Image Processing and Computer Vision

Task 1:

Affine and Non-Affine:

Upon conducting an affine transformation, collinearity is maintained. Collinearity is when a group of points previously belonging on the same line, are all placed on a line after transformation. An Example of an affine transformation would be scale. [1]

On the other hand, non-affine transformations occur when manipulating the third row of the transformation matrix (z). An example of this would be a perspective transformation. [2]

To reduce the size of the video feed, a Scale transformation would be used.

Task 2:

Colour-based object detection aims to detect objects based on the colour and analyse and showcase the distribution of colours within given images. The colours are represented by the huge and saturation vectors. [3]

Easier counting of objects is an advantage of this approach, however, to have a correct classification the objects need to be the same colour (if counting cars, all the cars need to be red).

A convolutional Neural Network (CNN) takes an image as an input, assigns weights and biases to aspects/objects in the image to differentiate the objects present. [4] Region-Based Convolutional Neural Networks (R-CNN) and builds upon CNN, R-CNN consists of 3 modules, these being: Region Proposal, Feature Extraction, Classification. [5]

An advantage of R-CNN is its flexibility, this allows the model to be generalized. However, it takes a bit of time to classify, therefore, making it unusable in real-time applications. [6]

YOLO is an abbreviation for the term ‘You Only Look Once’, it is one of the most used neural networks known as it produces high accuracy and processing speeds, due to these results, this neural network is recommended for real-time applications. It works by dividing the given image into a grid to detect an object per grid cell instead of an object per image. [7]

An advantage of YOLO is the fact that it can process frames at a rate of 45-150, producing results faster than real-time. However, due to the grid system it struggles to detect objects which are close to each other. [8]

To develop the proposed system YOLO will be used since real-time processing and accuracy is required.

Task 4:

Two types of image segmentation are: Semantic Segmentation and Threshold Segmentation.

Semantic Segmentation classifies and groups all the objects in an instance.

Threshold Segmentation computes the segmentation through pixel values.

To tackle the segmentation of brake lights for example a threshold of the colour of the light would be set and pixels that are computed below or above the given threshold will be classified. [9]

# Works Cited

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