

**Calvin College Computer Science
Senior Project Proposal Cover Sheet
CS 396 & 398**

Part I (to be completed by the student):

Name: Andy Meneely **Date:** September 29, 2005

Mentor: Professor Frens

Project Title: Galapagos: A Genetic Algorithm Framework

Is this an Honors Project (yes or no)? No

Attach a description of the project to this application; include an anticipated timeline for the project as well as the minimum expectations for completing the project (e.g., partially working application, public presentation at the end of the year, etc.).

Part II (to be completed by the Curriculum Committee):

Approval of Project Proposal: Yes No

Signed: _____ **Date:** _____

Signed: _____ **Date:** _____

Signed: _____ **Date:** _____

Comments:

Part III (to be completed by the Curriculum Committee):

Approval of Final Project: Yes No

Signed: _____ **Date:** _____

Signed: _____ **Date:** _____

Signed: _____ **Date:** _____

Comments:

Andy Meneely

CS 396

Fall, 2005

Senior Project Proposal: Genetic Algorithms

Note: a website for the progress on this project has been set up at:

<http://www.andymeneely.com/Prog/GA/galapagos/>

Project Vision

In this project, I want to study Genetic Algorithms in two ways: (1) develop a reusable Java framework and (2) study specific applications of Genetic Algorithms by applying the framework to academically interesting problems.

Developing the framework, named Galapagos, will improve my abilities to create well-designed, reusable code which is a easy to use for other developers. Many other reasons, however compel me to work on this framework, mostly pedagogical in nature. The target audience for this project is an undergraduate level Artificial Intelligence class wishing to explore Genetic Algorithms in one or two laboratory sessions. Galapagos will have much more than a programming framework; it will have a reporting mechanism, a graphical user interface for designing algorithms, example accessible as “Example Projects” in the Eclipse IDE, and a set of tutorials with exercises.

Galapagos is being developed along with a set of “pet problems” to serve the goal of research and to test the framework during its development. Some problems are simply trivial and show me if the framework is broken somewhere or if I need to redesign how the framework will be used. Other pet problems will serve an academic end; solving these problems will lead to a better understanding of both the problem and the use of Genetic Algorithms.

It is important to note that this purpose of this project is to develop a framework, explore interesting problems, and communicate my work in the form of tutorials and articles.

Technical Details

The framework is written in Java using Eclipse and the website is put together in Dreamweaver using Cascading Style Sheets. The unit tests are done in terms of trivial problems as a way of strategically testing components of the framework. Unit tests are done using JUnit. The graphical user interface for designing GA's without programming will be done in Swing as well as the SAX XML parser combined with Java's Reflection mechanism and JavaBeans. The reporting mechanism will be done using (tentatively) JFreeChart and JasperReports (possibly using JavaServer pages).

Habits of Test Driven Development are being employed in this project. TDD is where the developer writes the unit test first, then writes the code to actually pass the tests. This forces the programmer to rigorously (that is, programmatically) define the requirements *prior* to writing the code. TDD keeps the programmer on task as well as provides an automated "safety net" for future development.

Resources:

- The entire project can be done in Eclipse, while using books and online tutorials as resources.
- Professor Frens' guidance will be an invaluable resource

Forseeable Issues:

- The project becomes to large and unwieldy to manage

(Very) Tentative Schedule

- By November 15
 - Have the framework polished
 - Have the GUI runner in good condition
 - Have the reporting mechanism designed
 - Have two significant pet problems incorporated (with unit tests)
 - Have the first two tutorials written
- Depending on the emphasis regarding pet problems or the framework itself, some of these goals may require more time to meet.
- End-of-year goals
 - Give a presentation
 - Have all tutorials completed
 - Give a mock laboratory using the tutorials and Galapagos.