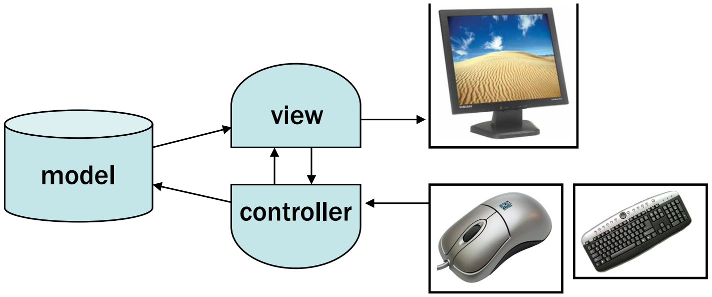
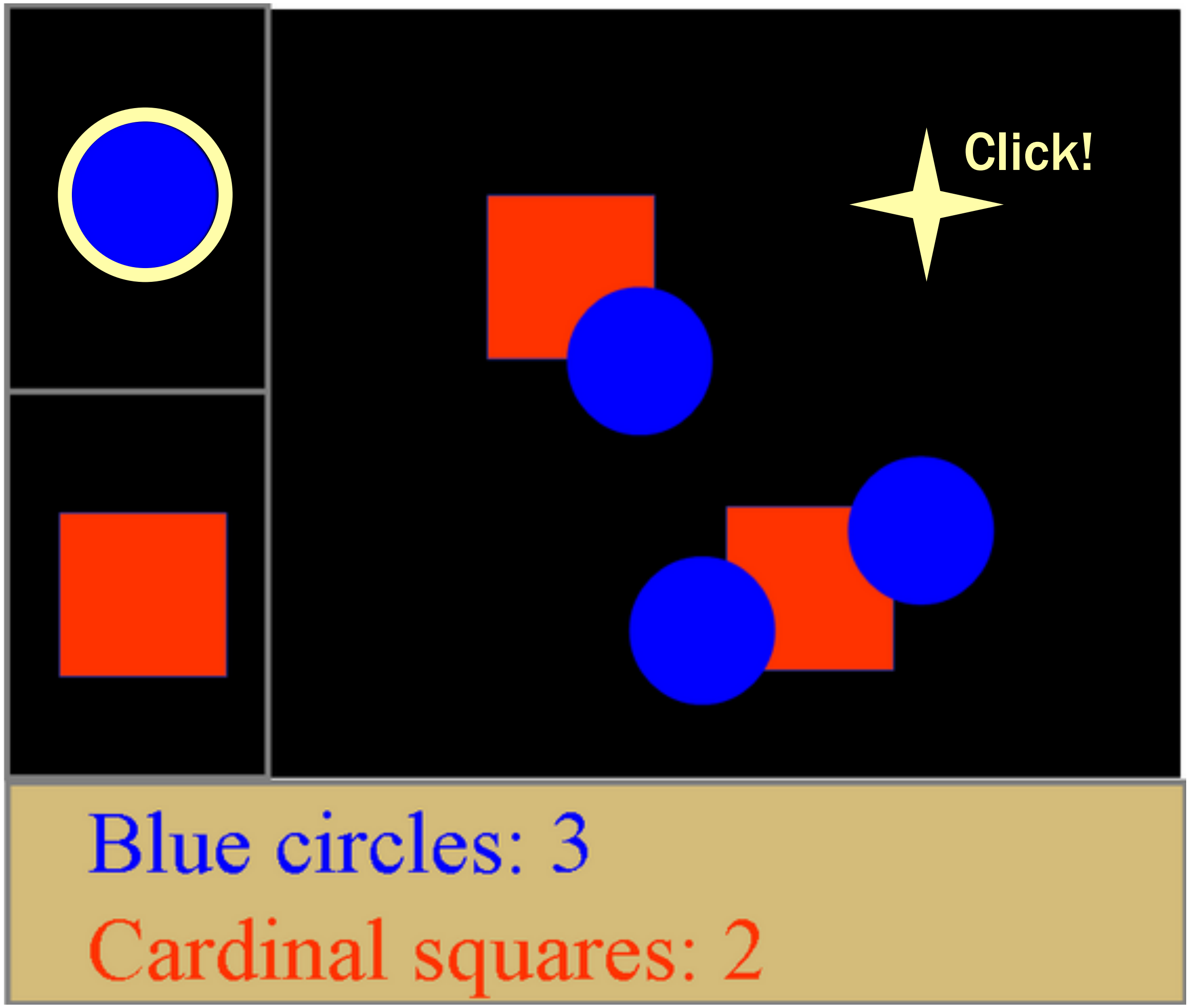
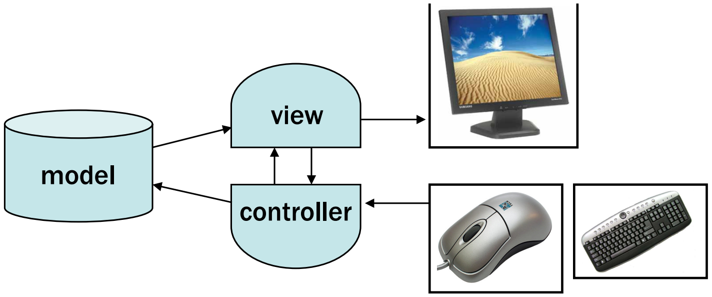
Cardinal squares: 2

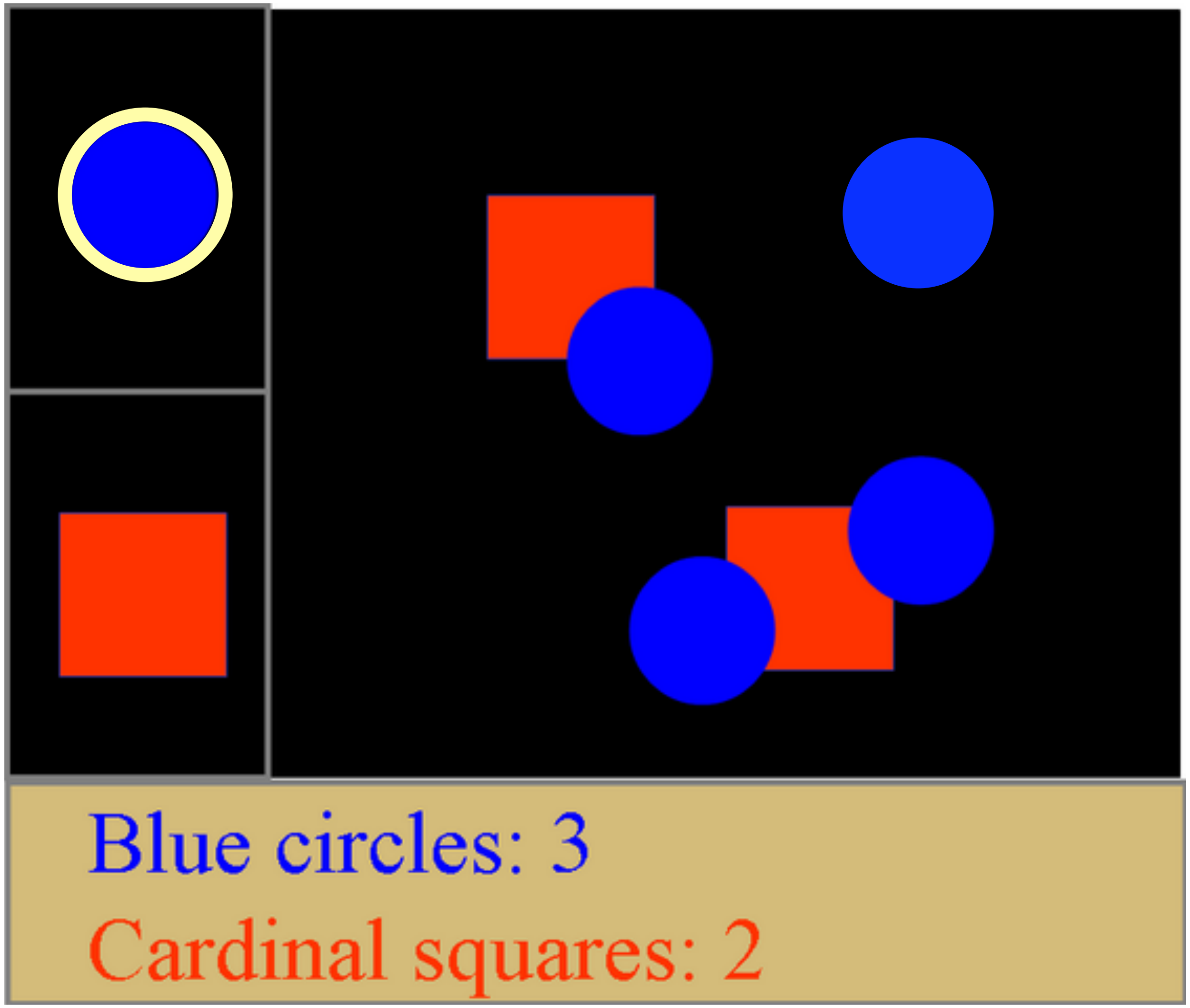




Blue circles: 3

Cardinal squares: 2

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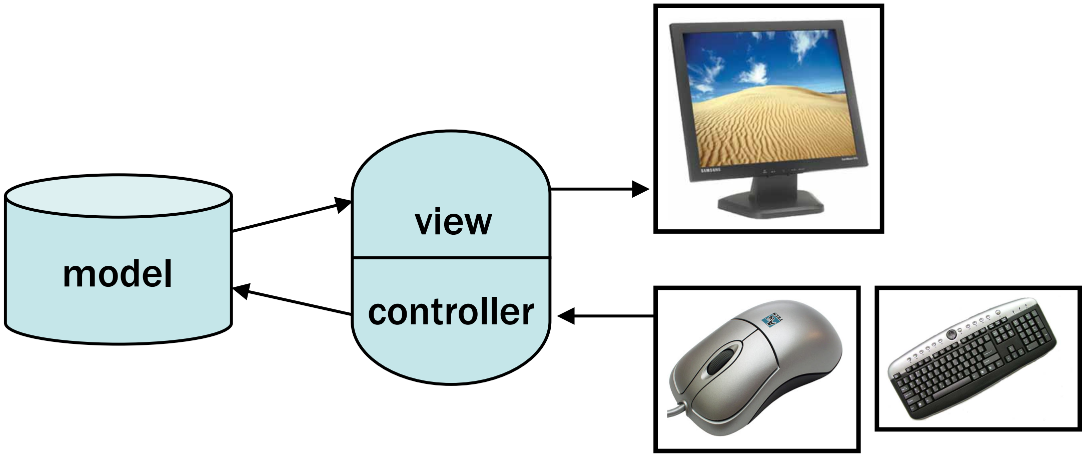
Cardinal squares: 2

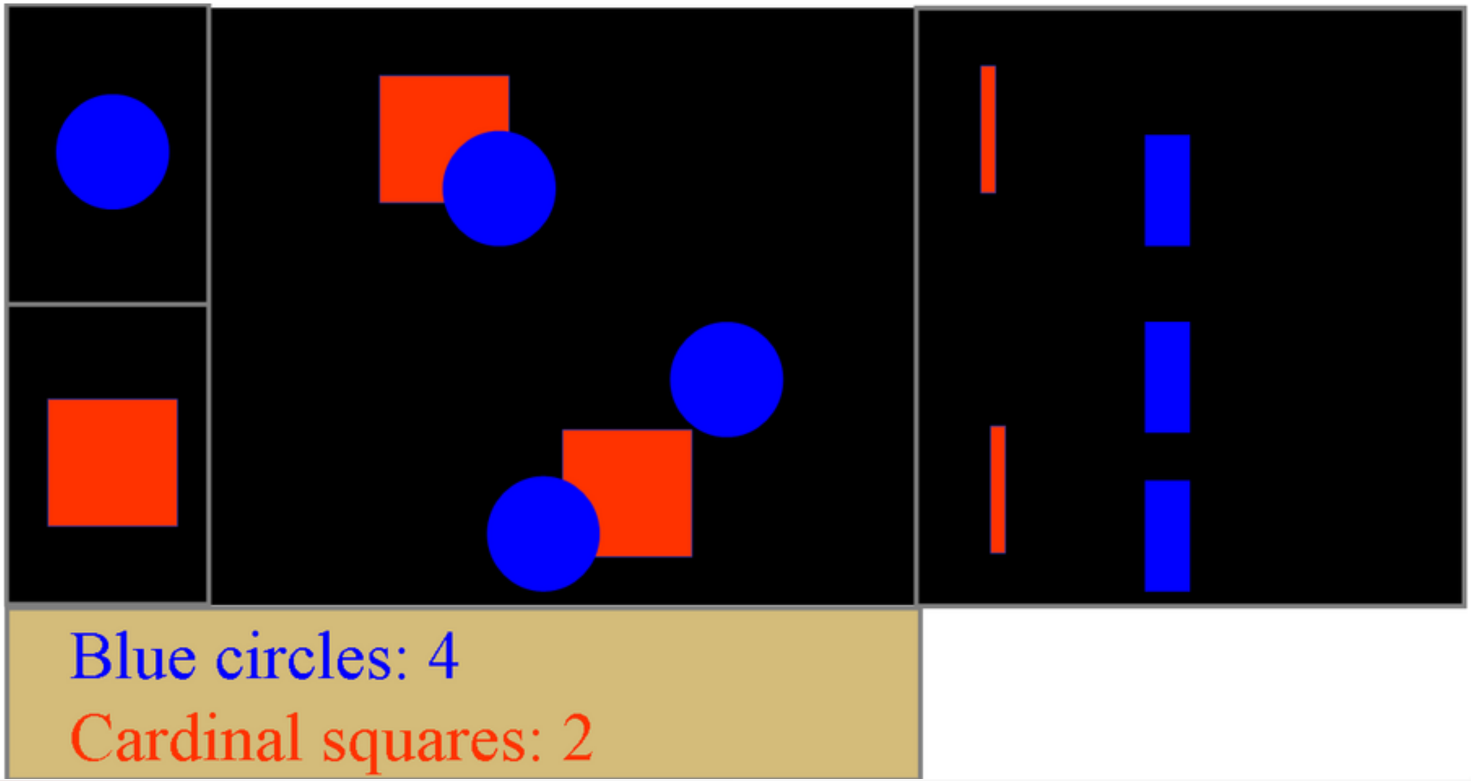
Combining the View and the Controller

- The View and Controller are tightly integrated
  - E.g. it requires communication to determine what was clicked
- Almost always occur in pairs
  - Need a separate controller for each view
- Many architectures combine View and Controller into a single unit.



Why MVC?

- Mixing all pieces in one place does not scale
- Separation eases maintenance and extensibility
  - Easy to add a new view later
  - Model can be extended, but old views still work
  - Views can be changed later (e.g. add 3D)



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Nesting MVC

- MVC is useful on both large and small scales
- Can be used for a whole application
- Or, can be used within a complex widget
  - Complex components need to store internal state (a model) that affects their drawing and event handling
  - Simplifies internal implementation
  - Example: Many Java Swing components have an internal MVC architecture

For graphical applications, we often have:

- Some underlying model (e.g. the application your working with, like a basketball game, a payroll, a painting canvas, or a 3D model).
- Some display of interface and maybe the underlying data in the program -- might change based on the state of the underlying model.
- Some ability to control the program through user interaction -- generating input events with the mouse and keyboard, etc.

- How do the classes in your project fit into these categories?
- To what extent can we (or do we already) employ MVC?