Review of Master's Thesis

Student: Samek Michal, Ing.
Title: Optimization of Aircraft Tracker Parameters (id 17054)
Reviewer: Vlk Jan, Ing., UPGM FIT VUT

1.   Assignment complexity   **more demanding assignment**

The topic selected by the student can be regarded as challenging when considering the mathematical algorithms normally utilized in the field of aircraft tracking and state estimator performance optimization. The processing of the data from the real radar measurements increases the complexity, as does the consideration of the uncertainties, which occur during the data acquisition phase.

2.   Completeness of assignment requirements   **assignment fulfilled**

All of the assigned tasks of the thesis were accomplished. The student first describes the algorithms that will be utilized for the aircraft tracking and for the optimization of tracking algorithms. The next part is focused on the state of the art in aircraft tracking methods and subjects of optimization. Chapter 8 deals with the optimization of the tracker based on an evolutionary strategy. Last two chapters are dedicated to the implementation of the designed algorithms and the evaluation of the results.

3.   Length of technical report   **in usual extent**

The thesis is in usual length and in accordance with the master theses requirements.

4.   Presentation level of technical report   **75 p. (C)**

The structure of the report is one of the few weaknesses of the thesis. The report contains 11 chapters, some of which are only 2-3 pages long, which is quite confusing for the reader. I would recommend to reduce the number of chapters and change their order for a better orientation in the text.

5.   Formal aspects of technical report   **85 p. (B)**

The formal layout of the report is at a high level. One of the minor drawbacks is the length of figure captions, which on occasions reach 2-3 sentences / lines. The explanation of the figure content should be mentioned in the text, not in the figure caption. The student proved his excellent skill in writing English texts, which also happen to be enjoyably readable.

6.   Literature usage   **80 p. (B)**

The student cites 36 books and articles relevant to the topic of the thesis. All of the references are properly cited throughout the text.

7.   Implementation results   **95 p. (A)**

The results, which are presented in Chapter 10 prove the tracker performance improvement after the utilization of the optimization routines. All requirements defined in Chapter 2 have been accomplished.

8.   Utilizability of results

The algorithms for the automatic aircraft tracker tuning designed by the student are in my opinion applicable in various aircraft traffic control systems. With a slight modification they can be useful a number of other processes, which employ state estimation and filtration techniques e.g. adaptive filters.

9.   Questions for defence

- Would it be possible to use more complex structure for modeling the aircraft motion than constant velocity model and constant turn model? What would have to be changed in the state estimator structure?
- Is it possible to fuse the data from more than 3 sources (radars), how would it influence the designed algorithms.

10.   Total assessment   **87 p. very good (B)**

The student proved good understanding of various techniques in the field of state estimation, data fusion, classification and evolutionary optimization. The implementation of his optimization routines improved performance of the state of the art aircraft trackers, which have been evaluated using sets of real data measurements. The structure of the technical report is the only minor imperfection, which disturbs a very well written thesis. Suggested grade - **very good** (**B**)

In Brno 11. June 2015

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