**TASK 2: FEATURE CALCULATION**

**Assessment Overview**

The need for trying out this assessment is the application of the theories acquired through class lectures to make up the assessment, thereby improving my knowledge and skillset needed to solve problems relating to computer vision-related tasks as it affects society.

**TASK 1**

**1.0 Introduction**

The intent is to demonstrate how spectral features (frequency and spatial space) can be used to differentiate between images with different textural characteristics. Feature extraction as the name implies translating raw data into numerical features.

**Inverse Fourier Fast Transform**- computes the inverse discrete Fourier transform of Y using a fast **Fourier fast transform**- computes the discrete Fourier transform (DFT) of x using a fast Fourier transform (FFT)

**Feature extraction in special domains**- The process of translating raw data into numerical features that may be handled while keeping the information in the original data set is known as feature extraction.

**Gray Level Run Length-**

**Gray Level Co-occurrence matrix (GLCM) -** The gray-level co-occurrence matrix is a statistical approach of assessing texture that takes into account the spatial interaction of pixels.

**1.1: Implementation steps**

**Step 1:**

I have deep reflection on the topic “feature extraction and its calculation”. I read literatures and made some personal research to get a detailed explanation of the concept.

**1a) Uploading the dataset:** I downloaded the file (ImgPIA.jpg) and save the image in the MATLAB current folder. Then, I uploaded the image to my MATLAB environment and created a pathway for the image to be readable by MATLAB. Meanwhile, I observed that while I tried to load the image before its conversion to gray, it could not load until I applied the rgbb2gray function which aided me to convert the color image to gray. The image can be seen in figure 4.

**2) Reading of files**

**I segmented the image into four pieces to get it into a smaller size, and this sub-image (smaller size) represented different textures within the main test image (ImgPIA.jpg) seen in figure 5. From our assessment note, I applied the Fourier Fast Transform and Inverse Fourier Fast Transform that was given and I observed the changes made for the final image to be presented. This was shown in the diagram in figure 6, figure 7, and figure 8 respectively in the appendix. I tried first with the inverse Fourier transform and replaces it with both the Fourier transform, and the inverse Fourier transform simultaneously, and I got the effect of the changes made. Figure 5 shows when I loaded it with a Fourier fast transform. Figure 6 shows when it was replaced with an inverse Fourier fast transform, and figure 8 shows when both the inverse and Fourier fast transform was applied. All the images produces algorithm and amplitude values as shown in the diagram** (Ans **=** 5.158801618675188e+00, Ans = 10136717)

**2) Operations on the IMAGE**

**Converted to grayscale:**I converted the images from the color RGB to grayscaleto eliminate the hue and saturation information while retaining the luminance. I selected the features for both radius and direction using the graycomatrix function provided in the workshop thereby tweaking the radius at different value from (1 to 4) in the direction of 0, 45, 90 and 135 degree respectively and printed the output as they offset in different angle and radius a shown in the figure 9, 10, 11, 12 &13 and plotted a table of the degree and radius using a table function. This can be seen in table 2.

**TASK2**

**Converted to grayscale:**I converted the images from the color RGB to grayscaleto eliminate the hue and saturation information while retaining the luminance. I make use of the graycocrops function from the workshop to display some of the features suggested by Haralick. I also went further to consult some literature which had to give me other knowledge of other features in addition to the Haralick book on Texture analysis. My result and reference were presented in the appendix and reference section. I make sure I tweak the bit-depth of the image using the specified bits as shown (4 bits, 6 bits and 8 bits) on the assessment booklet. I did for the Gray Level Run Length (GLRL) and observed that for each time when I run the GLRL feature (Short Run Emphasis, Long Run Emphasis, Gray level Non- Uniformity, Run Percentage, Run-length Non-Uniformity, Low Gray Level Run Emphasis, High Gray level Run emphasis), I notices that the values changes. My result were presented in the table section of the appendix. The processed is known as image quantization.