Data in Brief 9 (2016) 492–500

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Experimental dataset for optimising the freight rail operations

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ARTICLE INFO

Article history:
Received 4 July 2016
Received in revised form
5 September 2016
Accepted 12 September 2016
Available online 21 September 2016

Keywords:
Fright Rail Systems
Train Scheduling
Metaheuristic
Constraint Programming

ABSTRACT

The freight rail systems have an essential role to play in transporting the commodities between the delivery and collection points at different locations such as farms, factories and mills. The fright transport system uses a daily schedule of train runs to meet the needs of both the harvesters and the mills (An Integrated Approach to Optimise Cane Rail Operations (M. Masoud, E. Kozan, G. Kent, Liu, Shi Qiang, 2016b) [1]). Producing an efficient daily schedule to optimise the rail operations requires integration of the main elements of harvesting, transporting and milling in the value chain of the Australian agriculture industry. The data utilised in this research involve four main tables: sidings, harvesters, sectional rail network and trains. The utilised data were collected from Australian sugar mills as a real application. Operations Research techniques such as metaheuristic and constraint programming are used to produce the optimised solutions in an analytical way.

DOI of original article: http://dx.doi.org/10.1016/j.cie.2016.06.002
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http://dx.doi.org/10.1016/j.dib.2016.09.015

Specifications Table

Subject area	Operations Research
More specific subject area	Rail Systems Optimisation
Type of data	Table, graph, figure
How data was acquired	From mills and farm locations
Data format	Filtered, analysed
Experimental factors	Data had been customised to remove any mismatching with real life application such as siding capacity, daily allotment,
Experimental features	A near optimal scheduler for trains was produced using a real sector of Australian rail network.
Data source location	Queensland University of Technology, Brisbane, Australia
Data accessibility	Data is within this article

Value of Data

- The main aim of the presented data is to develop mathematical models of the freight rail systems and help in producing effective solutions in a reasonable CPU time.
- In this research, minimising the makespan is proposed as a main criterion to optimise the freight rail systems using the introduced data. The results in this research can be used to compare the performance of the proposed mathematical methods in optimising complex systems such as rail systems in many prospective studies.
- The data of the produced schedules of the train runs can be used for many different types of the freight systems such as the sugarcane or coal rail systems [5]. The data describe the daily trips of each train to deliver the empty bins at different locations called sidings and collect the full bins from these sidings for delivery to the mills or the factories.

1. Data

Based on the feedback from our industry partners, the data utilised in this research are created in four main tables: Sidings (Table 1), Trains (Table 2), Harvesters (Table 3) and Rail Network (Table 4). In addition, three figures are presented to show the main steps of the proposed solutions: Kalamia's mill with the main original map (Fig. 1), the main steps to produce the final solution (Fig. 2), and the daily trips of each train in the system (Fig. 3).

2. Experimental design, materials and methods

A case study was examined to validate the constraint programming models and metaheuristic techniques. Fig. 1 shows a sector of the transport system of Townsville's mill in Queensland, Australia. Many train runs are generated where each run start at one mill and finishes at the same mill after visiting many different siding locations. The number of trains was selected to implement different runs requiring a fewer number of trains. Kalamia's mill has 58 sidings located in 9 segments but not all of them work on the same day. Approximately 14 trains can be used to construct