

Analysis of Strawberry

Background info

Visual analysis of Strawberries

- Color - determines ripeness
 - White (unripe), Orange (partially ripe), red (ripe), deep/dark red (over-ripe)
 - Detecting edge cases (partially ripe to over-ripe etc)
 - Surface will be “smooth” (no edges or features visible on the surface)
- Bruises on the skin – decay
 - Little “edges” or “notch” in the surface.
 - Decay area usually “different” (darker) color than rest of the surface.
 - Uniform color vs. two shades of color (need to ignore white)
- External growth (fungus, bacteria, etc.)
 - On the surface vs. growing over the surface (depth perception?)
 - Or look for edges

Partially ripe



Ripe (ideal)



Over-ripe



Harvesting Stage of Strawberry

- Color and coverage of surface area
- USDA : $\frac{1}{2}$ to $\frac{3}{4}$ pink
- California: $\frac{2}{3}$ pink

Notice smooth skin-tone – same color, bit of a “shine”





Decay – usually two different colors on the skin. Can edges or different colors be detected?





Scoring of Decay in Strawberries

Initially we can detect the presence or absence of decay.

Then try to estimate the area or size of decay.



1=none 2=slight 3=moderate 4=mod.severe 5=severe

Summary

- I have experimented with DenseNet, Inception, RCNN, and Mask RCNN. (about 55% accuracy in estimating remaining freshness)
- Also tried to extract features from intermediary layers – also experimented with Feature Pyramid Networks (FPN) for object detection, etc.
- Utilizing DAGAN to generate additional samples for training -
<https://github.com/AndreiasAntoniou/DAGAN>
 - (accuracy jumps to 83%)