Final Project: Image Classification System

Universidad Carlos III de Madrid, Multimedia, Year 2018-2019

### Autors

Name 1 Last Name(s) 1 - Name 1 Last Name(s) 2

### Assigned Class

TIE Interceptor / Cloud Car / N-1 Starfighter / Carguero Corelliano

### Chosen Classification Model

K-Nearest Neighbours / Support Vector Machine

### Upgrades Implemented

Upgrade 1 and/or 2 and/or 3

# Development

## Preprocessing

**P1**. Is the segmentation correctly performed in all cases? In case of a negative answer, why do you think Otsu’s method fails to discriminate object from background?

The segmentation is performed correctly in many cases, but not in all of them. That happens since Otsu’s method need the image to have its colours distributed in a bimodal way, having two significant peaks. When that does not happen, this method is not so good for the segmentation.

**P2**. If the current scenario required multiple object identification, ¿which technique could be employed for such a task? Explain briefly that technique.

*Answer*

**P3**. What was the main benefit of the opening operation?

*Opening the image allows to decrease the noise by erasing some small objects found in the background (or black part). In our tests, we also found that when the white part of the image is bigger than the black part, applying the opening operation reverses the colours.*

**P4**. If we set the radius of the structural element too large for the opening operation, what risk do we take?

*If we set the radius too big, most likely we will get important parts of the object in the image removed so we will loose the shape.*

**P5**. Why was the closing operation useful?

*The closing operation reduces the noise inside the body of the object (or the white part) by removing the small objects found there. This, combined with the opening operation leads us to having an image with two really differentiated parts, background and foreground. This way, the shape of the object is more noticeable.*

## Feature Extraction and Normalization

**P6**. What advantages does the HSV colour space offer with respect to RGB?

*Answer*

**P7**. What would happen if we tried to extract this feature for the whole image, i.e., without previously applying segmentation and morphology preprocessing?

*Answer*

**P8**. What measures can be taken so that image size does not affect the shape feature?

*Answer*

**P9**. How would a bad object segmentation affect the extraction of generic features related to shape?

*Answer*

**P10**. In your opinion, what is the most useful feature regarding the discrimination of the spaceship assigned to your group? Justify your answer and use figures to support your claims.

*Answer*

**P11**. Taking into account what was done in Stage 3, mention at least 3 additional features (one of each kind) that could be extracted for this system. Justify your choices.

*Answer*

## Classification. Training and Evaluation of New Samples

**P12**. Explain the algorithm for classifying new samples followed by the K-NN method.

*Answer*

**P13**. For this particular case, what would happen if we set a value of *K* equal to the number of samples available for training (*K=56*)? Why?

*Answer*

**P14**. Why are we forced to used the same normalization values we used during training?

*Answer*

**P15**. Why can’t we use the same set (e.g. our whole database) for training and testing?

*Answer*

**P16**. ¿What risks do we run by setting a training set too small? And by setting it too large?

*Answer*

**P17.a.** In case K-NN was selected for classification, why do you think the model can only set fixed values of +1 and -1?

**P17.b.** In case SVM was selected for classification, what do you think the variability of the score values mean?

*Answer (only one option)*

## Assessment of the System

**P18**. In your own words, describe what each of the presented metrics mean for our case of study (spaceship discrimination system).

*Answer*

**P19**. Taking into account the obtained results (specify them in your answer), do you consider the performance of the system to be acceptable? Why?

*Answer*

**P20**. Discuss the relation between the curve displayed in the figure and the values obtained for and .

*Answer*

**P21**. If the AUC gave a value of 0.5, what would this imply?

*Answer*

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# Annex: Preliminary Report

## Introduction

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## Technical Solution

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## Performance

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## Conclusions y lines of work

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