CS 537 Programming for GIS

Syllabus and Preface

GIS has its roots in Geography, but its applications are numerous and apply to a very large number of fields, including geology, natural resource exploration, business and marketing, government planning, transportation, hydrology, etc. Traditionally, GIS stood for Geographic Information Systems, but in this class and others the 'S' is for Science, possibly somewhat in the sense of IT, and includes such things as data mining, scientific visualization, good old fashioned programming, applied math and statistics, so forth.

The big goal is to explore the following application package:

Map Objects, Java Edition

NOTE: alternative packages would be JUMP, UDIG, MapWindows (the last one is VB based)

There have been two versions of the Java Edition, MOJ10 and MOJ20, or if you prefer, MOJ 1.0 and MOJ 2.0. We will usually just abbreviate by MOVB or MOJO. The MOJO versions stopped with 2.3. JUMP is also known as OpenJUMP.

Map Objects is distributed by ESRI, a GIS company in Redlands, CA.

Brief History of GIS software from ESRI:

ESRI originally produced ArcInfo, essentially a UNIX platform package of GIS software which is very powerful and detailed, but which is not easily absorbed by self study, or other means (a PC version followed after some time). The next substantial product, besides Map Objects, was ArcView, which can be summarized as GIS for your PC. This is a typical GUI application with lots and lots and lots of menus and tools on the screen. The current version is ArcView 3.3. Arcview was for years the 'flagship' ESRI product.

This millenium, ESRI released a new flagship product, ArcGIS, which in its full blown version contains something resembling ArcVIEW, but known as ArcMAP, and a version of ArcINFO, called ArcINFO. ArcGIS can be 'customized' with VBA or ArcObjects or Python.

Many of the texts in this area are published by ESRI, and tend to ben low level guided tours through the software packages, in which the student types exactly what she/he is told to type, and observes the results on the screen. Self-congratulation can follow, like end-zone celebrations follow touchdowns.
At the bottom of the Cover of a Ralston book on Map Objects, VB is the following line:

LEARN TO PROGRAM GIS APPLICATIONS FROM THE GROUND UP

That is a terrific summation of the Map Objects culture. You start with little and build up what you want exactly as you want it. With a flagship product you start with more features than you can possibly use, try to select what you want, live with that exactly as it is, and try to conceal what you do not need. Customization with a flagship product is possible, but non trivial. But customization with Map Objects is limited only by Java, which is not very limited at all.

The course begins with general information about gis, old friends like latitude and longitude, and a fair amount of new material on other coordinate systems, projections, datums, etc. Then we cover Map Objects facilities outlined in the list below.

Among the topics we will cover are:
- tocs (lists of the 'legends' and 'layers' used in a map)
- home made tools and toolbars
- adding a print facility
- adding new menus
- the resizing problem and possible solutions
- status bars
- displaying attribute data in nice ways
- making new layers from scratch
- changing layer order nicely
- adding distance measurement
- selecting layer subsets, and creating new shapefiles from them
- choropleth maps: quantiles, natural breaks, equal intervals;
  programming concerns
- unique value colored maps
- special marker symbols (true type fonts)
- accessing the o.s. from java
- accessing he web from java
- deployment by java executable jar files, or other means
- achieving relative addressing in an application, even when presented
  in the form of a jarfile
- controlling closely the initial rendering of map layers when the
  application is started

Intermixed will be a considerable amount of material about Java:
- inner classes
- interfaces and adapters
- threads
- awt and swing
- jar files and executable jar files
javadoc
checked exceptions and error handling
so forth

Class notes: somewhere around 235 pages on Map Objects Java Edition written by the instructor. These notes are available at Cal Copy.

Grading: 3 midterms each worth 25% and hw worth 25%

NOTE: the purpose of the syllabus is to state the syllabus. There is no attempt to let you decide which weekend you can plan to go to Yosemite because there is guaranteed to be no exam the following week.