

# Assignment 4-- Final Project

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## Problem Description:

In this problem, we are given an image from Pokémon go game. Our task is to recognize the Pokémon, its CP, HP and stardust. We also must find the level and center of circle for the progress arc.

## Algorithm:

### Pokémon ID finding:

- Take the input image.
- In all images, Pokémon is located at same relative location and hence we can extract a rough patch from image.
- Once we extract this patch we use 2 type of features, namely the resized image patch and color feature.
- First extract the color features. For color feature, we separate the image's 3 channel and then find histogram for each channel.
- Once we find histogram we save it in matrix. Repeat this for all images and append all histogram in matrix.
- Second resize the image patch and use it as feature. For this convert the image in grayscale. Save the patch in separate matrix. Repeat this for all images and append the patches to matrix.
- Now we have two feature matrixes one for color and another for image patches.
- Run 2 separate K-means on both features and get the centroids.
- For every image find bag of word vector for each feature type.
- Append both the vectors to form single vector.
- Repeat above for all images.
- Train a classifier. In this I, have used SVM. I have used `fitcecoc()` function. This is a multiclass classifier which uses series of SVM for classification.

#### Bag of words:

- For each extracted feature of an image find the nearest cluster centroid and assign it to that feature.
- Repeat above for every feature vector for that image.
- Count the frequency of each cluster centroid and save the frequency in a vector.
- Repeat above steps for every image in training data.
- Save all the frequency vectors also known as bag of words vectors into file for further use.

#### Extracting Features:

- Extract Features from each image and store it in matrix.
- Train k-means with k value, where k is number of clusters we want to divide the data into.
- Save the extracted features.

#### Center of Image:

- Center of the arc is found by using percentage of the Row and Columns of a image. The center is located at relatively same location in image. So, we can use the Row and Column to find it.

#### Character/Digit Recognition:

For this project, we are required to find the CP, HP and Stardust value. All these values are located at different places in image and can be roughly located. To extract the digits from This we need to first find out the which location represents what. Once we know the location we can then extract the Digits.

#### Algorithm:

- This algorithm works by template matching.
- We have templates of all digits from 0 to 9 and character C, H, P stored as binary images.
- We then extract the image patches from the large image.
- This patches are passed to the OCR function

- The OCR function first converts this patches to binary, the finds out the number of Areas.
- For every area, we find out a bounding box around it and extract the portion.
- Later we compare this extracted portion with the stored templates.
- We take the Highest score and return that digit. We also compare this with template C, H and P to remove any character that might have also cropped with image.
- We then aggregate the digits to form number. The number formed in in reverse order so we flip it.

Some of the stored templates looks like:



Accuracy:

The Pokémon classification accuracy is about 68.79 %.

The CP accuracy is: 0.41

The HP accuracy is: 0.12

The stardust accuracy is: 0.0142