MISTA 2015 Submission 12

Update information
Update authors
Update file
Withdraw

If you want to **change any information** about your paper or withdraw it, use links in the upper right corner.

For all questions related to processing your submission you should contact the conference organizers.
Click here to see information about this conference.

All **reviews sent to you** can be found at the bottom of this page.

Paper 12

Title:	Exact and heuristic methods for trading-off makespan and stability in stochastic project scheduling
Submission	
Track:	MISTA 2015 Full Papers
Author keywords:	Project Scheduling Stochastic RCPSP Stability Buffers
EasyChair keyphrases:	proactive schedule (370), project scheduling (338), expected makespan (210), activity duration (190), temporal constraint (130), expected instability (120), resource constrained project scheduling (120), resource constrained project scheduling problem (116), reactive project scheduling (110), proactive reactive project scheduling (100), stochastic activity duration (95), realized schedule (90), roel leus (90), operational research (90), willy herroelen (90), milp model (90), scheduling policy (90), project execution (80), stochastic project scheduling (79), feasible resource flow (79), proactive stochastic rcpsp (79), lama vilch (70), erik demeulemeester (70), resource flow (70), data point (70), research area (70), resource constrained project (63), list based policy (63), expected project makespan (63), trading expected makespan (63)
Abstract:	This paper addresses a problem of practical value in project scheduling: trading expected makespan for stability, under stochastic activity duration uncertainty. We present the formal statement of a problem that we name Proactive Stochastic RCPSP (PS-RCPSP). Assuming activity durations follow known probability distributions, PS-RCPSP asks to find a so-called earliest-start (es) policy and a proactive schedule that together minimize the weighted sum of expected project makespan and expected instability (deviation of the realized from the proactive schedule). Extending an existing MILP model for the well-known deterministic Resource-Constrained Project Scheduling Problem (RCPSP), a MILP model for PS-RCPSP is presented, which allows us to find optimal (es-policy, proactive schedule) pairs. To deal with instances of practical size, we propose a Linear Programmiing (LP)-based and a Mixed-Integer LP (MILP)-based heuristic. Our LP-based heuristic optimizes the proactive schedule by keeping the es-policy part of the solution fixed. Our MILP-based heuristic optimizes the structure of the policy together with the proactive schedule. In contrast to existing state-of-art approaches, our heuristics rely on optimizing the proactive schedule together with the scheduling policy. Experiments show that the LP-based heuristic is efficient and compares favorably with the state-of-art (i.e. achieves smaller expected makespan for a certain level of expected instability) when the aim is to achieve near-zero instability at the cost of higher makespan. The MILP-based heuristic seems more effective (albeit not as efficient) when the aim is to achieve low expected makespan at the cost of moderate or high instability.
Time:	Jan 24, 06:39 GMT

Authors

first name	last name	email	country	organization	Web site	corresponding?
Kiriakos Simon	Mountakis	k.s.mountakis@gmail.com	Netherlands	Delft University of Technology	http://www.alg.ewi.tudelft.nl	✔
Tomas	Klos	t.b.klos@tudelft.nl	Netherlands	Delft University of	http://www.st.ewi.tudelft.nl/~tomas/	✔

				Technology		
Cees	Witteveen	c.witteveen@tudelft.nl	Netherlands	Delft University of Technology	http://www.st.ewi.tudelft.nl/~witt	✔
Bob	Huisman	bob.huisman@nedtrain.nl	Netherlands	NedTrain		✔

Reviews

Review 1

Review:

This paper presents exact and heuristic methods to solve a so called Proactive-Reactive resource-constrained project scheduling problem where a "baseline" schedule has to be computed together with an "earliest-start policy" (a set of precedence constraints) to minimize a weighted sum of the expected makespan following the ES-policy under uncertain duration and the expected deviation from the baseline schedule. This problem has already been studied by a number of authors. The authors of the present paper propose LP and MILP based methods. The MILP is actually an exact method (see however an small issue concerning this term). Basically these methods use a sampling of the scenario set and a start time variable per scenario, which allow to compute a feasible solution for each scenario for a fixed scheduling policy. the LP method used a ES policy fixed by a heuristic while the MILP method computes the ES policy by means of binary variables, ensuring feasibility via a resource-flow formulation. An iterative flattening based on the MILP is proposed.

The paper is sound and well written, maybe a bit too long for a conference proceedings. The approach obtains good results. there are a number of issues that should however be addressed.

1) The LP and the MILP formulations are not really new. The constraints of LP formulation (15-18) and MILP (28-30) and (31-35) are (almost) the same as the formulation [20-29] in reference [1] where a sample of possible duration scenarios is used to evaluated the maximal regret of an ES-policy. In fact, there is just a change in the objective function and addition of "release dates" constraints from the baseline schedule.

However it is a clever idea to reuse this formulation for the expected makespan and deviation from baseline schedule objectives, but please cite the original formulation.

2) the term "exact" method for the MILP formulation is true only for a fixed sample. It follows that for a general probability distribution, only a lower bound is obtained.

3) About reference [11] by Deblaere et al 2011, the authors mention that "their approach is difficult to compare computationally since no railway-mode scheduling is assumed". This is not a good argument as in the paper by Deblaere et al 2011, there is a separate cost associated to the negative deviation that can be set to arbitrary values so has to obtain prohibitive earliness costs. On the other hand, why is the "railway scheduling assumption" important in the proposed LP and MILP ? I have the impression that the models could be easily modified to relax this constraint.

In conclusion I would suggest to accept this paper provided that the authors address the above-raised issues, at least by appropriate discussions.

[1] Artigues, C., Leus, R., & Nobibon, F. T. (2013). Robust optimization for resource-constrained project scheduling with uncertain activity durations. Flexible Services and Manufacturing Journal, 25(1-2), 175-205.

typos

§2.1 bottom of p. 3 direced -> directed
p 5 in paragraph "List based policies" computatinal -> computational
p. 6 before § 2.3 Leus et. al [22]

Review 2

Review:

the paper addresses the pro-active stochastic project scheduling problem. it proposes two heuristics based on LP and Mixed IP formulations. the heuristics are compared with two state-of art alternatives on benchmarks from the literature.

the heuristics are parametric like the others approaches. The results are better expected makespan but higher instability (measured by total weighted tardiness)than other approaches for a certain range of parameter values. Outside the range, the others become better. is it because of the calibration to choose the right parameter, while comparing to published results?.

q2- it would be of interest to have self-controlled parameter.
q3- you mentioned that the LP heuristic is faster, taking about time, are you using the same computer system of those used for the published literature, when we can not time on different system to claim speed.

Review 3

Review:

1) Please remove citation in the abstract.
2) 50% of in the abstract is just an introduction.
3) Refine the abstract and introduction to clearly address:
- the research issue, i.e. why do you do this research
- Which work do you follow.
- What's new about your work.
4) Write in short and precise.
5) Shorten your paper.
Thank you.