UFMFRR-15-M

MACHINE VISION

GROUP REPORT

Title

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No.	Name of group members	Contribution to project	Contribution to report
1			
2			
3			
4			
5			
6			

Abstract

This paper is the group work for the Machine Vision course and is divided into ... sections. We present ... in Section 1.

In Section 2, we summarise ....

Afterwards, in Section 3, we present .... In Section 4, we present ...

We describe in Section 5 how to ....

We complete the experiments on ... and summarise the results in Section 6.

Conclusions, references and appendices are included at the end, ...

Contents

List of Figures

List of Tables

1 Introduction

1.1 Background

The rapid growth of ... (Liu, Yan, Tian, & Yuan, 2021).

In view of the above background, we try to ....

1.2 Assumptions

For the detection task in this paper, we assume that:

- ...
- ...
- ...

1.3 Aims & Objectives

We plan to achieve ...:

- ...
- ...

1.4 Challenges

After ..., we recognize these challenges:

- ...
- ...
- ...

2 Related Works

2.1 Conventional Image Processing in Apple Counting

Qilemuge and D (2018) performed ....

Guennouni, Ahaitouf, and Mansouri (2014) used ....

2.2 Machine Learning in Apple Counting

Rahnemoonfar and Sheppard (2017) applied ....

Chen et al. (2017)s' model based on ....

3 Data Acquisition

3.1 Dataset

We utilized the MinneApple dataset, ...

The average object categories and numbers of objects in each image for these datasets are summarised in Tab. 3.1.

Table 3.1: Number of categories contained in each image and the number of instances of each category of the four datasets (Häni et al., 2020)

	MinneApple	COCO	ImageNet	PASCAL VOC
Number of categories	1.5	3.5	≤ 2	≤ 2
Instances per category	41.2	7.7	≤ 3	≤ 3

3.2 Data Quality

We ... Most of the images in the counting dataset are ... and have a resolution ... (Fig. 3.1).

Figure 3.1: Caption (Häni et al., 2020)

4 Methodology

4.1 Approach A——

The pseudocode for ... is summarised in Algorithm 4.1.

Algorithm 4.1 Name

```
Input:
Output:
for every ... do
    ...
    if ... then
        ...
    else
        ...
    ...
    for ... do
        ...
        if ... then
            ...
        else
            ...
        ...
        if ... then
            ...
        else
            ...
return ...
```

4.1.1 HSV

4.1.2 ...

... The expression is as follows:

$$d(x,y) = \begin{cases} 255 & if\ lower\ value \leq s(x,y) \leq higher\ value \\ 0 & otherwise \end{cases} \tag{4.1}$$

where ...

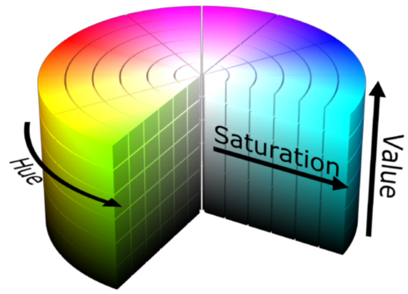


Figure 4.2: Hue, Saturation, Value colour space (source: `https://upload.wikimedia.org/wikipedia`)

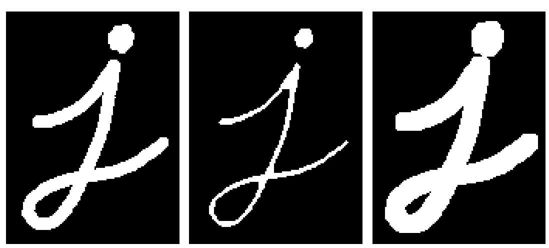
4.1.3 ...

Here you can make some annotations to the equations, see `https://github.com/synercys/annotated_latex_equations`

$$d(x, y) = min_{(x', y')|pixel(x', y') \neq 0} \; s(x + x', y + y') \tag{4.2}$$

$$d(x, y) = max_{(x', y')|pixel(x', y') \neq 0} \; s(x + x', y + y') \tag{4.3}$$

Sub figures.



(a) Original 'i' (b) Eroded 'i' (c) Dilated 'i'

Figure 4.3: Caption

4.2 Approach B——

The network structure...

A PowerPoint drawing template for machine learning models, see `https://github.com/dair-ai/ml-visuals`

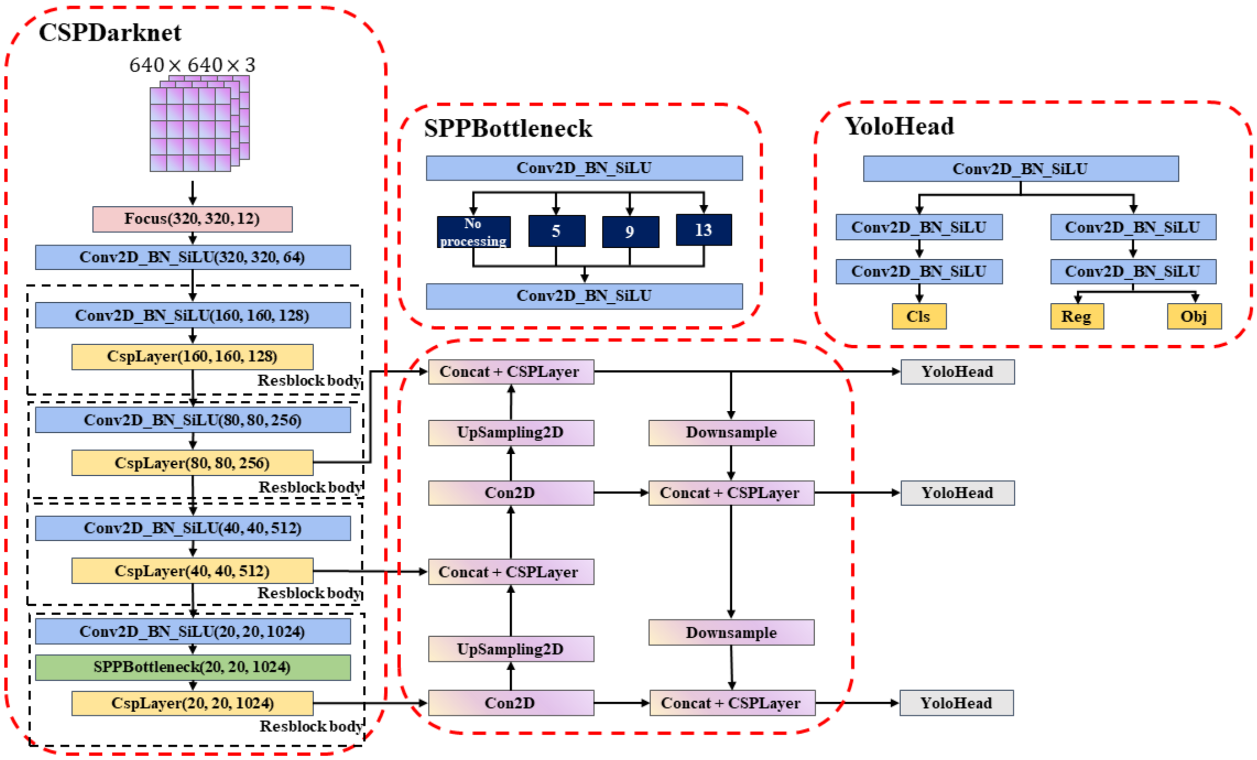


Figure 4.4: Caption

4.2.1 CSPDarknet

1. ...
2. ...
3. ...
4. ...

4.2.2 ...

When the input is $640 \times 640 \times 3$, ...

5 Experiment and Implementation

We executed our experiments on ...

5.1 Experiment A——

5.1.1 Determination of ...

...

5.1.2 Determination of ...

...

5.2 Experiment B——

5.2.1 Dataset preparation

...

5.2.2 Pre-processing of the Dataset

...

5.2.3 Training

The hardware ... and the training hyperparameters are listed in Tab. 5.3 and Tab. 5.2.

Table 5.2: Hardwares and their parameters

Hardware	Parameter
GPU	
VRAM	
CPU	
RAM	

The curve of the loss and the mean Average Precision (mAP) along epochs is shown in Fig. .

Table 5.3: Hyperparameters for training

Hyperparameter	Value
Input shape	
Epoch	
Batch size	
Initial learning rate	
Minimum learning rate	
Optimizer	
Activation function	

6 Results and Evaluation

6.1 Metrics

...

6.2 Results A——

The results of ... are summarised in Tab. 6.4. We achieved ...

Table 6.4: Results of ...

Dataset	Precision	Running time/s
Counting		
Detection		

6.2.1 Result in the counting dataset

...

6.2.2 Result in the detection dataset

...

6.3 Results B——

The results of ... are summarised in Tab. 6.5. It achieved ...

Table 6.5: Results of ...

Dataset	Precision	Running time/s
Counting		
Detection		

6.3.1 Result in the counting dataset

...

6.3.2 Result in the detection dataset

...

6.4 Comparison

6.4.1 Running Time

To be fair, we turned off the GPU acceleration and ... The results are listed in Tab. 6.6.

We found that ...

Table 6.6: Results of the running time tests

	Counting dataset	Detection dataset
Algorithm 1		
... without GPU		

6.4.2 Precision

...

6.4.3 Energy-precision Ratio

... The expression is:

$$\begin{cases} R = \frac{A}{W} \\ W = \sum p_h \times T \end{cases} \tag{6.4}$$

where W is ..., which gives the... in Tab. 6.7.

Table 6.7: The results of the energy-precision ratio test

	Counting dataset	Detection dataset
Algorithm 1		
... with GPU		
... without GPU		

6.4.4 Overall Analysis

...

7 Conclusions and Future Works

In conclusion, ...

Nonetheless, ...

One of the future works is ...

Moreover, we believe that ...

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Appendix A Python Code of ...

```
import ...

Attach your python code here.
```