



Internship offer

Duration: 5-6 months

Internship position: In-flight wing shape estimation for high-altitude pseudo-satellite aircraft

Towards satisfying strict power requirements in solar energy high-altitude pseudo-satellite aircraft, there's an increasing trend to optimize aerodynamic performance by increasing aspect ratio and to reduce weight by minimizing structure. Both solutions lead to increasingly flexible aircraft. Such potentially fragile systems call for protective control laws for managing load distribution during gusts and assure dynamic structural stability. This research project intends to study such control laws. This internship position assists the implementation of a state observer for a very flexible wing to estimate (during flight) the shape of the wing and its derivatives for control purposes. Our novel technique [1] uses a combination of inertial engineering and computer vision, and it is already theoretically verified. The successful student will assist in algorithmic implementation on an experimental platform for real-world validation.

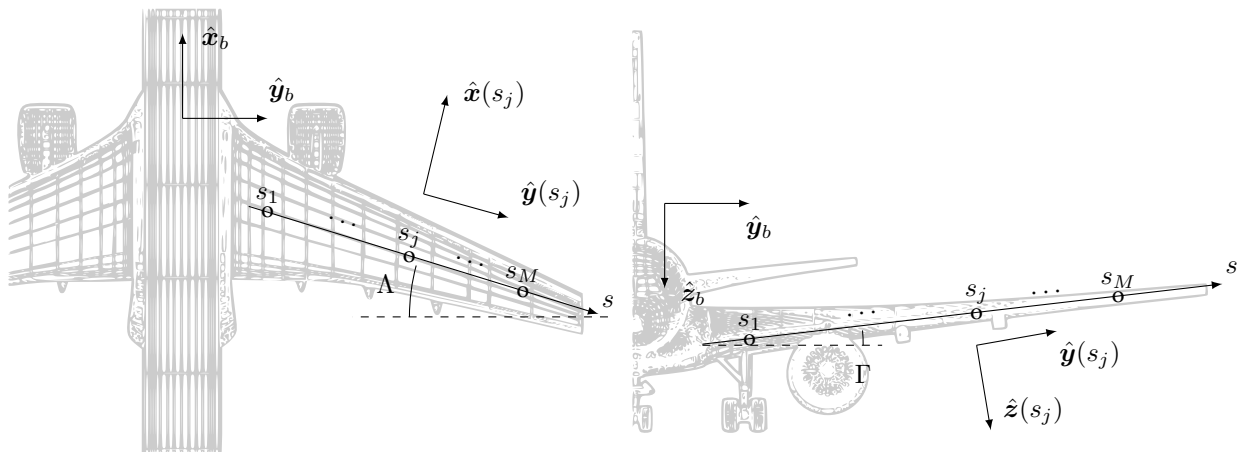


Figure 1: Reference lines to parameterize and model elasticity for control purposes. Adapted from [1].

Student profile

The student will be responsible for a flexible wing mock-up design, manufacturing, instrumentation selection and assembly, and evaluating various computer vision algorithms for feeding the estimator. Therefore the following skills are desirable:

- fundamentals of manufacturing processes (especially towards RC modeling);
- electronics assembly;
- computer vision, C/C++, openCV, CUDA.

The work will proceed in person (plans may change as the public health situation dictates).

References

[1] Lustosa, L. R., Kolmanovsky, I., Cesnik, C. E. S., and Vetrano, F., Aided inertial estimation of wing shape. *Journal of Guidance, Control, and Dynamics*, 2020.