Extending Jumping Range with Deployable Gliding Wings

Guston Lighthouse, Engineering (Robotics)
Mentor: Daniel Aukes, Assistant Professor
The Polytechnic School

RESEARCH QUESTION

What combination of surface area and deployment time of foldable gliding wings provides the greatest reduction of cost of transport?

DATA COLLECTION

- Glider trajectories will be recorded with a high-framerate video camera
- Videos will be analyzed and glider trajectories plotted according to position and time
- Cost of Transport [1] will be calculated:

$$CoT = \frac{1}{1 + \frac{1}{2}\frac{L}{D}}$$

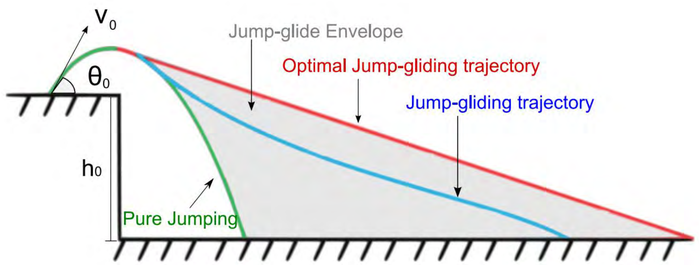
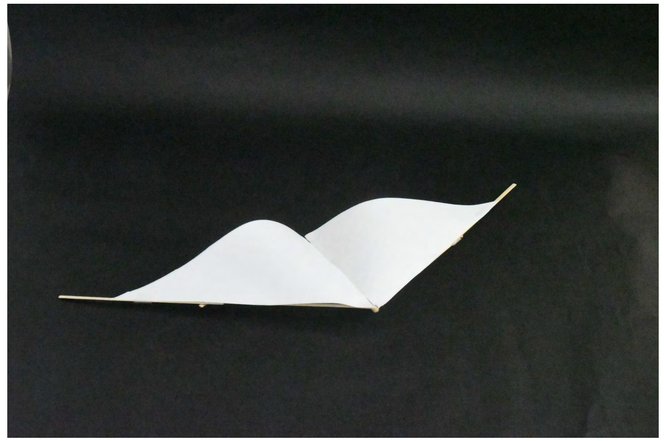


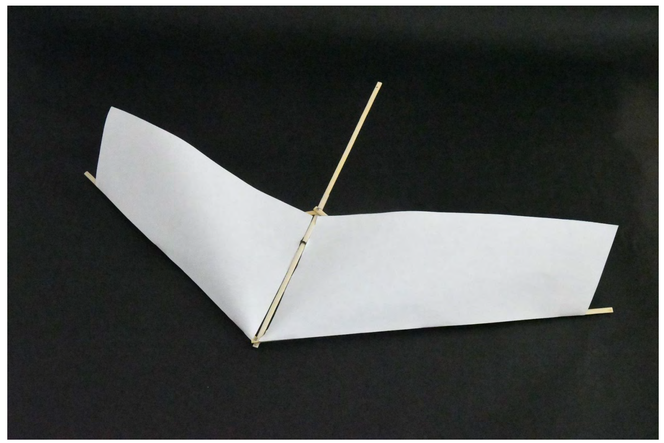
Figure displaying various jumping trajectories [2]

DESIGN PROCESS

- Created prototype gliding wings to test viability
- Iterated prototype wings to improve durability and add folding functionality



Above: initial prototype
Below: second variation of prototype



FUTURE WORK

- Design and manufacture wing actuation mechanism
- Test varying deployment start times
- Test varying wing surface areas

Above: unfolded wing skeleton
Below: folded wing skeleton

REFERENCES

[1] A. Desbiens, M. Pope, D. Christensen, E. Hawkes and M. Cutkosky, "Design principles for efficient, repeated jumpgliding", Bioinspiration & Biomimetics, vol. 9, no. 2, p. 025009, 2014.
[2] A. Vidyasagar, J. Zufferey, D. Floreano and M. Kovač, "Performance analysis of jump-gliding locomotion for miniature robotics", Bioinspiration & Biomimetics, vol. 10, no. 2, p. 025006, 2015.

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Ira A. Fulton Schools of Engineering
Arizona State University