Background: We studied Bezier Curves that are useful in computer aided design and we studied cubic spline interpolation. A generalization of these two notions is that of a B-spline (or basis spline). What are the advantages and disadvantages of using higher order splines? What are the advantages to B-splines over Bezier curves?

Project: Develop a numerical software package that will generate a parametric curve using a B-spline. Use multiple degrees of B-spline to generate approximations for various images. It is beyond the scope of this project to have your software read an image and determine the locations of the points. Instead, do this portion manually. For example, take an image like the block U logo and put a grid on it. Determine the locations of important points along the edge and what the slope of the tangent line would be or the other necessary information for generating a B-spline. Then your software should take this information and generate an approximation to the block U outline. Do this for a few images with varying texture (lines, curves, complicated outlines) and compare the performance of your different degrees of B-spline. First, start with Bezier curves since this was explicitly detailed in the text and in class. B-spline algorithms and theory can be easily found a slightly more advanced Numerical Analysis text from the library.

Paper: Write a paper detailing the mathematics behind your software including any mathematical preprocessing included in your algorithms. The paper should also include necessary background to state the problem, a concise statement of the problem being addressed, a description of the software package including an error analysis, tests on known data, and a performance comparison of the various functions in the package. A brief users guide (i.e. instructions on how to run your software) should be included as an appendix.

Presentation: At the end of the semester, your group will give a 7-10 minute presentation on this project.

Peer Evaluations: Peer evaluations will be emailed to me by the individuals. Each student will numerically rank the participation of the group members and provide a written account of who did what during the project. Each group member must write at least one routine in the project to receive any credit for the project.