PROJECT SUGGESTIONS

Exploratory statistical mapping:
Here the idea is to extend the choropleth mapping/data classification capabilities of ArcView to provide users with a flexible tool for exploring data. In all cases, your application should: (a) prompt users to select a theme and a data table and have the system Join the two, (b) allow users to interactively select which field or fields of data they want to view and to specify the number of classes and a class break scheme for a choropleth map, (c) allow users to enter (or select) a pair of colors to ramp between as a first look at the map. Beyond this basic mapping operation, your application should address (in more depth) some aspects of one or more of the following issues: data classification, color schemes, depiction of multiple variables, (or multiple times), and or integrated exploration of spatial and attribute information. Each is discussed briefly in isolation below, but your are welcome to consider some combination of issues as an alternative to focusing on a single topic.

Data classification:
One option here is to implement an interactive classification procedure similar to the one you can read about (Haug, et al: see me for a copy). One useful feature to include (that builds upon your previous lab) is for the system to respond to user manipulation of class breaks, not just with a map, but also with a cumulative frequency chart. An alternative option here is to implement contiguity-constrained data classification (a clustering algorithm that groups enumeration units that are both similar in value and near one another). A third option is to generate an "uncertainty" map that helps users see where on a classed map the representation is questionable and how questionable it is (uncertainty might be measured as by the standard deviation of the class that each enumeration unit falls in and it might be represented with a bivariate choropleth color scheme or an overlaid graduated circle map).

Color manipulation:
The primary suggestion here is to implement Brewer’s set of color schemes and provide a mechanism by which the system picks an appropriate scheme for the data (perhaps using responses of a user to a set of questions about the data and what the user is interested in using the data for). See Brewer's chapter in Visualization in Modern Cartography, (I have a copy I can loan you). An alternative to this option might be to develop an interactive tutorial for teaching users about cartographically sound color selection.

Multi-variate mapping:
For this topic, one option is to implement a method for generating bivariate choropleth maps. See pp. 91-94 of MacEachren, SOME Truth with Maps (I have a copy I can loan to you) and the paper by Brewer mentioned above. The user should be given a range of choices for:
   a) number and kind of classification,
b) bivariate symbolization schemes that use color attributes for both variables or color for one and some other symbolization method (e.g., textures) for the other, and
c) merged maps versus side-by-side maps. You might even try tri-variate maps.

**Time-series mapping:**
here the problems are similar to multivariate mapping -- the comparison of multiple maps, but the problem is conceptually different because the emphasis is on a sequence of change over time rather than just differences between two or more variables. There are various kinds of views that users may want to see, and you should include at least the following two: (a) "small multiples" a set of time slices arrayed in small windows at the same time, and (b) map pairs compared to maps of change between the two times.

**Projections**
Here the object is to provide users with a flexible tool for making use of, or learning about, ArcView's projection features. Three options are suggested, a tutorial, a tool that compares projection properties mathematically, and a tool for helping users select a projection. It would be possible to combine aspects of each -- and you might also consider adding new projections of your own.

**Tutorial:**
The object here is to develop an application that teaches users about a series of projection concepts in a highly interactive way. Users should learn about projections not simply by being lead through a set of rules but by being prompted to explore options and see what their impact is and to respond to questions (perhaps presented as multiple choice) that reinforce what they are learning. The application must be designed to have a clear structure that leads users through it in a specified way (perhaps with the potential for side-trips to explore things they are curious about). At the least, issues of distance, angular, and area distortion should be covered as they relate to projections designed for global and regional mapping and to choices of projection origin.

**Distance distortion assessment:**
Here the goal is to implement a procedure that compares different projections, and/or the same projection with different parameters specified, for distance and/or area distortion. The method would involve using a small set of distortion diagrams to represent area/angular distortion or a larger set of point locations for which distance (as displayed) was measured and compared to true distance -- with the difference summarized.

**Selection guide:**
For this option, the goal would be to create an application that leads a user through a tightly structured series of decisions that result in an appropriate projection choice for a specific application. This option requires identifying or creating a set of projection choice rules and creating a set of user input prompts that allow the rules to be applied to real projection choice problems.
**Hardcopy output map design:**
This option focuses on design issues associated with preparing a map for hardcopy. Emphasis is on implementing a variety of Layout options in a flexible way that allows a user who knows little about map design to end up with a reasonable map. Thus, the application should lead the user through a series of choices, providing choices in some cases and using answers to questions to make choices automatically in other cases. This option might be combined with some of the data classification components in the data classification option above.

**Digital atlas:**
The goal here would be to implement an system and interface that would help people plan trips, find facilities (e.g., gas stations) while traveling, etc. You might model the operations to 'include after one of the CDROM or WWW atlases that have become popular.

**Site selection:**
The goal would be to implement an application that prompted users to load a variety of themes relevant to a particular site selection decision, weight each theme's importance in the decision, and generate a result map that categorizes places as good or bad choices for the location of some facility. In addition to generating an answer, the application should facilitate "sensitivity analysis" (experimentation with theme and weighting choices to see how much impact particular changes in input parameters can have on the final decision. Some mechanism to facilitate comparing two results would also be useful.

**Grid Theme Exploration.**
The goal would be to create an environment that allows a user to explore a set of spatial analysis parameters like methods of interpolation, calculating viewsheds, or determining erosion potential from slope, aspect, and soil type themes. One example might be developing a tool with which a user may select a point on a topographic display (say from Tussey Mountain) and all mountains (or parts of mountains) and valleys in view would be highlighted.