

Review report on diploma thesis of Anne-Laure Coiffier entitled

Analysis and design of manufacturing operations

Assignment

The assignment of this thesis is well chosen since it aims at a very actual topic of making production lines more flexible. I evaluate the level of its difficultness as **average**.

Fulfilment of the Assignment

The presented thesis **fully fulfills** its assignment.

Selected Solution

The student proposes a sound approach; however, I have a few comments. The scheduling part of this thesis assumes that only one product is produced at time. Considering this special case, scheduling based on complete search is acceptable although its computational complexity is high. This issue is mentioned on page 41, where the author discusses the case when more resources provide the same operation. There is written that it makes the computation slower: "i.e. several minutes)". It would be appropriate to elaborate the scalability of the proposed solution in detail since it is crucial for its applicability in manufacturing practice. I grade the selected solution with **B - very good**.

Professional Level

I highly appreciate the utilization of the up-to-date Siemens technologies such as Process Simulate and TIA Portal. They provide a rich set of features to model and manage complex manufacturing systems, which makes them not always easy to start with. The student has proven her ability to use these complex tools not only in the traditional but also in an innovative way. I grade this part with a **A - excellent**.

Formal Aspects and Language Level

The thesis is well organized and easy to follow. It is written in English and contains a few grammatical mistakes that sometimes make the understanding more difficult. For instance, on page 2: "... how to transform the generated schedule obtained from the capability description in action sequences ...", where "in" is used instead of "into". Another example is the incorrect word order on page 3: "In this chapter is also described the implementation of the production line...". I believe that an additional proofreading would have eliminated these minor issues and it is a pity it was not done. I grade this part with a **B - very good**.

Resources and Citations

The student cites very relevant sources, but considering mainly work of a single team at fortiss in Munich (Nadin Keddiss et al.). A diploma thesis deserves broader literature review and should cover more than one page. Moreover, the citing standards are not met. **I grade this criteria with a D.**

Overall evaluation, questions and proposed final grade

Experiments performed in the thesis are well-described. Results show the work succeeded linking of problem formalization and experiments. The result of work are algorithms, simulations, and new approaches for programming production lines. The results of the work have been verified on the model of Industry 4.0 testbed that is currently being built at CIIRC CTU.

I would like the student to answer the following questions:

1. At page 2 you wrote that your use-case is much more complex comparing to the one considered at fortiss. Please, could you be more specific what makes your scenario more complex?
2. The goal of the proposed scheduling algorithm is the minimization of the overall processing time. If I understood you well, you consider only the process times of individual operations, but the transportation strategy minimizes the number of intermediate nodes. Can you guarantee that this approach leads to minimization of the transportation time?

In my opinion, the reviewed thesis fulfills all requirements posed on diploma theses. This thesis is ready to be defended orally, in front of the respective committee. I propose the final grade **B - very good**.

In Prague June 5th, 2017

Ing. Petr Kadera, Ph.D.