

Supervisor assessment of Bachelor's Thesis

Student: Karpíšek Jakub
Title: Beresheet Lunar Landing Simulation (id 22727)
Supervisor: Chudý Peter, doc. Ing., Ph.D. MBA, DCGM FIT BUT

1. Assignment comments

The aim of the thesis was to calculate an optimal descent trajectory with its associated state quantities for a small spacecraft lunar landing. The non-trivial nature of the task originates from the optimal control problem definition and its anticipated numerical solution. The ability to formulate the control task with meaningful operational constraints requires a deeper understanding in spacecraft modeling and simulation, astrodynamics and numerical computation. In order to compare the anticipated optimal solution with a state-of-the-art industrial quality result, the actual Beresheet mission flight conditions were used in the calculation. Beyond the computational effort and the associated composition of the optimization task, the author has designed and implemented an intuitive visualization which helps to understand the lunar landing manouver. Based on the previous conditions I consider the overall difficulty to be above average.

2. Literature usage

The author worked successfully with a portfolio of topic relevant references and performed a tailored research on astrodynamics, spacecraft modeling, optimal control and the actual Beresheet mission. The author successfully mastered the utilization of published resources to estimate the optimal trajectory for the lunar landing simulation.

3. Assignment activity, consultation, communication

The author demonstrated a high level of commitment in achieving excellent results. The author attended scheduled meetings regularly, was well prepared and contributed meaningfully to the meeting discussions. The author was able to draw individual conclusions and transforming them into an functional concept. Communication with the author was conclusive and punctual.

4. Assignment finalisation

Both, the text of the thesis and the implementation part have been finished in advance of the deadline and the content has been examined. Minor adjustments to the author's ideas originating from the meeting discussions and periodic reviews have been included into the thesis.

5. Publications, awards

Unknown

6. Total assessment

excellent (A)

The student's overall activity and his motivation were at a high level throughout the entire work on the thesis. Achieved results, compared to the available Beresheet mission data, exhibit a reasonable level of match, making the lunar landing simulation a good starting point for further studies in spacecraft dynamics and control. The amount of demonstrated knowledge, enthusiasm and focus needed for successfully accomplishing the thesis was beyond the usual expectations. I recommend the thesis for a defense. Suggested grade as based on the above mentioned: **Excellent (A)**.

In Brno 24 June 2020

Chudý Peter, doc. Ing., Ph.D. MBA
supervisor