Orchard Structure Classification

Aims

Primary: To determine what planting pattern is present from aerial images of an orchard or plantation.

Secondary: To extract key parameters about the orchard. For example, the spacing within or between rows.

Template Matching:

- **Is** the process of finding a smaller image, called a template, in a larger image.

- **Successfully** determines patterns present in orchard, given enough differences in patterns being tested.

- **Successfully** extracted some parameters such as overall rotation and spacing within and between rows

- **Struggles** to detect differences between very similar patterns.

- **Can be improved** through use of complex row detection and noise reduction

Hausdorff Distance

Method

- Three methods were used to determine the best pattern, modified exact, partial and average Hausdorff

- These were used in combination with an optimization algorithm to find the closest pattern match

Findings

- The modified exact and partial performed poorly, where the exact Hausdorff measured too harshly and the partial Hausdorff was too lenient.

- The average Hausdorff could accurately determine the planting patterns.

- However, the run times are long, thus rendering the algorithm inefficient
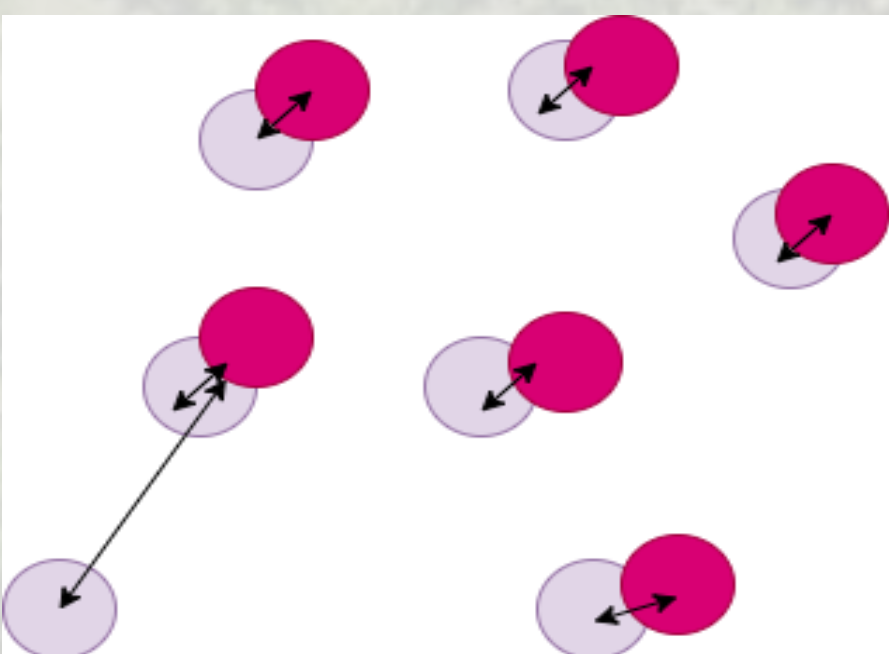
The calculation of the Hausdorff distance between two-point sets
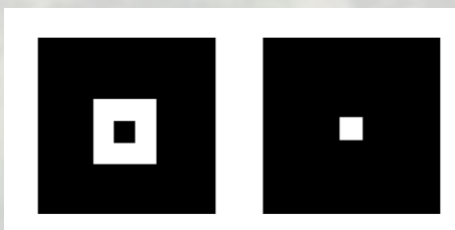
Hough Transform

Pre-Processing
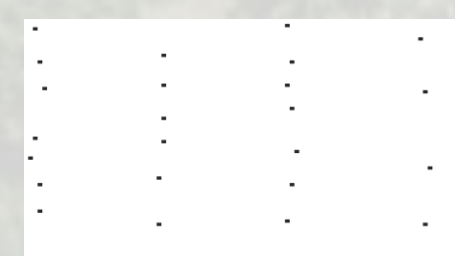
 Centroid Mapping from GeoJson polygons

 Application of Canny Edge Detector

 Pixel reduction in Edge map

Hough Transform & Post Processing

- Multiple HT threshold application used to identify main and secondary orchard planting direction.`

- False Positive row identification reduced through line filtering

- Secondary parameters identified by application of Euclidean distance formula on filtered rows

Findings

- Effective in determining the main orchard orientation.

- Unable to find planting pattern based on both main and secondary planting direction

- Selection of correct HT threshold difficult to determine

Conclusions

Template matching is a sufficient method for detecting the type of pattern though it fails to determine specific variations. Hausdorff can determine the pattern type though it has longer runtimes. Hough Transform was unsuccessful in pattern identification using the main and secondary direction but had success in identifying orientation and partial corner point locations.

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