UCCC3053 Assignment
Flag Recognition & Detection

The task here is to create a system to recognize a segmented (isolated) flag and later detect (segment and then recognize) a flag. Students can work in groups of 2 members. 287 test images with noise are provided in the file "287 world-flag.jpg" and shown in Figure 1 too with 18 rows and 16 columns. To make it complete, one can add in the flag of Penang (Figure 2) to the image set.

Figure 1: 287 flags.

Figure 2: The flag of Penang.

1.   **DETAILS**

Design and implement using the learnt <u>image processing techniques</u> an automatic flag recognition and detection system using C++ and OpenCV. You should not use other techniques such as Deep learning to complete this assignment. The details include:

a) Take randomly two consecutive rows (of 32 flags) from Figure 1 as the noisy test images (upon agreement/approval from the lecturer such that your input data set is different from your friends') for your work. Let this set of images be <u>*set A*</u>. You should manually separate each image out as one test image.

b) Get clear images such as Figure 3, for example, from the Internet as the training models. The images should be corresponding to the selected test images in set A. Let this set of images be <u>*set B*</u>.

c) Get an image with some background such as Figure 4 from the Internet as a new test model. One should get at least one such image with respect to each in set A. Let this set of images be <u>*set C*</u>.

d) Test your work first with the images from set B (Test 1), then set A (Test 2), set C (Test 3) and finally test your system with yet other two consecutive rows (of 32 flags as Test 4) from "287 world-flag.jpg".

e) The operation should run in real time and take less than 1 second on any of the lab machines for each image.

Figure 3: The flag of South Africa.

Figure 4: The flag of South Africa with background.

2.   **REPORT**

You need to write a report for your work. The report can follow the template file "FYP2_Report_Template_CS"		from		the		FICT		FYP		web		site		at

https://fict.utar.edu.my/FYP/main.php. (chapter 2 is not needed) It should include the followings:

a. W^{5}H: This represents the terms What, Why, When, Who, Where and How with respect to the assignment title. Usually, we pay more attention to what, why and how. In this report, you need to provide and explain what is the system design (i.e. the system block diagram or flowchart), why this design and how each of the details work together to form the final system.
b. Experimental result and error analysis. In addition, under what conditions will your system fail and why?
c. The source code listings listed in the appendices.
d. Choices of thresholding and tolerance parameters. Give reasons to justify your choices.

Other small but important details that you should know are:

a. Excluding the code and intermediate results shown in the appendices, the written report should not exceed **50 pages** with font sizes 10 to 12 using font Times New Roman. (A 20 pages report is good enough.) A long report might imply that you are not able to do summarization and hence producing a second-class report (should be penalized).
b. Report will be graded on **clarity** and **authenticity**.
c. Each report section and source code section should be tagged with name of the group member who produces the writing and / or the implementation.
d. University regulation prohibits **plagiarism**. If caught, you will end up with an "**F**" grade.
e. Late project **will not be** accepted after the due date under any circumstances.

3. **<u>PRESENTATION & DEMONSTRATION</u>**

Besides the report, you are required to provide a short video of presentation of your work and demonstration running your code and displaying the results. In addition, a readme file for me to test run your work. The readme file should capture the method for system installation and way to run the code. You should test run your code in the lab machine in order not to miss out any step or source code files prior sending them to me to test run it on my office PC. Marks will be deduced for missing files and steps.

4. **<u>MARKING</u>**

In total, 100 marks will be awarded.

a) A well written report,
   i. Follow the FYP2 report writing format (chapter 2 is not needed) to explain what the system design (i.e. the system block diagram or flowchart) is, why this design and how each of the details work together to form the final system.   (65% of 36 marks)

ii.   Experimental result and error analysis.   (25% of 36 marks)
iii. Choices of thresholding and tolerance parameters. Give reasons to justify your choices.   (5% of 36 marks)
iv. Report is within 50 pages long, excluding the code and intermediate results shown in the appendices.   (5% of 36 marks)

                                                              (36 marks)

b) Work fine in Test 1.   (16 marks)

c) Work fine in Test 2.   (16 marks)

d) Work fine in Test 3.   (16 marks)

e) Work fine in Test 4.   (16 marks)

5.   **HINTS**

One can find numerous pieces of demo and code using OpenCV from the Internet to segment traffic sign. You can refer / reuse them for your code but a translation to C++ and OpenCV is needed. Cite the sources in your report if you reuse or adapt their code.