Assignment 1

14.03.2006 **Due date: 23.03.2006**

AspectJ

AspectJ is a simple and practical extension to the Java programming language that adds to Java aspect-oriented programming (AOP) capabilities.

AOP allows developers to reap the benefits of modularity for concerns that cut across the natural units of modularity. Modularity is an essential characteristic of good designs since it enhances the separation of concerns and enables developers to reduce the overall system complexity. In object-oriented programs like Java, the natural unit of modularity is the class. In AspectJ, aspects modularize concerns that affect more than one class.

Take any complex application that you have implemented in the previous semester. Insert into your application the folowing aspects without modifing the application code at all. The aspects should not be specific to your particular application; it should be possible to integrate them into any existing Java program.

1. Implement a simple tracing aspect that prints a message each time a public method is executed, except the main method. The message contains the signature of the method and it is displayed before the method is executed.
2. Implement an advanced tracing aspect that in addition to (1) prints also the names of the arguments and the input values passed to the method call.
3. Implement a profiling aspect that for each class counts the number of read and write accesses to the instance variables. The aspect computes for each class two numbers: the total number of references to all fields in this class and the total number of set operations to all fields in this class. Do not change the code of the classes and do in the aspect everything related to the counting.
4. Implement an aspect that prints after the execution of main the counts from all classes computed at (2).
5. Implement an aspect that modifies the output every time a String or an Object is printed via System.out.println or System.out.print, except the times when the outputs are printed from the tracing aspects. The aspect simply converts the text into Upper Case before printing it. The aspect does not modifies the outputs sent to other output devices, including files and PrintStreams other than System.out.

AspectJ can be found at http://eclipse.org/aspectj/. AspectJ is installed on the machine at the department at /usr/common/aspectj.

If you need more information on AspectJ: book chapters (http://java.sun.com/javaee/reference/bookshelf/), courses in German (http://www.aosd.de/Vorlesung/Vorlesungsplan.html)
