

Measuring the size of strawberries using binocular photos

Kris van Melis



Supervisor(s): Junhan Wen

Thomas Abeel

1. Introduction

- Size important quality factor

Can the size of strawberries be measured using binocular photos?

2. Data Exploration

- Two camera's available (FIG 1)
 - RGB Camera
 - Near-infrared camera (OCN)
- They form a stereo image (FIG 2)
- Segments of the strawberries are also available (FIG 3)
- Three size categories: Tiny, Small and Coarse

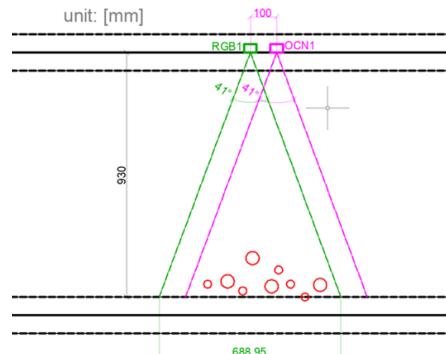


FIG 1: Blueprint of the farmhouse setup

3. Stereovision

- Depth is needed to give pixels a real world size
- Stereo vision is the standard depth mapping using stereo images
- Based on disparity

Disadvantages

- Image must have unique textures
- More noise with smaller window size

So does not work well with our data
(FIG 4)



FIG 2: Example of stereo image formed by both cameras.

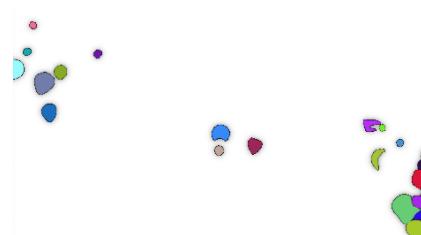


FIG 3: Given detected segments

4. Object Based Stereovision

Instead of texture mapping, just match the segments

1. Create a new image with segments only
2. Map left and right together as best as possible (FIG 5)
 - a. This is done by modelling Min Cost Network Flow Problem
 - b. Cost is based on relative difference in amount of area
3. Calculate disparity
4. Calculate depth
5. Measure width in mm using depth

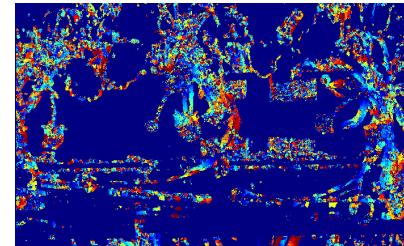


FIG 4: An example of classic stereovision being applied on the case

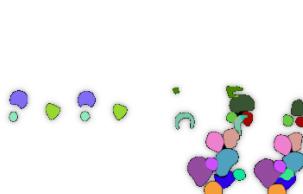


FIG 5: Same colors indicated left and right segments have been matched together

5. Results

- Segment matching accuracy: 87%
- Relative depth estimation: 70%
- Size estimation accuracy: 75%
- 90 cm depth base line size estimation accuracy: 75%

6. Conclusion

- Measuring is possible with accuracy of 75%
- However, not better than base line with fixed depth
- Results based on few data, more data needed
- Sizing labels only has three categories, not possible to test against actual size

Small 25 - 30 mm



Tiny < 25 mm



FIG 6: Size estimation of strawberries. A warmer colour indicates a smaller depth