The purpose of this project is to study color image processing and image compression.

1 Color Image Processing

(a) Write a program to perform spatial filtering of an RGB image. You can fix the size of the spatial mask at $3 \times 3$, but the coefficients need to be variables that can be input into your program. Test your program using a blurring filter and a sharpening filter. Note: The filter has to be applied to each channel.

(b) Write a program that converts an RGB image into a gray level image.

(c) Write a computer program for computing the intensity histogram of an RGB image. Implement the histogram equalization technique. Show the results on three different Color Images.

(d) One way of Image compression is to convert RGB image into YCbCr space and then sample the Cb and Cr components (A method known as Space Sampling). The idea is that you can assign the same value for Cb and Cr for an $n \times n$ subblock. This value can be the average Cb or Cr for that block. Implement this technique for $n=2,3,$ and $4$. To display the image, you have to convert back to RGB space. Comment on the results.

2 Image Compression

(a) Implement the LZW technique. Test your results on two different PGM images and compute the compression ratios.

(b) Write a computer program to
   1) Divide an image into 8x8 subblocks
   2) Perform the DCT transform on every block
   3) Retain only $m \times m$ coefficients within each block (i.e set other coefficients to zero).
   4) Perform Inverse DCT.
   5) Combine the blocks and display the image.
   6) Calculate the MSE between the original and reconstructed image and the compression ratio.

Apply the above steps on two different images for $m = 8, 4, 2$ and $1$. 