Review report of a final thesis

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Reviewer:	doc. Ing. Štěpán Starosta, Ph.D.
Thesis title:	Learning to land
Branch of the study:	Knowledge Engineering

Date: 3. 6. 2019

Evaluation criterion:	The evaluation scale: 1 to 4.
1. Fulfilment of the assignment	1 = assignment fulfilled, **_2 = assignment fulfilled with minor objections,_** 3 = assignment fulfilled with major objections, 4 = assignment not fulfilled

Criteria description:
Assess whether the submitted FT defines the objectives sufficiently and in line with the assignment; whether the objectives are formulated correctly and fulfilled sufficiently.
In the comment, specify the points of the assignment that have not been met, assess the severity, impact, and, if appropriate, also the cause of the deficiencies. If the assignment differs substantially from the standards for the FT or if the student has developed the FT beyond the assignment, describe the way it got reflected on the quality of the assignment's fulfilment and the way it affected your final evaluation.

Comments:
Items 1 and 2 of the assignment concern a survey on automatic landing with focus on model-free methods. The presented survey, part 1.2., is roughly 1 page long, and gives little detail on the methods used is the sources listed in this survey.

Evaluation criterion:	The evaluation scale: 0 to 100 points (grade A to F).
2. Main written part	*40 (F)*

Criteria description:
Evaluate whether the extent of the FT is adequate to its content and scope: are all the parts of the FT contentful and necessary? Next, consider whether the submitted FT is actually correct – are there factual errors or inaccuracies? Evaluate the logical structure of the FT, the thematic flow between chapters and whether the text is comprehensible to the reader. Assess whether the formal notations in the FT are used correctly. Assess the typographic and language aspects of the FT, follow the Dean's Directive No. 26/2017, Art. 3. Evaluate whether the relevant sources are properly used, quoted and cited. Verify that all quotes are properly distinguished from the results achieved in the FT, thus, that the citation ethics has not been violated and that the citations are complete and in accordance with citation practices and standards. Finally, evaluate whether the software and other copyrighted works have been used in accordance with their license terms.

Comments:

There are several issues with the written part of the thesis. First, from the formal point of view, the citations are not done correctly. Starting on page 5, the author references [16] from which the rest of 1.1.1.1 is copied and pasted into the text. This quote is not typed correctly, it is introduced as a paraphrase. In 1.1.1.2 it is not even mentioned that the various speed definitions are taken from a source although they are, again, copied. Scikit-learn is mentioned on page 17 and a hypertext link is nonstandardly given in parenthesis after the paragraph. Later, for instance on page 30 and 31, the descriptions of parameters of scikit-learn package methods/function are copied without any kind of reference. There are several other incorrect citations. Figures should have their references in their captions.

The copy and paste strategy is one of the reasons that the text is hard to understand. Other reasons for this is that the author avoids specifying accurately what is he doing.

For instance, starting on page 40, the considered reward functions are described only in words, and a description of their quantification is missing completely. There is no formula in the text, which greatly prevents the reader from smooth understanding of what is exactly being done, and hinders reproducibility of the work. Some crucial parts of the text, which are important for understanding what was done, are hard to grasp, for instance, section 3.2.1 is rather confusing as there is no information about the conditions under which the data of 10 flights were obtained, and more importantly, one expects a description of the methodology (as the chapter title says), and section 3.2.1 is in the spirit "this and that was done, then we did this, and we trained a model". When reader reads the next chapter, chapter 4, he can later understand what was meant here, but with quite some effort. Figures in section 3.2 are more confusing than useful.

Some decisions in the text lack an explanation. For instance, section 4.2.1 describing the selection of the model for the environment is with no explanation. It seems that the criteria chosen was availability in Scikit-learn package. This is somewhat underlined by the range of parameters tested for these methods. On page 40, the text says "reward function is based on pilot good practices" with no reference.

There are some obvious discrepancies in the text. For instance, on page 23, it reads "The model is trained with whole database of flights". Then, later, on page 32, section 4.2.2., it seems that only 8 out of 10 flights were used for training purposes, and the remaining 2 for evaluation. Some of the less obvious discrepancies is that in the text, there is no information that some of the actions are forbidden (for instance taking the gears up again), this can only be inferred from the attached code.

The text is written in English. Omitting the copied parts, the level is satisfactory with some minor grammar problems and typing errors. There are several unfinished sentences (for instance, in the third bullet on top of page 9 and the last but one paragraph on page 19).

Evaluation criterion:	*The evaluation scale: 0 to 100 points (grade A to F).*
3. Non-written part, attachments	*70 (C)*

Criteria description:
Depending on the nature of the FT, comment on the non-written part of the thesis. For example: SW work – the overall quality of the program. Is the technology used (from the development to deployment) suitable and adequate? HW – functional sample. Evaluate the technology and tools used. Research and experimental work – repeatability of the experiment.

Comments:

The result, the trained policies, are able to take control of the simulator and attempt to land. The organization of the code is not good: there is no user's manual, and the code is written in a way that it takes a lot of effort to put all the pieces together. Some parts have little or no comments at all, and some parts contain obvious programming issues (for instance, the string `def create_connection(db_file):` repeats 16x times in the files, the files policy/parallel_entropy_X.py differ by 1 line). The choices for the technologies are adequate.

Evaluation criterion:	*The evaluation scale: 0 to 100 points (grade A to F).*
4. Evaluation of results, publication outputs and awards	*60 (D)*

Criteria description:
Depending on the nature of the thesis, estimate whether the thesis results could be deployed in practice; alternatively, evaluate whether the results of the FT extend the already published/known results or whether they bring in completely new findings.

Comments:

As mentioned above, the organization of the code is not very clear, and instills doubts about reproducibility, and thus about a possibility of a future modification. The results concerning the landing itself are hard to judge: in my opinion, the methods used, although it may seem that some blind wide range experimentation was performed, yield some intermediate results that can be further developed. However, one needs to consider that several huge restrictions were put to place (one given scenario, restrictions on states and actions).

Evaluation criterion:	*No evaluation scale.*
5. Questions for the defence	

Criteria description:
Formulate questions that the student should answer during the Presentation and defence of the FT in front of the SFE Committee (use a bullet list).

Questions:

1. What are the consequences of the choice described in 3.2. - using the dynamics model based on 10 flights? Is there a reason to expect better/worse performance if one used X-Plane in realtime?

2. All the chosen elite policies tend to land too soon. Is there some reason for this behaviour? How can this be fixed in your selected setting?

Evaluation criterion:	The evaluation scale: 0 to 100 points (grade A to F).
6. The overall evaluation	*49 (F)*

Criteria description:
Summarize which of the aspects of the FT affected your grading process the most. The overall grade does not need to be an arithmetic mean (or other value) calculated from the evaluation in the previous criteria. Generally, a well-fulfilled assignment is assessed by grade A.

Comments:

The presented diploma thesis is on the borderline of what I deem defensible. The text part lacks clarity and accurate description of what was done, many decisions come with little or no explanation, and the text contains several copied parts of text from other source without proper citation. It is also debatable whether the first part of the assignment was fulfilled. On the other hand, I consider this assignment to be hard, and the author clearly had to understand and work with a complex problem of landing a large aircraft and more or less successfully applied methods of reinforcement learning. The obtained results seem to be not bad and I think that, with some effort, they could be developed further.

Signature of the reviewer: