Stitching of crop images to form Crop Map with Weeds

Shehryar Raza
BS(Final Year Student)
Problem

- Show the field directly to the farmer
- Compensate for the errors and uncertainty in weed detection
- Detailed and high resolution view of field
Motivation

● UAVs and mapping
  – Show the health of areas in field
  – Bigger and better
    – Larger FOV
    – Better final representation

● Google Maps only up-to 20m

● Other Applications: Surveillance
Solution (beta): Hugin

- **Drawbacks:**
  - Only rotatory motion
  - A lot of time
  - Does 1:N-1 matching in feature matching phase
  - Does not exploit multithreading

- **Conclusion:**
  Not fit for our task
Solution: Process Overview

- Feature Finding
  - SURF
- Feature Matching
  - Brute Force
  - FLANN
  - Adjacent matching (O(n^2) to linear)
● Calibration
  – Intrinsic features of camera
  – Exposure Difference
● Alignment
  – Perspective projection (Homography Matrix and RANSAC)
● Blending
  – Apply Adjustments from calibration
  – Remapping images to output projection
  – Seam Adjustment
  – Vignetting and Parallax
  – Rectilinear, Cylindrical, Spherical, Fish eye projection
Multithreading Optimizations

- Feature Finding
- Warping
- Initial stages of blending
Results(5)

- 10 images + 7 images
- Rotating motion of camera
- Treated as 2 rows
Results(5)
Results(5)
Results(5)
Results(5)
Results(5)
Challenges

- Linear motion of camera
- Scene motion
References

• Brown and D. Lowe. Automatic Panoramic Image Stitching using Invariant Features