

FOLDABLE ROBOTICS

Dan's Project Pitch

Background: Mine Clearing

- 12 Countries with 100 square kilometers or more covered in unexploded ordnance and landmines
- Killed over 96000 people since 1999
- 1000 child casualties in 2014 alone, 40% of total



Woodpecker

- Body adapted for drilling into trees
 - High impacts on head
 - Larger forces on feet
 - More moment provided by tail
- Adaptations for climbing and vertical perching



Bock, W. J. & Miller, W. D. The scansorial foot of the woodpeckers, with comments on the evolution of perching and climbing feet in birds. *AmMusNov* (1959).

Fujita, M., Kawakami, K. & Higuchi, H. Hopping and climbing gait of Japanese Pygmy Woodpeckers (*Picoides kizuki*). *Comp. Biochem. Physiol. A. Mol. Integr. Physiol.* **148**, 802–10 (2007).

Theme Roadrunner

- Walking, Running, Jumping, Flapping
- Interacting with the world: grabbing with beak
- Subsystems: Legs, wings, beak, neck
- Low cost
- Data collection: force plate / inertial sensing, current & voltage
- State Sensing: joint angle sensors, motor encoders

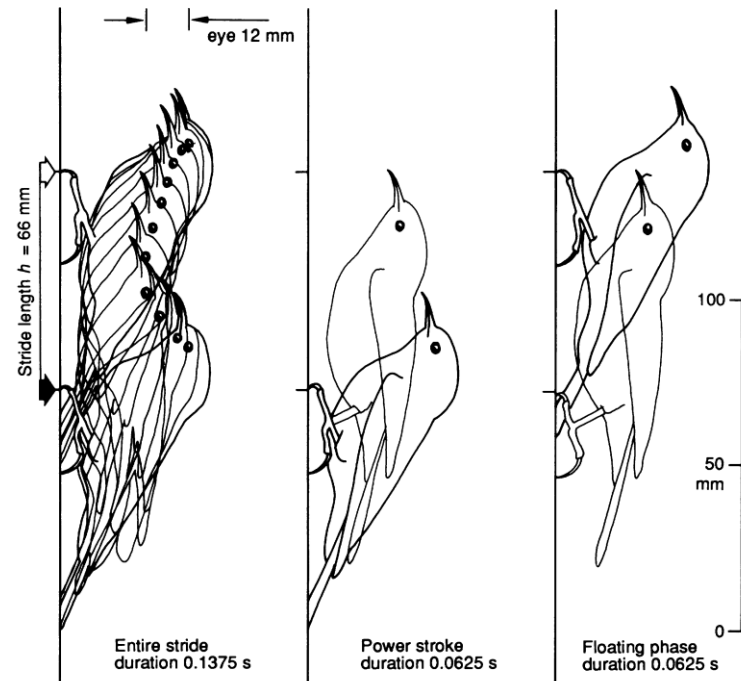
Bundle, M. W. & Dial, K. P. Mechanics of wing-assisted incline running (WAIR). *J. Exp. Biol.* **206**, 4553–4564 (2003).

Proposal

- Build a machine which utilizes impact drilling to make small holes
- Vertical or Horizontal(may require different animal)
- Useful for agricultural purposes

Treecreeper-leg-climbing

- Treecreeper leg system adapted for vertical climbing
- Unlike woodpeckers, treecreepers do not drill into trees. Leg morphology more closely linked to climbing



Adaptations, S. Treecreeper climbing ; mechanics , energetics , and structural adaptations. *Oikos* **17**, 191–209 (2008).

Proposal

- Make a climbing robot based on the treecreeper