PROJECT BASICS AND RELATED WORK

MAIN TASKS

- **Data retrieval**
- **Preprocessing**
- **Fruit detection**
- **Fruit counting**
- **Fruit tracking, merging**

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Data retrieval

- **Type of data**
  - **RGB, Thermal**
  - **Resolution**

- **Form and amount of data**
  - **Positioning of camera: above, front, back**
  - **Number of pictures**

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Preprocessing

- Scaling

- Smoothing

- Shadow reduction

- Increasing contrast

- Converting to other color spaces

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Fruit detection - problems

- Occlusions
- Overlapping objects
- Picture quality
- Environmental conditions
- Size of dataset

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Fruit detection - approaches

- **Thresholding techniques with color/shape**

- **Edge detectors**

- **Clustering: k-means**

- **Classification: SVM, CRF**

- **Segmentation with NNs**

- **Detection and counting by NN**

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Fruit counting - problems

- **Counting blobs as one fruit**
- **Counting same fruit multiple times**
- **Counting partly occluded fruit as multiple fruits**
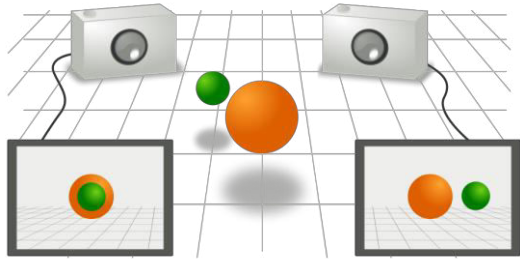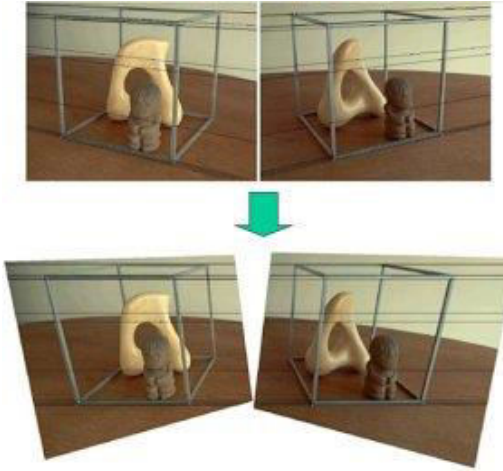
Fruit counting

- **Object-detection based counting**
  - **Contours and edges**
  - **Circular Hough Transform (CHT)**
  - **Watershed Transform**
  - **Template matching**
- **NNs**

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Fruit tracking

- **Avoid overlapping images**

- **Stereo block matching and GPS information**

- **Epipolar geometry and GPS position**

- **Mulit-sensor and optical flow**

- **Affine tracking and SFM (Structure from motion)**

Ressources

- **Häni et al., A Comparative Study of Fruit Detection and Counting Methods for Yield Mapping in Apple Orchards, 2018**
- **Fu et al., Kiwifruit yield estimation using image processing by an Android mobile phone, 2018**
- **Mohammed et al., Color-Based for Tree Yield Fruits Image Counting, 2017**
- **Malik et al., Detection and Counting of On-Tree Citrus Fruit for Crop Yield Estimation, 2016**
- **Gongal et a., Apple crop-load estimation with over-the-row machine vision system, 2016**
- **Gan et al., Immature green citrus fruit detection using color and thermal images, 2018**
- **Stajnko et al., Estimation of number and diameter of apple fruits in an orchard during the growing season by thermal imaging, 2004**
- **Behera et al., Yield Estimation of Pomegranate Using Image Processing Techniques, 2019**

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