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REU
WEEK 8 PRESENTATION

The problem

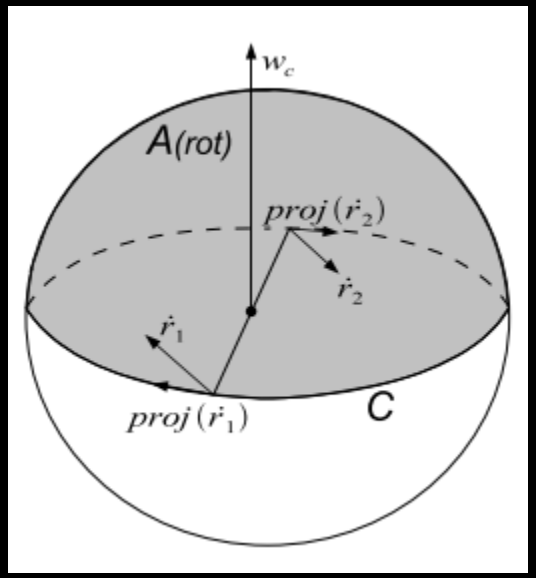
- How do we ~~accurately~~ detect ego-motion using optical flow?
- How do we recognize gestures with the device?

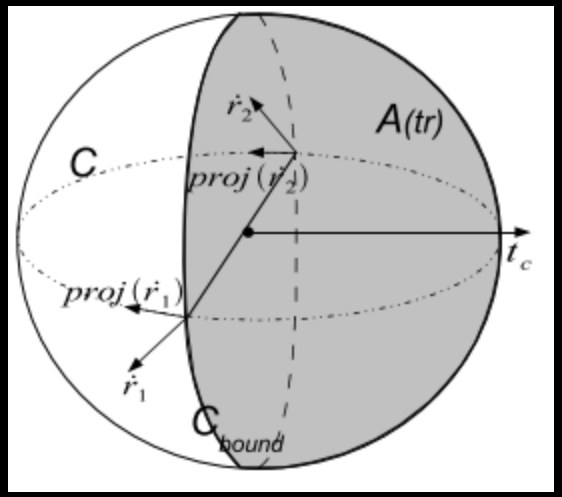
Antipode technique

- Based on the projection of the optical flow onto a great circle, we have two possible constraints:
  - If the projections are in the same direction, then we have a translation
  - If the projections are in opposite directions, then we have a rotation

From John Lim and Nick Barnes

Antipode technique

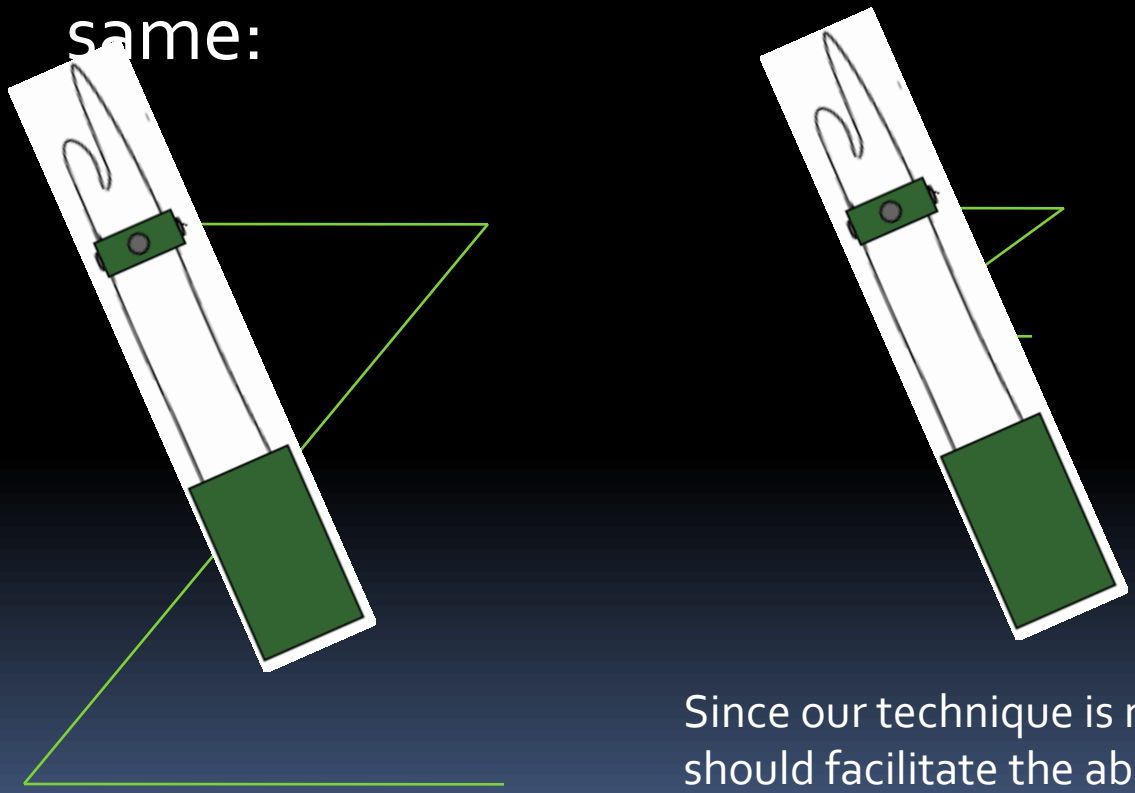




- The left shows a case where we would guess there is a rotation
  - The axis of rotation is always perpendicular to the great circle
- The right shows a case where we would guess a translation
  - The direction of translation is always parallel to the projection vectors

Good !

- For gestures, we want the following to be the same:

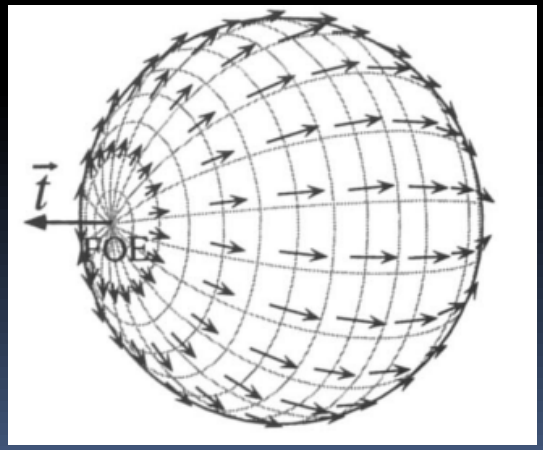


Since our technique is not concerned with scale, it should facilitate the above idea

Arm courtesy of Jon Harter

Problem!

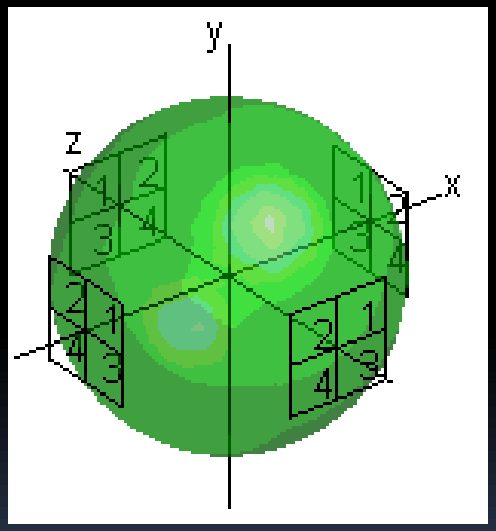
- Our system is not spherical
- How can we get the actual DOT and AOR?
  - Short answer: We don't. Well, we can't…
  - Instead, get a close guess that is within a cone of the actual answer

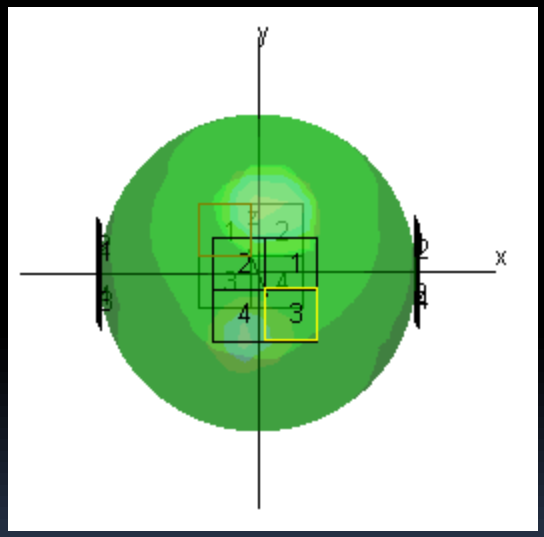


Brodsky et al

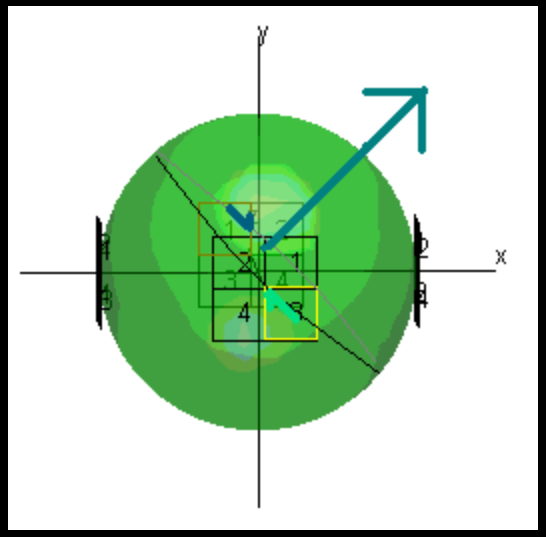
The technique

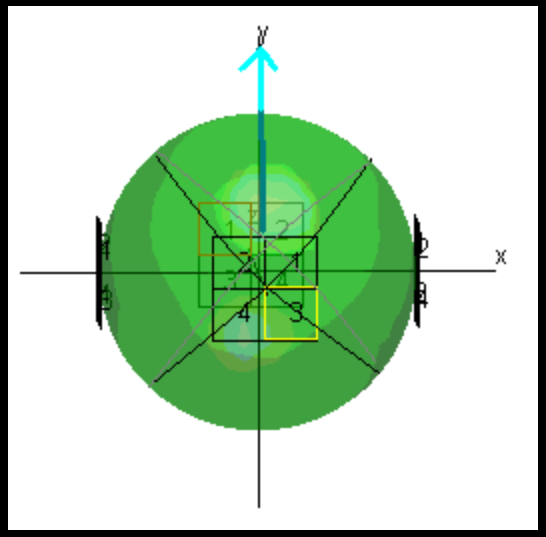
- Number the image plane into four or six sections
- Average the optical flow in each section





The technique

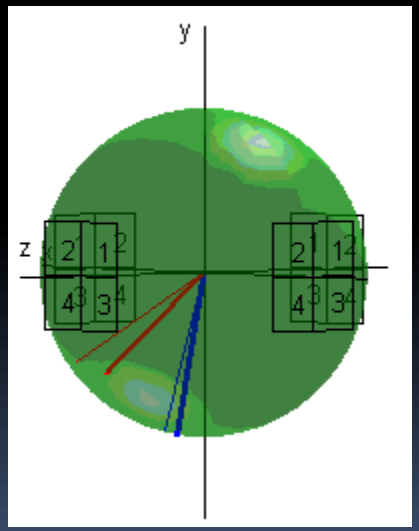




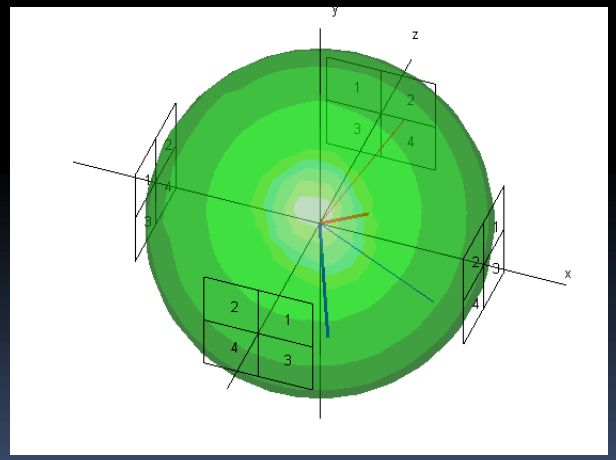
- The less great circles we use, the less accuracy.
- However, the number of great circles is limited by our system

Preliminary Results

- Thin red lines are the actual DOT
- Thin blue lines are the actual AOR
- Our results in thick lines



AOR = [0, -3, 1]
DOT = [1, -2,3]



AOR = [3, -4, 2]
DOT = [1, 0, 7]

The future

- Compute the math behind the technique
- Classify gestures

Questions?

Wizards of the coast et al.