

Road Following

Objective: Use computer vision to autonomously track a perimeter on the ground.

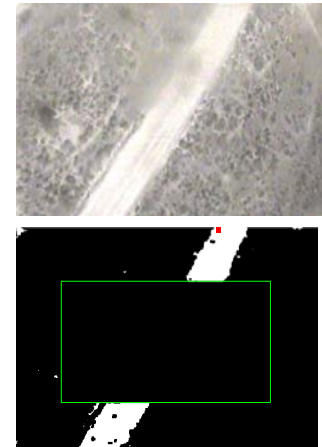
Principle Investigators: Randy Beard, Clark Taylor

Sample Publication: Joseph Egbert, Randal W. Beard, "Road Following Control Constraints for Low Altitude Miniature Air Vehicles," *American Control Conference*, New York, New York, July 2007, p. 353-358.

Funding Source: NASA.

Computer Vision

- Threshold in Hue-Saturation-Value (HSV) color space.
- Connect the classified pixels into components
- Find the largest components and return the top center pixel.



Approach

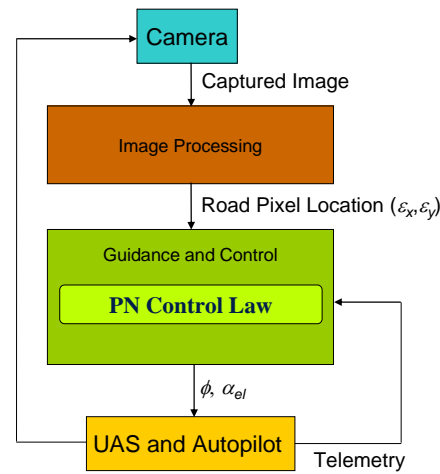
- > Control a desired heading rate for a skid-to-turn platform equipped with a strapped-down camera:

$$\dot{\chi}^d = N \left(\frac{\epsilon_x \epsilon_y - \epsilon_y \epsilon_x}{f^2} \right)$$

- > Control a desired roll angle and a gimbal elevation angle for a bank-to-turn platform equipped with a gimballed camera:

$$\phi^d = \frac{V}{g} \arctan(\dot{\chi}^d)$$

$$\alpha_{el}^d = \phi$$



Results

- Successful flight test in 2007.
- Used in conjunction with cooperative perimeter tracking and image mosaicing.
- Rural road successfully tracked for over two miles.

