Design of the Video Game Package

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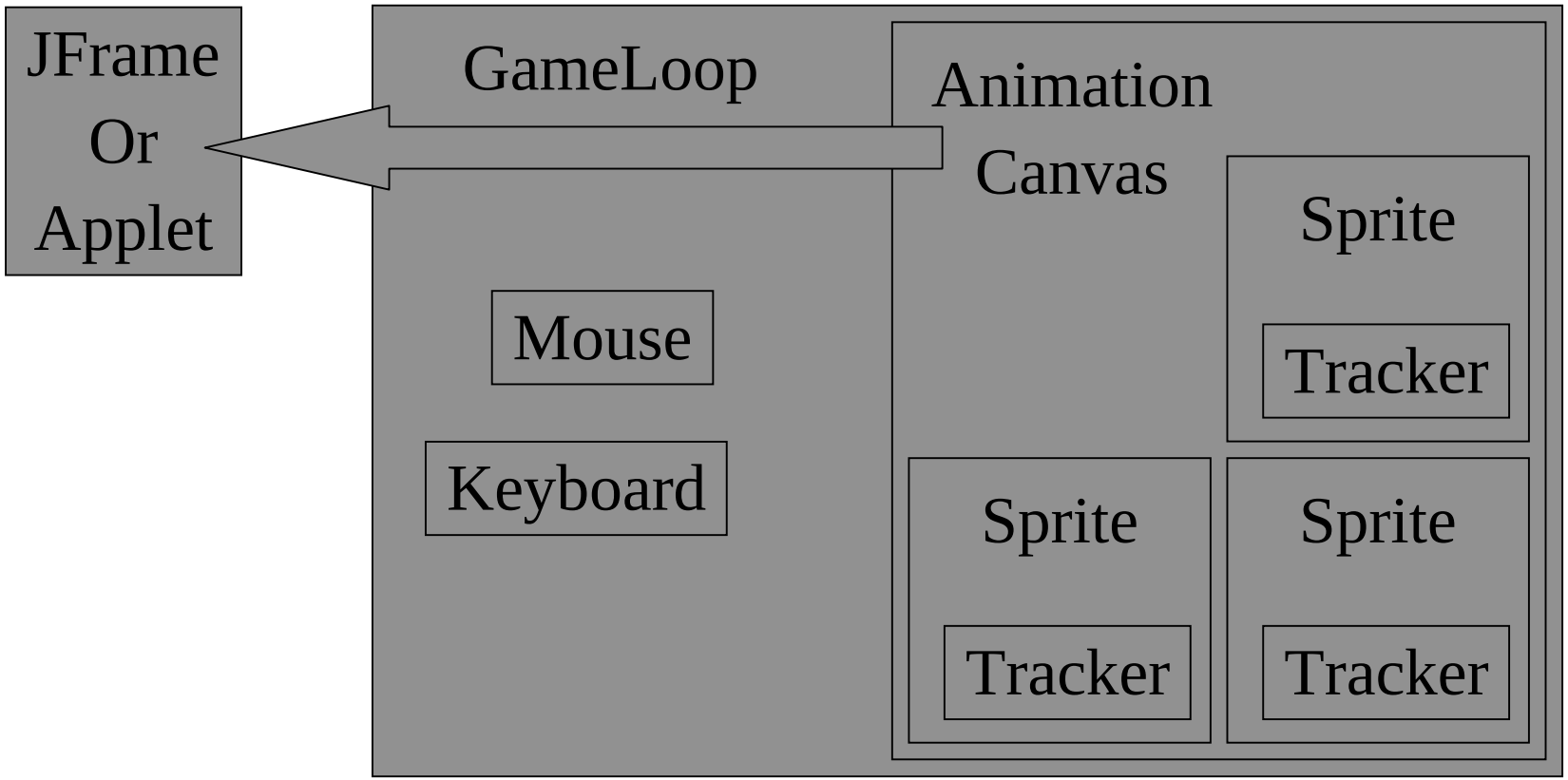

The Plan

- Basic principles of design
- Motivate why MVC is needed
- Model/View/Controller (MVC) overview
- Model (today)
- View (when we get to Graphical User Interfaces)
- Controller (when we get to Event Handling)

Basic Principles of Design

We want our programs to be

- **simple**
- **functional**
- **fast (to code and to execute)**
- **correct**
- **easy to modify**
- **easy to extend**
- **capable of reuse**

Why Simple?

- Simple is easy to understand and therefore easier to reuse, modify, and extend.
- Simple has less likelihood for program errors and is therefore more likely to be correct.
- Simple may be faster than complex, certain to code and perhaps in execution time.

Why functional?

- It has to work.

- How well it works is negotiable considering:
  - speed to release
  - cost to release
  - lifetime of code

Why fast?

- Who wants to wait?
- Works better on slower, more out-of-date machines.
- Sometimes crucial to application's purpose
  - air control
  - nuclear plant facilities
  - weather prediction
  - stock prediction

Why correct?

- In some cases, incorrect execution is unacceptable
  - access control
  - online sales
- In some cases, incorrect execution can be remedied by re-execution
  - operating system locks up, so just reboot
  - database goes down, just restart
- impacts time coding

Why easy to modify?

- Users rarely can tell you exactly what they want
- Even if they could tell you, what users want changes
- Changes in hardware and software mandate code modification (think Y2K)

Why easy to extend?

- Why not make a good thing better?
- Enables multiple releases of functional programs
  - Windows 3.1, 95, 98, 2000, NT, etc.
  - Java 1.0, 1.1, 1.2, 1.3, 1.4 and now 1.5 (5.0)
- Keep up with increasing competition and demand

Capable of Reuse

- No need to reinvent the wheel
- Easier to build with tools than starting from scratch
- C was used to make C++ compiler, C++ used to
- make Java, Java used to make Java compiler!
- Reduce, reuse, recycle is good for coding too!

Why we need MVC?

MVC assists in achieving design principles:

- **simple idea**
- **fast to code with a clear ready-made design**
- **structure makes reuse, modification and extension simple**
- **MVC design easy to test for correctness**

What is MVC?

- **Model**
  - representation of the data
  - has no visual component
- **View**
  - visual display of the data
- **Controller**
  - specifies ways in which the model can be changed
  - between model and view

Simplified 1D Model

- Recall collision detection simulation.
- We're going to apply MVC to solve the problem more generally.
- Were going to use Object Oriented Programming
  - what are the objects?
  - what value do they have?
  - how do the values change?
  - how are the values accessible?

What are our objects?

We're going to model 1D particles and segments.

- `Particle` (similar to the Sprite class)
- `Segment` (similar to extending the Sprite class)
- `Tracker1D` (similar to Tracker)
- `VelocityTracker` (similar to ProjectileTracker)
- `ModelTest` (similar to our JFrame)

class Particle

Attributes

- `double position`
- `Tracker1D`

Behavior

- `double getPosition()`
- `void setPosition(double)`
- `Tracker1D getTracker()`
- `void setTracker(Tracker1D)`

class Segment extends Particle

Attributes

- `double position`
- `double width`
- `Tracker1D`

Behavior

- `double getPosition()`
- `void setPosition(double)`
- `double getWidth()`
- `void setWidth(double)`
- `Tracker1D getTracker()`
- `void setTracker(Tracker1D)`

interface Tracker1D

Attributes

- none

Behavior

- `double getPosition()`
- `void advanceTime(double)`

class VelocityTracker

Attributes

- `double velocity`
- `double position`

Behavior

- `double getPosition()`
- `void advanceTime(double)`

class ModelTest

Attributes

- none

Behavior

- `public static void main(String[] args)`

More to come….