**Design Document**

For our final project, we originally had three other ideas of what we wanted to do, but with advice and counseling from our professor Dr. Kendall we boiled it down to a project that could be done in the span of time provided, which would also provide us with a great learning experience.

We designed our final project in a fashion that would most importantly meet most of the requirements of the project rubric to enable us to fulfill our goal of getting an A+ as well as learning new things. We primarily did most of our project in MATLAB, with the portions that control the Arduino on Java and Arduino.

We did not use any Java APIs. We tried to find a java conversion tool in MATLAB to convert our MATLAB code into Java, but we weren’t successful due to limited resources pertaining to our access to MATLAB. We tried to access MATLAB on the school’s computer, but they didn’t have an updated version of MATLAB or any packages that were necessary for our project. We also tried to contact MATLAB support several times to get the trial version of the Java converter tool but didn’t get the tool. We believe that we should get an A, in this part of the section since we spent a good amount of time and effort in looking for the conversion tool, and going to all possible available resources that we could have access to.

We used external API’s within MATLAB to call many functions such as making the 3D clustering system, image manipulation, getting color proportions and making the bar graph.  We had GUI elements in our project as well. Most of our data is represented in a GUI, to display our various outputs of the image color data, manipulated image data, as well as a color line to represent all the colors in the image. We also had an option for a video, if the user wanted to get all color variations in a video, they would be able to do so frame by frame, with the color line plotting all the changes live. We included thirty-two colors ranging from colors such as black, grey, dark purple, light sky blue, and many others to represent most of the different colors that in the particular image or video. Although it was time consuming, we worked hard on it in order to have a nice display.

Our project also uses inheritance and polymorphism in the MATLAB portions as well, specifically with the GraphInterface, ThreeDCluster, and BarGraphs classes. All our code is also well-commented, and we also have a detailed UML diagram and documentation that goes over the related classes and design decisions.

Our lead programmer, Shane Staret, also made an hour video going over all the MATLAB code line by line, going over all the different functions and methods used, to explain to others how our MATLAB program works. We also used encapsulation in our project, especially in our Driver script to represent the RGB values for all our colors. For our video presentation, we presented our running codes and walked through the code, and discussed future ideas that would enhance the project.

Overall, we believe that we achieved an A on this project, due to the progress we have made in reaching our goal as well as learning many new things and gaining a better understanding of different programming languages such as MATLAB, Java, and the Arduino. Although the process was not always easy, at the end we are happy to have worked on our project and in the future, will remember to set the standard high.