Introduction to Object Oriented Computing and Modeling
Getting Started

• Last time we talked about the four main concepts of OO programming/languages:
  – Abstraction
  – Encapsulation
  – Generalization
  – Polymorphism

• Any questions?
So what is this strange concept of OO programming?

Don't fear the OOP!

Why Coding Java (or any other object-oriented programming) is just like writing a trashy Western novel.

Adapted by Dr. Schafer, but...
Shamelessly stolen from an original concept by Johannes "Jos" Dianovich Claerbout and Pierre Dagher
A SIMPLE ANALOGY

• Think of a Java programmer as a writer, composing a stock novel.

• All of the characters and settings are "off-the-shelf", and need be only modified slightly to fit into a new book.

• All that's left to write a bestseller is to come up with a plot that pulls all those pre-existing elements together.
MEET EUNICE

• Eunice writes very popular Westerns.
• Her books are very consistent.
  – Her secret is to write the whole story onto one sheet of paper.
• How can she do that?
  – Simple. Everything she writes on the page is just a sequence of events, or plot.
  – Setting, character development, and how her characters interact is all taken care of elsewhere.
• How does she do that?
  – Let's find out.
A Western Town – the base concept

The first thing that Eunice needs is a setting. So she pulls down a binder she has marked "Western Towns", opens to the first page, and reads the first few lines:

Every Western town has a few key ingredients: stables, saloons, sheriffs, and a couple troublemakers. A standard town would have three stables and be located West of the Mississippi sometime around 1850.

This description:
1. Establishes the key ingredients of a Western town.
2. Gives default values that may occur in a typical town.
1. First line: Eunice is defining a Western town.
2. Then she declares what sorts of variables (those things which define how the town looks) that a class of Western towns might have.
3. Then she constructs a sample town, with default values for her variables.

WesternTown
- has a certain number of stables
- has a certain number of saloons
- has a certain number of sheriffs
- has a certain number of troublemakers
- is located somewhere
- exists at a certain time

A typical WesternTown would have
- number of stables = 3
- location = Western America
- time period = 1850
Eunice’s New Book - The Main Plot

“The Gunfight at the Old West Saloon”
This story takes place in a Western town called Sweaty Post. Sweaty Post has one sheriff, two saloons, and five troublemakers.

Main Gunfight
Western Town sweatyPost is a new Western Town
the number of saloons in sweatyPost is two
the number of sheriffs is one
the number of troublemakers is five
Humans – the base concept

Now for the villain Eunice picks up another binder. This is marked “Humans”. This is what she finds in the introduction:

"All humans start out with two legs, two arms, two eyes, a nose, a mouth and a hair color. They are either male or female, have a name, have a hair color, and have different preferences in whiskey. If someone asks, humans can respond with their name or their hair color."

• Notice Eunice likes to make all body parts variables!
• The sex, name, hair color and whiskey preference will be defined later in the plot.
Human

has a certain number of legs
has a certain number of arms
has a certain number of eyes
has a certain number of noses
has a certain number of mouths
has a name
has a certain sex
has a hair color
has a strong preference in whiskey
A standard human would start with
two legs
two arms
two eyes
one nose
one mouth

When someone asks for your name
Tell them your name
When someone asks for your hairColor
Tell them your hairColor

• Eunice's human has some interactivity. She can ask its name or its hair color, and it will respond. This is called a method and is your key to a good time. We'll get to it later.
Villains – the base concept

Eunice found the human description not very specific. Flipping through the "Humans" binder, she comes to the chapter entitled "Villains":

Villains are based on the idea of humans. They are identical, except that they have some additional qualities, namely a moustache, a hat, a certain "look", some level of drunkenness, and a certain quantity of damsels in their possession. Your standard villain is a male. He will look mean, start the day out sober, and not yet have captured any damsels.

In Eunice's binder (class) for humans we find one of the subsections (subclasses). This particular subsection about villains, extended the idea of humans.
Villain extends the idea of Human. A Villain:
- has a moustache
- has a hat
- has a "look"
- has some level of drunkenness
- has a certain number of damsels tied up

For a given Villain,
- He is a male
- He will look mean
- He will start out sober
- He will start the day without having any damsels tied up
Villains drink...

Eunice moves on to some of the **methods** that villains employ to achieve their dastardly deeds. She focuses on how villains drink. So she writes:

```
Whenever the main plot says that a villain drinks whiskey, his level of drunkenness will go up by one.
```

Here Eunice is specifying how one of her characters acts, rather than just how he/she/it looks. This is how she can create quite a bit of character development without ever even touching her **main** plot page. You should also note that she is altering one of her variables here, the variable "drunkenness".

```
drinkWhiskey
  drunkenness increases by one
```

Notice the pattern than has begun to emerge in Eunice's writing. As usual, she notes what she is going to describe (in this case a **method** called `drinkWhiskey`) and then, on the next line, what that method will do when she **calls** it in her **main** plot (**routine**)."
Now, the villains in Eunice's stories are famous for being able to hold their liquor. Hence, it's very difficult for an onlooker to gauge how drunk one of her villains really is. Eunice decides that it's a good idea to allow her villain to state how drunk he is, so, she writes a new method:

If someone asks a villain how drunk he is, the villain will always respond with his level of drunkenness.

When someone asks how drunk you are, tell them how drunk you are.
Now, Eunice decides to give the villain the ability to tie up a damsel. What makes this **method** different than her other **methods** is that it needs information about someone other that the villain, namely the damsel to be tied up. To allow for flexibility (and for a variety of damsels), Eunice decides to leave the identity of the damsel blank for now.

When the villain is called to tie up a damsel, tie up a specified damsel, then add one to the number of damsels he has tied up. Then print out "Oh my gosh! (our villain) with (moustache kind), has tied up (the specified damsel), the pretty damsel with (her hair color) hair!"

So now you can see the flexibility that Eunice has in writing her stories; she can leave certain things to be specified only when the plot is written. By writing that the damsel will be specified, but not stating here who she is, that's just what she has done.
tieUpDamsel (name)

   add one to the number of damsels this villain
   has tied up

print "Oh my gosh! (our villain) with
   (moustache kind), has tied up
   (the specified damsel), the pretty
   damsel with (her hair color) hair!"
The Villain! (a review)

- Villains are based on the idea of humans. They are identical, except that they have some additional qualities, namely a moustache, a hat, a certain "look", some level of drunkenness, and a certain quantity of damsels in their possession. Your standard villain will look mean, start the day out sober, and not yet have captured any damsels.
- Whenever the main plot says that a villain drinks whiskey, his level of drunkenness will go up by one.
- If someone asks a villain how drunk he is, the villain will always respond with his level of drunkenness.
- If the villain is supposed to tie up a damsel, tie up the specified damsel, then add one to the number of damsels he has tied up. Then print out "Oh my gosh! (our villain) with (moustache kind), has tied up (the specified damsel), the pretty damsel with (her hair color) hair!".
Villain extends the idea of Humans.

Every villain has a moustache
Every villain has a hat
Every villain has a "look"
Every villain will have some level of drunkenness
Every villain will tie up a certain number of damsels

For a given Villain,

- He is a male
- He will look mean
- He will start out sober
- He will start the day without having any damsels tied up

- drinkWhiskey
  - drunkenness increases by one

- howDrunkAmI
  - tell them how drunk I am

- tieUpDamsel (a damsel)
  - add one to the number of damsels this villain has tied up

- print "Oh my gosh! (our villain) with (moustache kind), has tied up (the specified damsel), the pretty damsel with (her hair color) hair! "

The Main Plot

All this work with drinking and tieing up damsels is making Eunice feel a bit run down, so she decides to stop working on her characters for a little while, and to work a bit on the main plot. Accordingly, she sets her pen to the sheet of paper labeled main routine:

Here is the main plot of the Gunfight at the Old West Saloon: There is a Western Town called Sweaty Post. Sweaty Post has two saloons, one sheriff, and five troublemakers. There is a male villain named Maurice. Maurice has a black hat and a red moustache. Maurice prefers Jack Daniels whiskey. Mary is a female human. She is blonde. She prefers her whiskey straight. In our story, Maurice starts out by drinking whiskey. He then lets everyone know how drunk he is, and then ties up a woman named Mary.
Here is the main plot of Gunfight at the Old West Saloon:
In the novel Gunfight
    There is a town called sweatyPost
    sweatyPost has two saloons
    sweatyPost has one sheriff
    sweatyPost has five troublemakers

    There is a new villain identified as villainOne
    villainOne name is “Maurice”
    villainOne has a black hat
    villainOne has a red moustache
    villainOne prefers Jack Daniels whiskey

    There is a new Human identified as damselOne
    damselOne is “Mary”
    damselOne is female
    damselOne is blonde
    damselOne prefers her whiskey straight

    villainOne drinks some whiskey
    villainOne tells us how drunk he is
    villainOne ties up a damsel named Mary;
So what’s so special about Eunice’s way of writing? Why OOP? Why JAVA?

• It is not what is happening in the main plot (routine), but rather what happens behind the scenes.
• While some of the object traits were specified at the time of creation, most of their traits were specified back in the binders, or classes.
• This allowed Eunice to say a good deal while only saying a little bit in her main routine.
So what’s so special about Eunice’s way of writing? Why OOP? Why JAVA?

• The **main routine** turns out to be nothing more than a collection of references to **objects**, which in turn are references to **classes**.
• Any change Eunice wants to make to the setting, character traits and development, she can do it easily by making a change in one place.
So what’s so special about Eunice’s way of writing? Why OOP? Why JAVA?

• Eunice has a keen idea for the future of Westerns. She sees interactivity. And if, instead of being bound in pages, her characters live in objects and classes, Eunice is free to create a Virtual Sweaty Post. Readers (on her website) could be prompted for their own actions and her characters could respond in a variety of ways, according to what was written in their classes. Using Java, Eunice could finally bring the Old West back to life.