Introduction to Java for Robotics: Part 3

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Session Goals

- Eclipse / Java installation help as needed
- Review Java basics
  - Variables, objects, classes, program structure, ...
- Review Eclipse IDE basics
  - Create a Java class, run a Java class, …
- Learn more about classes, objects, constructors, …
- Begin looking at example robotics classes
  - How to install examples
- Test GearsBot in simulator
  - Joystick controls

Examples

```java
public class HelloWorld {

    public static void main(String[] args) {

        System.out.println("Hello, World!");

    }

}
```

Hello, World

```java
public class HelloWorld {

    public static void main(String[] args) {

        System.out.println("Hello, World!");

    }

}
```

Create HelloWorld class in Eclipse IDE

1. Start up Eclipse IDE
2. Create JavaIntro project
    a. File menu → New → Java Project
    b. Set Project Name to JavaIntro and click Finish
3. Create HelloWorld class file
    a. Open JavaIntro project
    b. Right-click on src folder, then choose New → Class
    c. Set Name to HelloWorld
    d. Check box for public static void main(String[] args)
    e. Click Finish
    f. Add System.out.println("Hello, World"); to main method
    g. Save
    h. Run
        i. Hello, World will be printed to the Console window

Hello, World

```java
public class HelloWorld {

    public static void main(String[] args) {

        System.out.println("Hello, World!");

    }

}
```

- HelloWorld is the class
- main is a class method
- Curly braces "{}" define a block of source code for classes, methods, etc.
- Parentheses "()" group arguments to methods
- Semi-colons ";" terminate statements

Adding to Hello, World

```
public static void main(String[] args) {
        String message = "Hello, World!";
        System.out.println(message);
}
```

- message is a variable of type String
- Equals sign "=" is the assignment operator
  - The right hand side is assigned to the variable on the left hand side
- Variables can be passed as arguments to methods

Variables

Types of variables:

- Primitive data types (contain a single value)
  - boolean: either **true** or **false**
  - byte, char: 8-bit and 16-bit characters
    - Examples: 'a', 'A', '$', 't', '3'
  - short, int, long: 16-bit, 32-bit, and 64-bit integers
    - Examples: ..., -2, -1, 0, 1, 2, 32767, 258293478251
  - float, double: real numbers (32-bit and 64-bit real numbers
    - Examples: 0.001, 123.456, 3.1415927, -42.0, 0.001f, 1f
- Objects
  - An object is an instance of a class
  - All data in Java is an object, except for primitive types

Classes and Objects

Classes are collections of data and methods

```
public class Circle {
        public double cx, cy;        // coordinates of center of circle
        public double r;             // radius of circle
        public double getArea() {
                return Math.PI * r * r;
        }
}
```

Objects are instances of classes

```
Circle c = new Circle();
double area = c.getArea();
String message = "Hello, World!";
```

More on Classes

```
public class Circle {
        public double cx, cy;          // coordinates of center of circle
        public double r;               // radius of circle
        public double getArea() {
                double area = Math.PI * r * r;
                return area;
        }
}
```

- cx, cy, r are member variables
- area is a method variable
- getArea is a member method

Additional Resources

- Java
  - Java Tutorials from Oracle
    - http://docs.oracle.com/javase/tutorial/index.html
  - Google search "Intro to Java"
  - Search / ask questions at sites like stackoverflow.com
- Eclipse
  - www.eclipse.org
- Robotics
  - 2015 FRC Control System
    - https://wpilib.screenstepslive.com/s/4485
  - FRC Java programming
    - https://wpilib.screenstepslive.com/s/4485/m/13809

Getting Ready for FRC Robotics Programming

FIRST FRC provides 3 different ways to program: LabView, Java, and C++. Cy-Ranch Cy-Borgs use Java.

Links to get started with the basics:

1. Install Eclipse (JAVA) to the computer you will be using (preferably a laptop) Eclipse Install
   a. Eclipse install: https://wpilib.screenstepslive.com/s/4485/m/13809/l/145002-installing-eclipse-c-java
2. Install NI driver station and updates. You will need this to drive the robot: Install Updates
   a. Install updates: https://wpilib.screenstepslive.com/s/4485/m/13809/l/144150-installing-the-frc-2015-update-suite-all-languages
3. Learn as much as you can about Java basics, Sensors, and Iterative Robot.
   a. Java basics: https://wpilib.screenstepslive.com/s/4485/m/13809/l/145309-java-conventions-for-objects-methods-and-variables
   b. Sensors: https://wpilib.screenstepslive.com/s/4485/m/13809/l/241868-wpilib-sensor-overview
   c. Iterative Robot: http://wpilib.screenstepslive.com/s/3120/m/7912/l/130578-choosing-a-base-class