

CS3303 Course Introduction Notes

Course Overview

- Data Structures and Algorithms is not a programming class. This means that programming is not the focus of the class. However it is assumed that each student has already mastered some level of proficiency in the Java language and assignments to illustrate data structure and algorithm design concepts will be implemented in the Java language.
- This course requires strong proficiency in the following foundational concepts.
 - A Mathematical foundation consisting of Algebra and Trigonometry. In particular we will be making extensive use of mathematical concepts such as sets, relations, summations, and logarithms. Logarithms are typically introduced as part of trigonometry. Please make sure that you have a solid understanding of these concepts.
 - An understanding of the foundations of the Java programming language. We use the Java language to implement the data structure and algorithm designs discussed and studied as part of this class. You must be able to implement an algorithm or data structure design as a procedure in Java.
- This course, CS 3303 Data Structures and Algorithms, is the first course in a two-course sequence. This course introduces basic data structures and the algorithms that implement them along with introducing algorithm analysis concepts such as asymptotic analysis. The learning in this course will be extended in CS3304, which will explore more advanced data structure, and algorithms, further develop algorithm analysis skills, and present and evaluate algorithm design paradigms. It is vital to fully understand the information in this course as preparation for CS3304 and other higher-level courses in the computer science curriculum.

Expectations

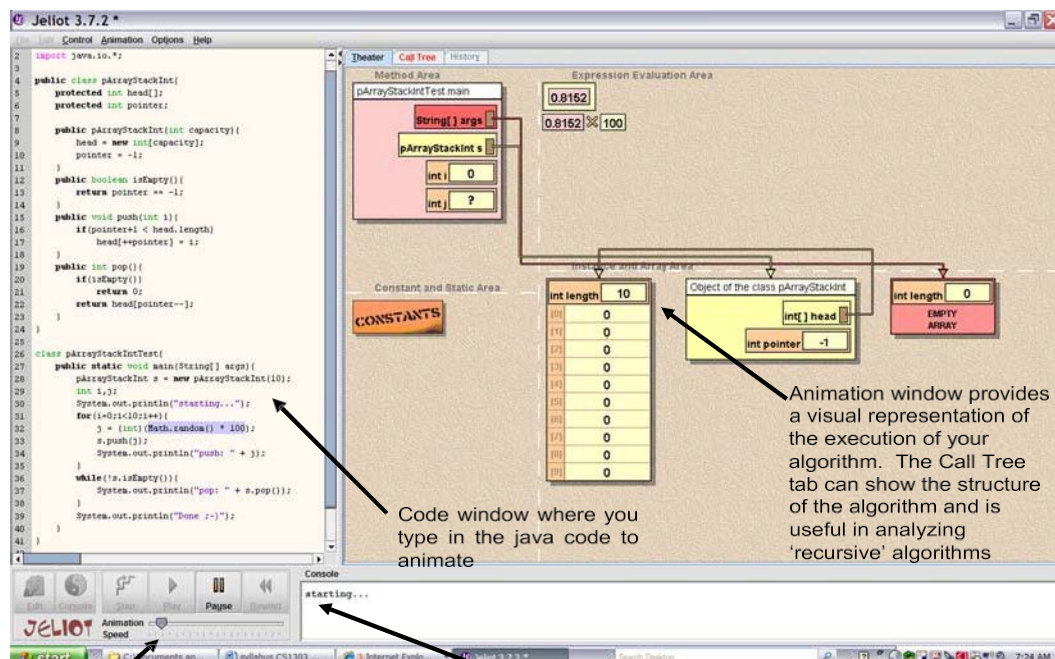
- This course is designed to be collaborative. Your interaction with your peers (other students in the class) should not be focused on providing an assessment of their work, but rather to collaborate to improve our collective understanding of the course material. As such feedback is MORE important than assessment. You should be providing feedback in the form of explanation, assistance, best practice sharing, and other forms of collaboration. Your instructor will be looking for these activities and a portion of your grade will be determined based upon the level of collaboration and peer interaction that you engage in.

- In unit two we will begin to explore the concept of Asymptotic Analysis. This subject has been described as the most intellectually challenging concept in computer science. We will learn to conduct Asymptotic analysis in unit two of the course; however, it will remain a focus throughout the entire course and will also be a subject for further study in the Analysis of Algorithms course. The expectation is that students will collaborate to build their understanding of Asymptotic analysis. Postings for unit 2 will feature an analysis conducted by each student. The expectation of the instructor is that students who have a better understanding will act as subject matter experts (SME's) to students who are struggling with the concept.

Using the Jeliot Tool

- The Data structures and algorithms course is focused on understanding the performance and resource constraints and the impact of different coding techniques in terms of performance and space. As such the focus is on understanding data structures and algorithms in great detail and not in creating complex code. To facilitate this in depth understanding we will be using a tool called Jeliot that was created by scholars at the University of Eastern Finland, School of Computing.
- Our focus in data structures and algorithms is on understanding basic data structures, the algorithms that implement them, and other fundamental data structures. A key focus will be on understanding the performance of our algorithms and being able to conduct an Asymptotic analysis of different algorithms to determine their performance characteristics and their suitability to solve a particular problem. To accomplish this goal, all of our algorithms will be constructed using primitive elements of Java. The Jeliot tool will support primitive elements of the Java language, but does not support many of the class packages that can be utilized in a typical java program. This limitation of the tool is well aligned with the objectives of this course. There are examples and materials on the Jeliot web site that indicate what external classes may be imported and used in an algorithm created within the Jeliot environment, however, be aware that it is very limited.
- One of the nice features of the Jeliot environment is the fact that it can execute directly from a browser. If you are using either Firefox or Internet Explorer, you can execute Jeliot by opening the following URL (<http://cs.uef.fi/jeliot/javaws/jeliot.jnlp>) with your browser. More information including instructions for using Jeliot and projects can be found at the project website at this URL (<http://cs.uef.fi/jeliot/index.php>)

A tutorial for using Jeliot can be downloaded at (<http://cs.uef.fi/jeliot/files/quicktutorial.pdf>). The tutorial explains the local installation of the Jeliot tool. In some cases, if you are using a shared or public computer and do not have the ability or right to install software on the computer, you might want to select the 'Start Jeliot through Java WebStart' option which allows Jeliot to be executed directly from a web browser such as Firefox or Internet Explorer so long as there is a basic Java runtime installed on the computer of version 1.4 or greater. Most systems that are 5 years old or less will likely have this installed. A more detailed users guide can be found at (<http://cs.uef.fi/jeliot/files/userguide.pdf>)



Animation Controls: Edit code, Compile Code, Run Animation. The Slider controls how fast the algorithm is executed which allows you to slow down the speed and watch how the code is processed.

Console window displays any messages or data that written to standard output.

Figure 1.

Figure 1 illustrates a screen shot of the Jeliot tool and highlights some of the regions of the tool and their function. Keep in mind that the animation controls can be very helpful in analyzing the operation of an algorithm because they will allow the processing of the algorithm to be slowed down or sped up and they also provide the ability to rewind and replay steps that you perhaps didn't understand.

The Animation window has several regions that you should understand. In the upper left is the method area which shows the objects created and the methods within the object that are being executed. In the upper right is the expression evaluation area where conditional tests are performed and calculations and their results are displayed. The lower left details any constants (variables that contain a static value) are detailed and finally the lower right is the instance and array area. The instance and array area will likely contain the most items of interest as it contains all of the data items such as variables, arrays, and instances of classes.

Using other Java environments

Due to the limitations of Jeliot and because some students seem to prefer it, we also allow the use of **Eclipse**. **Eclipse** is an integrated development environment (IDE) used in computer programming, and is the most widely used environment for **Java** development. It can also be used for other programming languages such as C, C++, Python, Perl, Javascript. Henceforth, getting familiar with Eclipse will help you in the job market.

Within Eclipse, there are two environments. You have to choose one:

- Eclipse Orion: Eclipse Orion, an open-source Java platform that runs on the Cloud via a web browser. You don't need to install the program in your computer. You can save your work on the Internet. It helps if you are doing your assignments in an Internet Café, or if you have an older computer without the minimum requirements. The link is at <https://orionhub.org>.
- Eclipse Neon: Neon is also a free open-source Java environment. The difference with Orion is that you need to download the environment and install it in your computer. You can download Neon at the following Link, <http://www.eclipse.org/neon/>