# Assignment 3 – Recognising gestures from images

Write a program in C or C++ using OpenCV that recognises gestures for the ASL gesture set for the digits. The program should *segment*, find the *contours* and compute the *Fourier Descriptors* for that contour, and then classify it to one of the 10 digits. The segmentation can be by colour (Hue) or by thresholding a greyscale image considering ideal conditions to segment the hand (see below). You are allowed to use the contour function found on OpenCV. Information about the Fourier Descriptor is found in the frequency domain chapter.

Given a set of training images, you need to implement and train a simple classifier able to detect the 10 different gestures from the ASL set. The gestures are shown in the figures below.
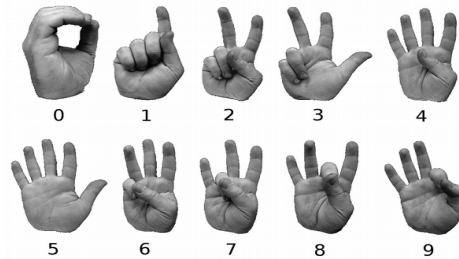
If the program takes one argument, e.g.:   `./gesturerecognition image1.png`
then it processes a single static image. The program should print the corresponding gesture on the resulting image.
If no arguments are given, then the program should enter in dynamic mode and use the web-camera. The program should show the fps and the gesture classification (use the function cvPutText() to achieve that, use the same camera code sample available on Stream).

The classifier:
You can use any machine learning algorithm you want. OpenCV has several options in the ML module (e.g., `ANN_MLL` for a simple neural networks, `Boost` for a simple AdaBoost binary classifier, `SVM` for support vector machine, `RTrees` for random trees. If the classifier method only works with binary samples, then the final classifier should be formed by 10 binary classifiers using one-against-all training. Otherwise, just use the multi-class approach. See http://docs.opencv.org/modules/ml/doc/ml.html) for more details.

You will find a *training* set at http://www.massey.ac.nz/~albarcza/gesture_dataset2012.html. All ASL gestures for different hands and light directions are represented in the dataset. You can find a (very) small static *test* set on Stream. You should also test with the camera against a constant background.

Assumptions:
1. The images present one (and only one) hand at a time.
2. The background is not cluttered with noise, and its colour makes it easy to carry out colour segmentation, the illumination does not cause segmentation problems.
3. The digits are represented by the ASL standard, with upright hands, with some rotation.
4. The size of the images are arbitrary, as well as the relative size of the images and the hand. For practical reasons, use always an image size of 640x480, and assume that the hand occupies a significant portion of the image, large enough to be considered the *largest blob* after a simple colour segmentation.

The assignment is worth **10 marks:**
5 marks for static images. Marks will be given for correct classification.
5 marks are for the dynamic version of the code. The image should show the fps and the gesture found for each frame. Marks will be given for correct classification (and its stability) and for performance (the fps should be above 80% of the fps without any processing).
Extra marks: a robust segmentation for the hand using the web camera (random and noisy background).
Submit your assignment on Stream by the due date. Late assignments lose 10% per day after the due date (unless you justify the delay with the lecturer). **DUE DATE: 26/June/2020**