PhD student position at KU Leuven:
Increasing railway robustness via real time conflict resolution

----

The Centre of Industrial Management, Traffic and Infrastructure of KU Leuven (Department of Mechanical Engineering) has a vacancy for a Dutch (or French) speaking doctoral student.

This PhD research is practically oriented and carried out at KU Leuven, in close cooperation with an enthusiastic team at Infrabel. The research topic is situated in the domain of operations research (operational research (OR), "besliskunde", operations management, distribution logistics).

Position:

- a four year fully funded doctoral research position at KU Leuven;
- (80%) scientific research in the field of operations research;
- (20%) educational tasks: seminars, workshops, thesis coaching, etc.;
- attending conferences, visiting international partners, etc.

Topic: Globally optimal solutions for detected train conflicts

Between 2014 and 2016, the Belgian railway infrastructure manager (Infrabel) will implement a new traffic management system (TMS), which encompasses a commercial software tool that detects potential conflicts on the railway infrastructure before they would occur. The TMS will constantly update all train positions and announces conflicts between trains that can be expected. A conflict means that two trains are expected to use, at the same time, the same part of the infrastructure (a switch, a platform or a track), caused by a delay of at least one of the trains. Once a conflict has been announced, the dispatchers of the regional infrastructure manager start thinking about an adequate response. This is an extremely difficult task since other parts of the infrastructure should be assigned to one of the trains and very often this leads to new conflicts to address. Even for an experienced dispatcher it is very difficult or impossible to assess the impact of a certain change on the rest of the trains and the performance of the railway system as a whole.

Infrabel wants the Centre for Industrial Management, Traffic and Infrastructure (CIB) to advise them in the development of a **real-time decision support system** that assists the regional infrastructure managers . Once a conflict is announced, the system should try to find the optimal response when considering the whole railway system. Actually, the decision support system should present a number of "best possible responses" to the dispatchers. For each response, the system should also indicate the **consequence on the**

performance of the whole railway system. Therefore, an offline decision support system, as developed in this project, will be evaluated. The system will use quantitative techniques from the field of operations research (mixed integer programming and/or metaheuristics) to design and evaluate appropriate responses. A trade-off between speed and optimality of the solution should be considered in this study.

Practical:

The starting date of this research position is preferably September, 15, 2014. The candidate should be Dutch (or French) speaking and should be able to write and teach in English. He/She should have a master degree in engineering, business engineering, computer science, informatics or applied mathematics and have an interest in quantitative techniques and operations research.

More information about our research can be found here: http://www.mech.kuleuven.be/en/cib/imresearch/pps. For any questions about this vacancy, you can contact Pieter Vansteenwegen (Pieter.vansteenwegen@kuleuven.be). If you want to apply, you should contact him as soon as possible and certainly before July, 21, 2014.