ME 599/AA 546/EE 546:
Biology-inspired robot control

Lecture 6
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Goals:

- Introduce Paper3
- Presentation and discussion of Paper 2 by Joon Jung

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Wednesday's paper: "Controlling free-flight of a robotic fly using an onboard vision sensor inspired by insect ocelli" by Fuller et al 2014

previous work: free flight control relying on external cameras (Ma, Chirarattananon, Fuller, Wood, *Science* 2013)

this work: first step toward flight control using sensors carried onboard. Stabilizing *attitude* using a four-pixel camera

Some suggestions for reading the paper

- it gives both a simpler “planar” analysis and also a more thorough 3D analysis. Start with the planar analysis.
    - The intrepid reader can advance to the 3D analysis but it may require preparation beyond a typical undergraduate training.
- explanations for some math-oriented formalism:

$\boldsymbol{f} \in \mathbb{R}^3$: the vector *f* is 3 real-valued elements

$s \in \mathbb{S}^2$: *s* is a unit-length vector that points in any *direction* (“on the unit sphere”)

$\mathbf{R} \in SO(3)$: *R* is an orientation in space. “SO(3)” literally means “special orthogonal group in 3 dimensions” because if *R* is represented as a matrix, it is an orthogonal matrix