

Control of an autonomous helicopter performing extreme maneuvers

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The purpose with this project is to investigate the possibilities to use modeled based control for control of autonomous helicopters. In contrary to most existing results, the aim is here to focus on more extreme maneuvers. Maneuvers where the helicopter loops, rolls and flips are to be considered. Especially the transition from normal hover to inverted hover is of interest. The expected outcome is insight of both academic as well as industrial relevance, and possibly, a very cool demonstrator.



The main objectives in the project is

- Review previous work
 - Which models are of interest.
 - Which models are freely available for use in for example Matlab and can easily be used for experiments.
 - To what extent has aerobatics been performed so far? Review the methods that were used in such solutions.
- Find already existing or develop a new simulation environment for Matlab where the most interesting model(s) for extreme flight conditions is (are) used. Preferably, 3D visualization should be made possible.
- Investigate at least two control strategies that can be used to control the highly non-linear system and apply them to the problem. One of them should be as simple as possible and one of them more advanced involving non-linear optimal control/MPC.

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- Extra tasks (select one if there is time)
 - Investigate application of non-linear explicit MPC.
 - Implementation on a real helicopter.

A typical background for this project is a student who has taken advanced control courses as Control theory and Optimal control. Interest in applied automatic control is of course also necessary.

If there are some ideas of changes to the project, we are open for such discussions. Please send me an e-mail or pass by my office if you are interested, and we can discuss a tailored project for your interests and background!