**UFMFRR-15-M Machine Vision**

**Group Report on Apple Counting in Orchards**

Group: WED 1500 7

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**Group Members Contribution**

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| No. | Name of group members | Contribution to project | Contribution to report | Signature |
| 1 | Manikandan Cheruvary |  |  |  |
| 2 | Samrat Ghosal |  |  |  |
| 3 | Madhurya Mozumder |  |  |  |
| 4 | Adharv Punathum Kandivil |  |  |  |
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| 6 | Sunil Thapa |  |  |  |

1. **Introduction (5%)**

Introduce the background of the project. Illustrate any assumptions made, for example, the lighting conditions you need to deal with in an orchard environment. Clearly show the aim and objectives of this project and discuss the challenges.

1. Related works (10%)

Conduct a short literature review on methods relevant to apple counting. For example, if algorithms proposed in prior works on berry detection/counting are deemed applicable to apple counting, you may include a critical review of these as well.

In later sections, you may use this literature review to assist with justification of your methodology as well as with discussing its capabilities and limitations. You will be assessed on the breadth and depth of the review.

1. Data acquisition and datasets (10%)

Note that you are not expected to carry out any physical data capture experiment. Instead, illustrate the types of image sensors/imaging systems that can be employed to achieve effective apple counting in a real-world application. Describe the process of data acquisition using the sensor(s) of your choice.

Describe the dataset(s) you employed in this project. Discuss data quality, variability, appropriateness for use in this project, and briefly how they were used in this project with reason.

1. Methodology (30% in total, 15% per approach)

Present the approach(es) you proposed. Show technical breadth and depth. Justify the use of specific algorithms. Use flowcharts to illustrate the process if applicable. You are welcome to use any image processing/machine learning approach, however basic it may seem, as long as you can justify it well, e.g. why do you think the proposed approach can deal with the challenges identified in Section 1 and 2. Refer to Requirement 4 for more information.

4.1 Approach A

4.2 Approach B (not applicable to an as a group-of-one assignment)

1. Experiment and Implementation (15%)

Demonstrate that you are able to implement the proposed approaches (introduced in Section 3) using Python programming. Describe the Python IDE/platform/hardware used, core python packages used, how you trained your machine learning model(s) if applicable, parameter tuning/optimisation of key algorithms if applicable. For example, if you used manual thresholding for binarization, explain how you chose an appropriate threshold. If you used deep learning models, explain how you loaded your images and ground truth data; how you split the data for training, validation and testing; and justify the training epochs used. Note that you are not expected to describe each line of your code here. Use flowcharts, diagrams and/or pseudocode where applicable.

1. Results and Evaluation (15%)

Present results; evaluate the proposed approaches (quantitatively and qualitatively) using appropriate metrics; and interpret findings. Make sure you explain how results were obtained and what they mean. Having a method that can detect all apples in all your images does not automatically grant you high marks. Compare approach A and approach B and discuss their respective capabilities and limitations. For a group-of-one assignment, compare your approach with those in the literature. Use your results to support your statements but also explain this from a theoretical point of view.

1. Conclusions and Future works (5%)

Conclude the project. Identify challenges relevant to apple counting (as well as detection and localisation) that have not been fully resolved within the scope of this project. Propose future works to deal with these challenges, e.g. is it possible to employ 3D approaches?

The remaining 10% of the mark is allocated to report presentation including logical structure and clarity, quality of writing, spelling, grammar, diagrams, figures and tables, clarity of expression and use of English, and accuracy, consistency and completeness of citations and references.