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Review of the Ph.D. thesis titled "Scheduling with Alternative Process Plan" by Ing. Roman Čapek

The thesis titled "Scheduling with Alternative Process Plan" by Ing. Roman Čapek aims to create alternate approaches of scheduling of processes. To this effect, the author aims to propose a mathematical representation for the scheduling problem with alternate processes, a mathematical formulation for each studied problem, develop an algorithm to solve large instances for each of the problems, compare the proposed solution methods with the state-of-the art results in literature and finally to propose a methodology for the comparison of the different solution approaches.

In my opinion, the thesis topic, with its detailed aims and objectives is a valid research topic, as it encompasses current technological processes in scheduling systems, and approaches it with both the mathematical and algorithmic solution.

The thesis meets all the stated goals and objectives. The author has published one impacted paper and nine international peer-reviewed conference papers. He is the first author in eight out of the nine publications. His impacted paper in EJOR, is extremely noteworthy. Having published in EJOR, I can personally vouch for their excellent standard, review process and subsequent impact of the article.

The thesis has a detailed literature review, which I consider more than sufficient and the author has made considerable effort to incorporate all the appropriate methodologies in his work. The developed methodologies and algorithms are validated through extensive experimentation.

I believe this work is of paramount importance in scheduling. There is always a drive to obtain better and more efficient algorithms, especially for non-traditional scheduling systems. Through the number of citations of the authors publications, it is obvious that there is a large community of active researchers in this field.

I would like to put the following questions to the author for his comments:

1. Which random number generator (RNG) was used to generate the test instances in Section 5.3.4? I assume that unless the author used True Random numbers (TRN), the generated instances are in fact not random, but rather pseudo-random, and their veracity is dependent on the generator itself (PRNG).
2. The DDE algorithm has been shown to rely heavily on local search for optimization, using it twice within one routine; once after mutation and then after crossover. This raises the overall complexity of the algorithm. Therefore, what is the overall complexity of the DDE algorithm with the modified RIS local search? Also, can the author speculate that if RIS is removed, how viable would the DDE algorithm be?
3. DE operates on two basic components; F - scaling factor and CR - crossover. The author is using GA type 1-point crossover. What is the rational for this?
4. The optimal size of the reference set (RefSet) in SS has been shown to be 20. What size was used for the experimentation? Was there any correlation found between different sizes of RefSet?

5. The standard ILOG model for job shop uses discrete event simulation, whereas DDE and SS (or any generic metaheuristic) uses dynamic programming. How did the author reconcile this two paradigms?
6. Can the author comment on the possibility of applying high performance computing (HPC), especially OpenMP or MPI to his heuristics? Specifically, which part of the algorithms can be parallelized?

The author of the thesis **proved** to have an ability to perform research and to achieve scientific results. I **do** recommend the thesis for presentation with the aim of receiving the Degree of Ph.D.

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