PROGRAMMING BASICS

Maslab ‘09

Overview

- Design Principles
- Performance
- Ant

Good Design Principles

- Stick to a Schedule
  - Have a contingency plan
- Keep It Simple Stupid (KISS)
  - Can you explain it to an audience?
- Be Consistent
  - Discuss team conventions

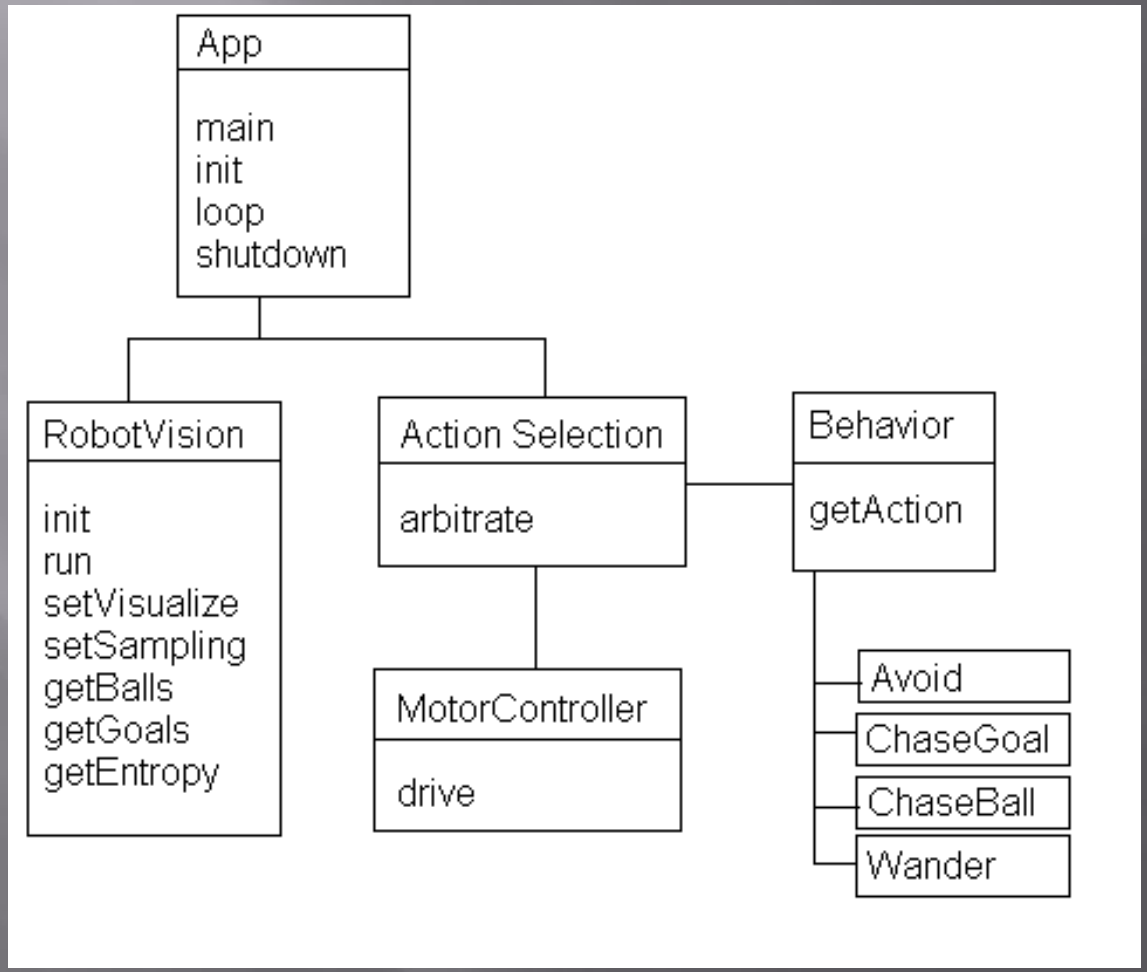
Common Conventions

- Every word in a class name is capitalized
  - ImageProcessor.java
- Variables start with a lower case letter and every subsequent word is capitalized
  - private int ballCount;
- Functions start with a lower case letter and every subsequent letter is capitalized, typically the first word is a verb
  - public int driveForward(int sec);

Modular Design

- Divide problems into chunks of work
  - Individual chunks are simple
  - Consistent interface between chunks
- Additional Benefits
  - Enables efficient individual work
  - Enables validity testing on each chunk

Modular Design Example

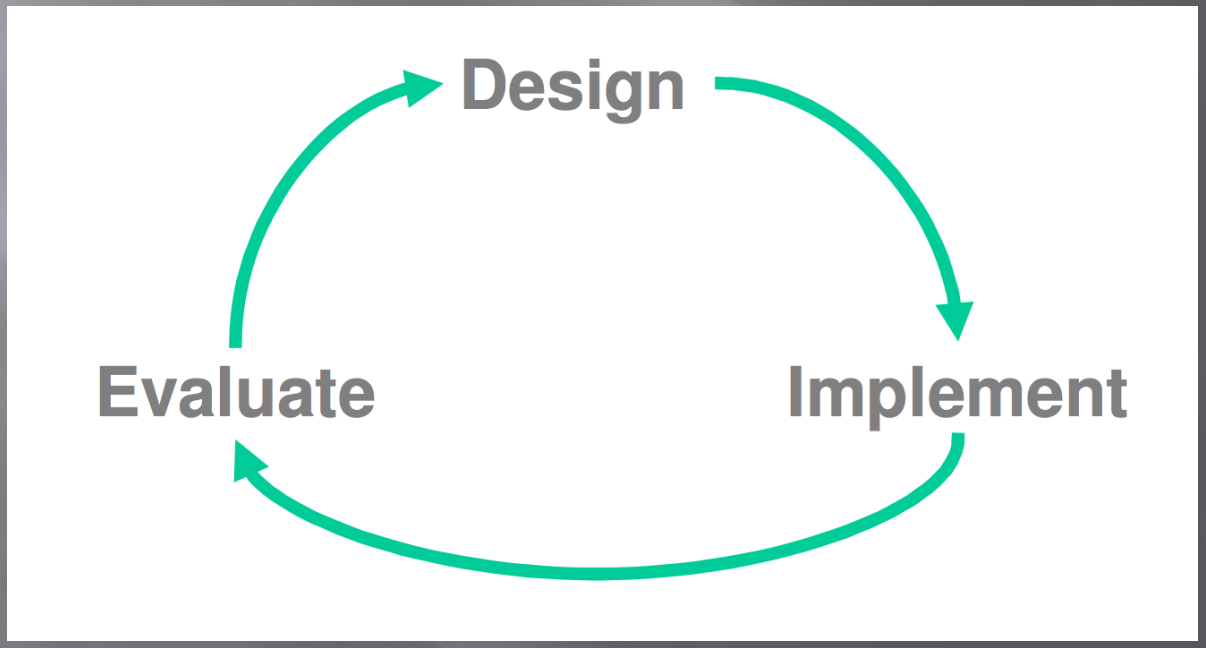


Packages

- Packages allow you to organize your code more cleanly
- Like folders to keep classes with some commonality grouped together
  - pegbot
  - finalbot

Iterative Design

- Don't assume your initial design is perfect
- Prototype high risk problems first



Testing

- Unit Testing
  - Every module should have one
- System Tests
  - Avert day-of-contest embarrassment with a complete test suite

JUnit

- Test code from right inside Eclipse
- Good for code that doesn't need the uOrc to function
  - Image processing
  - Utility classes

JUnit Example

Source Control

- Always Keep A Working Copy
  - Keep teammates productive while you fix things
  - Undo mysterious changes made during 6 am binge programming sessions

Documentation

- Javadocs are useful – use them.
- orc.jar API and maslab.jar API
- /**
  - Description
  - @return
  - @throws
  - @param
  - …
- */

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Software Performance

- CPU bottleneck: Image processing
  - 160x120 = 19,200 pixels to process every frame
- Minimize raw image passes
- Downsample
  - Skip lines if your feature detection can handle it

Hardware Limitations

- Camera Capture Frequency
- Motor Slew Rate

Threading

- Consider it very carefully
- Will learn more about it tomorrow

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Ant

- Another neat tool

Ant

- Another neat tool
- Ant is a Java-based build tool. In theory, it is kind of like Make, without Make's wrinkles and with the full portability of pure Java code.
  - http://ant.apache.org/

Components

- An XML file called build.xml
- targets
- commands
- properties

Example

```
<target name="build" depends = "clean">
    <!-- This compiles all the java -->
    <javac srcdir="src“
     destdir="bin" includes="**/*.java"
     debug="true" classpath="lib/maslab.jar:."/>
 </target>
```

- Run with:
  - ant build
  - Straight from Eclipse

Cygwin

- Bash shell for your Windows machine
- Allows you to use the provided build.xml with a minimum of fuss