

# TH Robotics Software Tools

Author: Aaron Klapheck  
Mentor: Alonso Vera  
Human Computer Interaction

## The Project

### Overview

- Create an interface between Score and a PER
- Learn the Java programming language
- Develop an activity dictionary in Score
- Create software test for Score
- Test the PER's hardware and software
- Develop a GUI program to control the PER

### Abstract

This summer program involved creating a computer interface between planning software (SPIFe) and a Personal Exploration Rover (PER). Tests were developed to determine the full functionality of the SPIFe program Score under numerous user conditions and requirements. After learning XML, an activity dictionary was created for the SPIFe program MSLICE, which consists of an XML document detailing the various actions the PER is able to perform. The PER comes with a fully developed software package that contains all of the commands needed to control the PER's motions and activities (developed in Java). In anticipation of a plug-in for a SPIFe program, a stand-alone program was created called Personal Exploration Rover Integrated Planning Software (PERIPS). Programming PERIPS involved serialization, event handling, and multithreading of over 20 interrelated objects capable of utilizing the PER's motion, electromagnetic, and image processing capabilities. Once PERIPS is in plug-in format a user would be able to plan activities for the PER in a SPIFe environment and click a button that would have the PER execute the activities right in front of them.

## Personal Exploration Rover (PER)



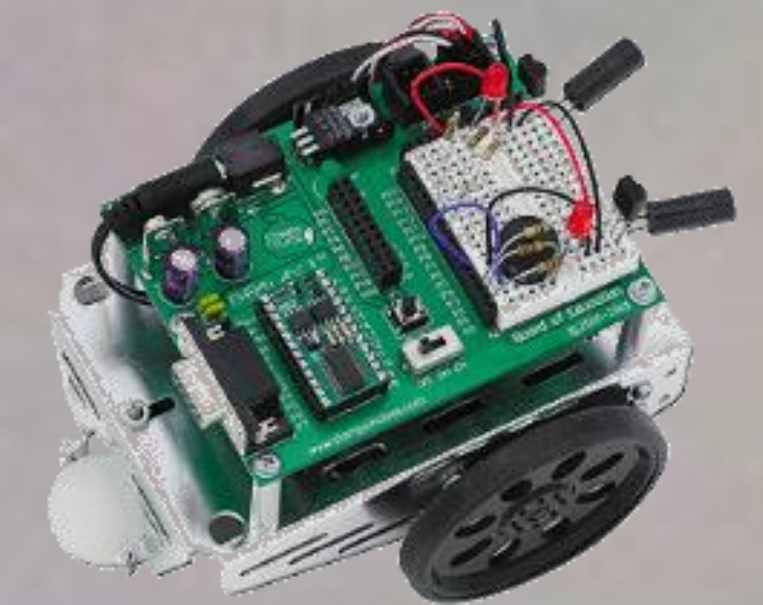
PER – Roaming



PER –Testing

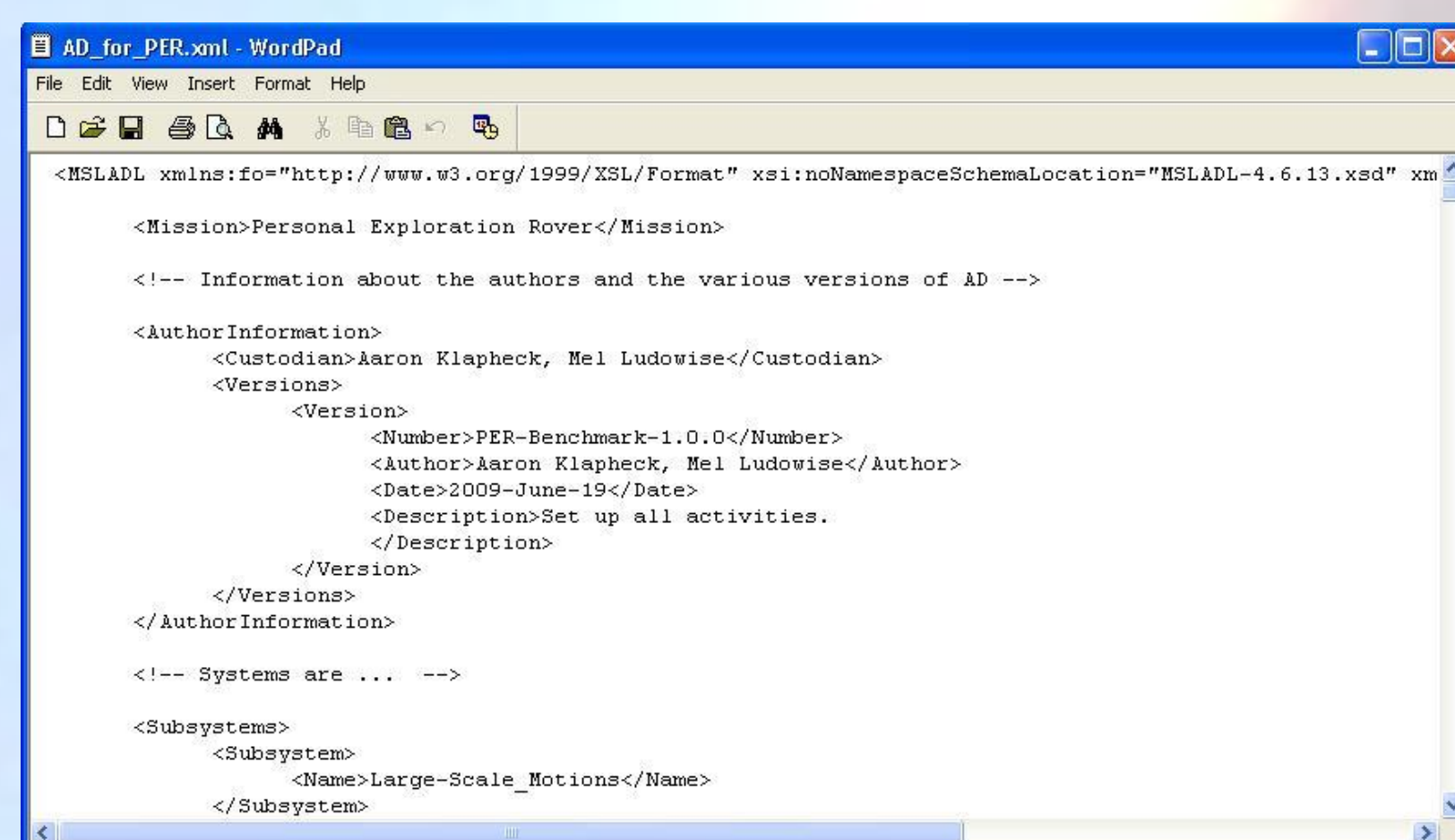
### Programming the PER

- PER – a battery powered robot designed to “hone your skills as a space [exploration] scientist”
- Created maintenance/testing reports
- Rapid code testing on Parallax Boe-Bot
- PER Programmable activities
  - Linear/curvilinear motions
  - Scan – object detection
  - Camera – pan/tilt, take picture, take panorama
  - UV Light control



Boe-Bot

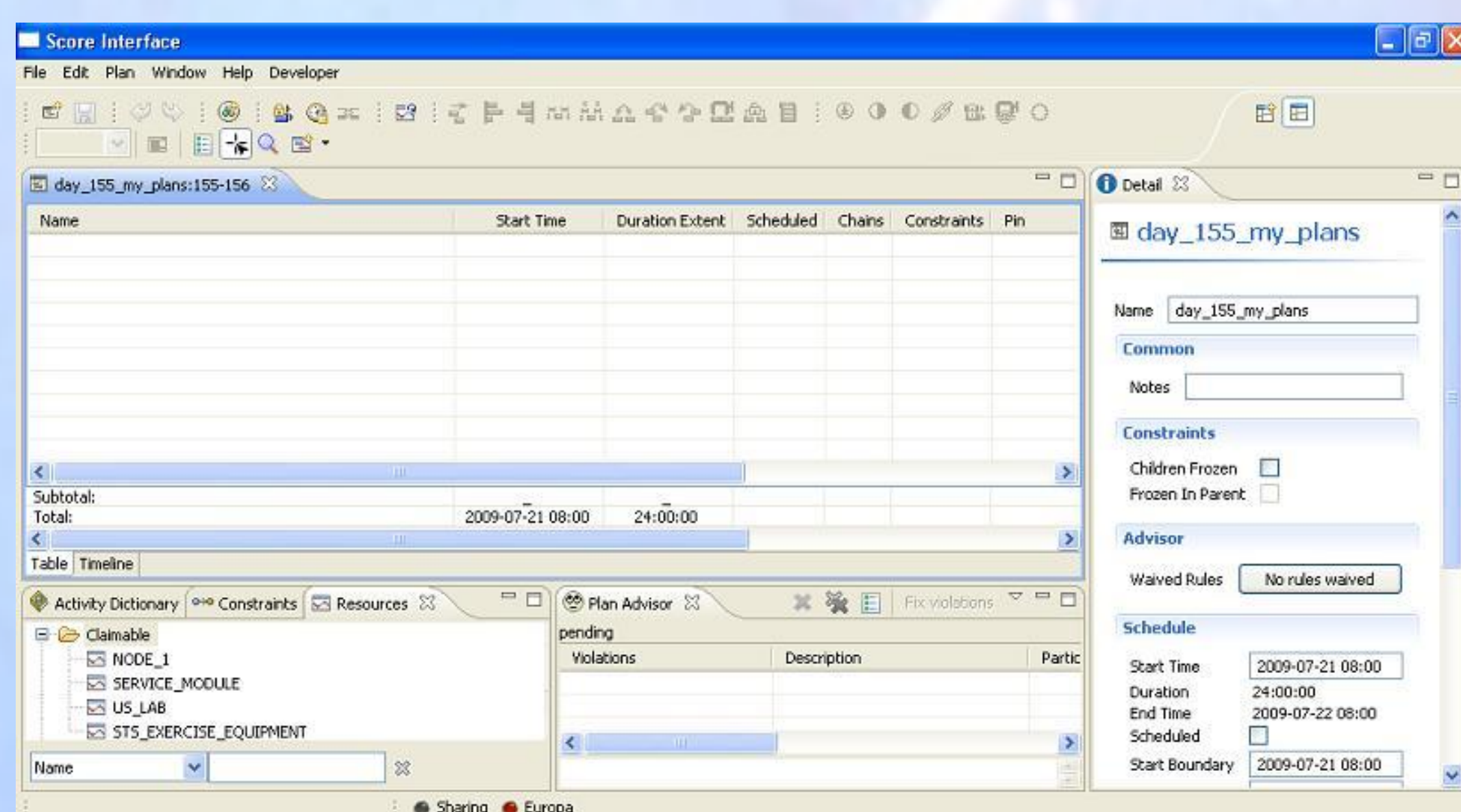
## Software Testing



PER Activity Dictionary

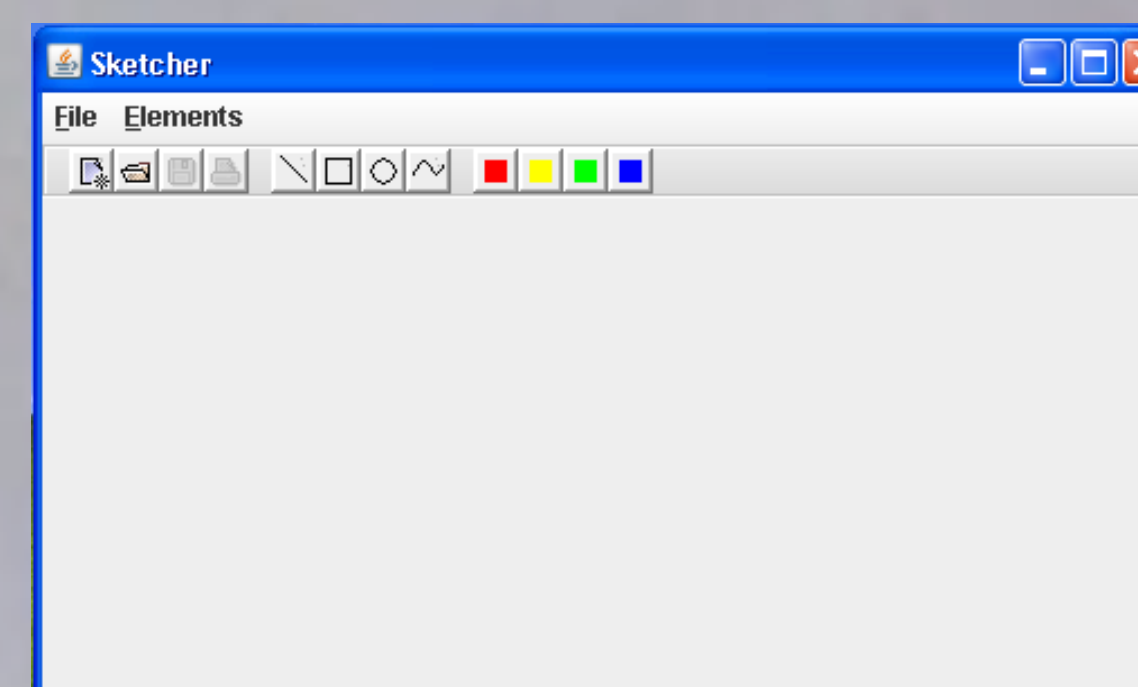
### Updating Score Tests

- Activity Dictionary (AD) – update version and create new ADs.
  - Test the various buttons' functionality and consistency
  - Constraint creation and editing – start, end, point, chain, etc
  - Time Line view – visualizations and activity actions
  - Preferences – allow users to set the look-and-feel of Score
- Rover Connection:**
- Create AD for PER – coded XML document specifying activities
  - Planning – used Score to plan activities for the PER

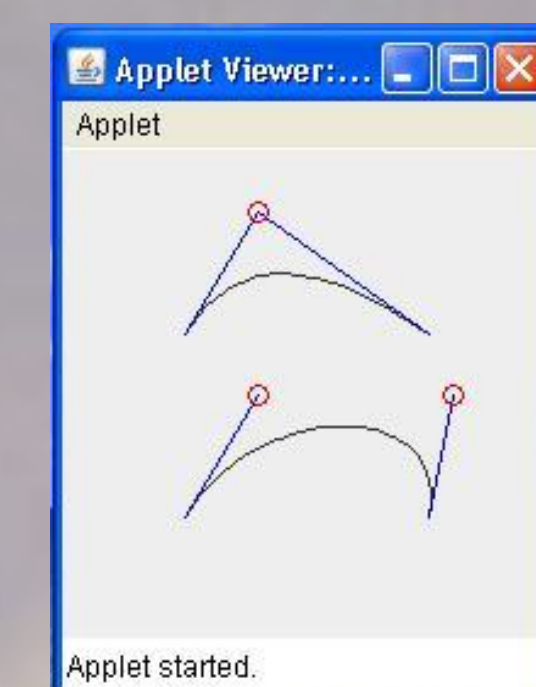


Score Application

## Learning Java



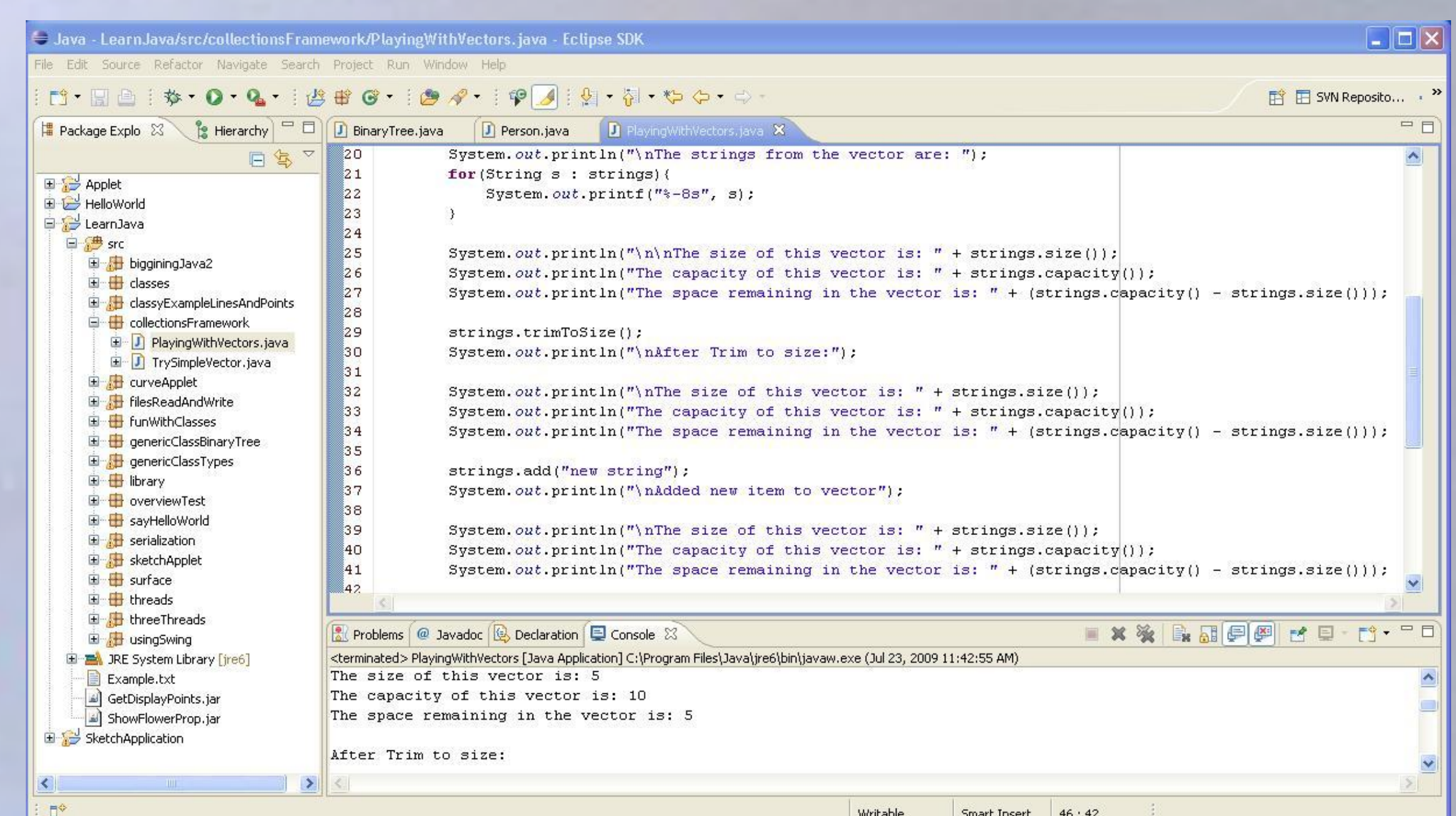
Sketcher Application



Curve Applet

### Learning the foundation of the Java

- PER preloaded with Java and extensive Java libraries. Learned the following about Java to use the PER:
- Classes, methods, and objects
  - Abstract classes, interfaces, and threads
  - Read/write operations, streams, and serialization
  - Generics and collections framework
  - Creating GUI environments, handling events
  - Creating Applications and Applets



Eclipse IDE