**Coding Design and Implementation**

For my Final Project Design, I decided to make a calculator. Since I did not know anyone in this class, I worked by myself on this project. At first, I wanted to make a keypad like calculator that usually comes to mind when you think of a calculator. To do that, I would have had to make a push button for each number, each method of operation, and the clear function. After working on this for some time, I realized the complexity of the function I was going to have to create. This is why I decided to make edit boxes for only two numeric values, which still allowed the function to accomplish the goal that I strived for (to carry out math operations of numbers). The next thing I decided to change from the normal visuals of a calculator, was a popup menu which allows the user to choose their desired math operation for their two numbers. A popup menu was new territory for me, with respects to the callback function needed to carry out the math operations. At first I tried assigning the method of operations to the numbers based upon the strings of each one of the popup menu options, which did work. I realized a popup menu callback differed from a pushbutton callback in the fact that I needed the inputs hObject and eventdata, and also needing to compare and use the values of my popup menu instead of the strings. For example, the first method of operation listed is ‘+’. Instead of writing my if statement to ‘+’, I needed to create a variable(op2) which held the values of the popup menu and relate ‘+’ to a value of 1. If this statement was true, the function would add both of the numeric values together. Also in this callback function, I needed to translate my strings into numbers before the operations, and then change the strings back into numeric values after in order for my answer display string to be able to display it. During this final project, I received assistance from Miguel Moreno, who approved my project proposal and also helped me through some of the problems I encountered when working on this project. During the problem with my callback function, Miguel worked through the popup menu problem, which is something that he never encountered before either. For my second push button, I decided to add the option to clear both of the numbers you wanted to use in a math operation and be reset to zero. I believe this is a useful addition to the design of my code, so it would be easier for the user to not get confused when doing more than one set of numbers. I also implemented a piece of code, where if the user were to put anything besides numeric values, they would receive a message that reads that their inputs for their numbers are insufficient. This was done by checking to see if the arrays were blank after using str2num on my strings. To check this, I used the built in MATLAB function “isempty” which I have never used before. In total, my GUI function includes two edit boxes, two push buttons, and a popup menu for the user to use. This allows the user to carry out addition, subtraction, multiplication, and division of any two numbers. In the future, I could see myself using GUIs to create cool applications. I had a lot of fun in this final project creating my calculator and was really of proud of how it turned out, even though I know it is pretty simple. If I were to get better using Matlab and all of its functions, I believe I could build some really useful tools for others in the future. As I go into higher level math classes, making a system of code that is able to solve higher level problems would be very fascinating. Although I know there is probably someone who has created websites that already do this for many operations, such as Symbolab, I would be interesting in creating my own code to do these things. One thing I noticed during this final project, is the built in GUI creator that MATLAB has built into itself, which you can access by simply typing guide into the command window. During my approval of my proposal, I asked Miguel about this feature and if I could use it because I thought it would save me time, but he strongly recommended me to not use as it defeated the purpose of the class and final project. I believe if I figured out how to use this more efficiently, I would be able to create much better GUI’s, with more complexity in a timely matter.