



ACRI Rail Knowledge Bank Update.



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Bridge

2017

[Application of results of tests in developing a two-dimensional model for soil–steel railway bridges](#)

Machelski, C; Janusz, L

This paper presents an analysis of the possibilities for the application of a two-dimensional model based on a circumferential strip of soil–steel structures that used results of measurements on railway soil–steel bridges.

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Environment

December 2017

[CO2 emissions and expansion of railway, road, airline and in-land waterway networks over the 1985–2013 period in China: a time series analysis](#)

Li, X, Fan, Y, Wu, L

With the expectation that transportation will contribute 30–40% of the total CO2 emissions in China in the near future, there is an imminent need to identify how the development of different transportation modes may have different long-term effects on CO2 emissions. Using time series data over the period of 1985–2013, this paper applies the combined autoregressive distributed lag (ARDL) and vector error correction model (VECM) approach to identify short- and long-run causal relationships between CO2 emissions and mode-specific transportation development, including railway, road, airline, and inland waterway.

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Maintenance

November 2017

[Estimating railway rail service life: a rail-grid-based approach](#)

Bai, L et al

Precise estimation of railway rail service life is of great significance for the efficient use of maintenance and replacement resources and the effective prevention of broken rails. Here, an innovative model for railway rail service life estimation is proposed. [View item](#)

November 2017

Multi-level condition-based maintenance planning for railway infrastructures: a scenario-based chance-constrained approach

Su, Z et al

This paper develops a multi-level decision making approach for the optimal planning of maintenance operations of railway infrastructures, which are composed of multiple components divided into basic units for maintenance. Scenario-based chance-constrained Model Predictive Control (MPC) is used at the high level to determine an optimal long-term component-wise intervention plan for a railway infrastructure, and the Time Instant Optimization (TIO) approach is applied to transform the MPC optimization problem with both continuous and integer decision variables into a nonlinear continuous optimization problem. [View item](#)

Public Transport

December 2017

Urban agglomeration benefits from public transit improvements: extending and implementing the Venables model

Hazledine, T; Donovan, S; Mak, C

In the Venables model, commuting costs determine the size of the Central Business District (CBD) workforce and thus the productivity and wage premium generated by agglomeration economies in the CBD. Improvements in public transit (PT) modes increase numbers willing to commute to work in the CBD, and generate additional productivity gains. The resulting efficiencies can greatly exceed estimates of direct travel time savings from the PT innovation. The Venables model is operationalised and extended, and applied illustratively to two actual PT innovations in Auckland: improved bus lanes, and improved rail service. [View item](#)

Rail

February 2018

What is the contribution of rail to the UK economy?

Oxford Economics

The UK's rail system contributes over £36bn annually to the UK economy and should be a focus for long-term investment, according to a report commissioned by the Railway Industry Association. [View item](#)

Safety

October 2017

Optimizing suicide and trespass prevention on railways: a problem-solving model from the RESTRAIL project

Havârneanu, G; Burkhardt, J; Silla, A

Suicides and trespassing accidents result in more than 3800 fatalities in Europe, representing 88% of all fatalities occurring within the EU railway system. This paper presents a problem-solving model, which consists of a multistep approach structuring the analysis of a suicide or trespass-related problem on the railways. First, we present the method used to design, evaluate and improve the problem-solving model. Then we describe the model in detail: it comprises six steps with several subsequent actions, and each action is approached through a checklist of prompting questions and possible answers. At the end, we discuss the added value of this model for decision makers and its usability in the selection of optimal prevention measures. [View item](#)

Station

February 2018

Pedestrian roundabout improvement strategy in subway stations

Sun, L et al

Intersecting streams of pedestrians are frequently seen in subway stations. When two or more such streams encounter each other in the normal way, there is interference of progress and a reduction in speed. This research explores the impact of roundabout design on intersecting pedestrian streams by conducting a series of experiments on pedestrians in the field. [View item](#)

December 2017

Simulating queuing behaviour of pedestrians in subway stations

Zheng, X et al

The aim of this study was to simulate pedestrian movements in the queuing process in subway stations using microscopic simulation models. The queuing process was divided into two stages – walking and selecting a queue, and entering a queue and waiting in that queue. Two examples – a ticket office and a security check in a subway station – were used to verify the validity of the proposed models. [View item](#)

Track

December 2017

The analysis of tram tracks geometric layout based on mobile satellite measurements

Specht, C et al

In this article, the results of the research in a field of which uses active global navigation satellite system (GNSS) geodetic networks for the inventory of geodetic geometric tram tracks are presented. The applied measurement technique has been adapted for the designing of the geometric layout of tram tracks. [View item](#)

December 2017

Flexural behavior of concrete crossties under different support conditions

Bastos, J et al

Successful mapping of concrete crosstie flexural demands to different railroad track support conditions can lead to an improved understanding of crosstie flexural performance and more representative design requirements. To quantify the influence of support conditions on concrete crossties' bending moments, laboratory experiments were performed. [View item](#)

February 2018

Performance of geogrid-reinforced pile-supported embankments over decomposed granite soil

Wu, L et al

This paper presents a full-scale test of high-speed railway embankments over completely decomposed granite soil foundations in order to investigate the performance of geosynthetic-reinforced and pile-supported (GRPS) embankments. [View item](#)

Train

January 2018

Assessing technology acceptance for skills development and real-world decision-making in the context of train driving

Naweed, A; Rose, J

Theories relating to technology acceptance include elements such as perceptions about the purpose and use of the technology, personal impact, individual characteristics, peer influence, perceived equity, and organizational factors. Although considerable research into technology acceptance and resistance has been conducted in other domains, very little has been conducted in transportation. Findings from two Australian studies are reported which examined train driver attitudes to two state-of-the-art technologies aimed at enhancing skills development and real-world decision-making. The technologies were implemented in the form of in-vehicle information support and simulated learning. [View item](#)

December 2017

A driver advisory system with dynamic losses for passenger electric multiple units

Ghaviha, N et al

Driver advisory systems, instructing the driver how to control the train in an energy efficient manner, is one the main tools for minimizing energy consumption in the railway sector. This paper discusses the design of a mathematical formulation and optimization approach for such a system, together with its implementation into an Android-based prototype, the results from on-board practical experiments, and experiences from the implementation. [View item](#)

December 2017

Research and development of automatic train operation for railway transportation systems: a survey

Yin, J et al

In this review, the authors focus on this emerging technology of automatic train operation (ATO) for its theoretical development and practical implementations. Specifically, this study first presents the background of ATO technology in railways, which involves the detailed description of its development and implementation in urban metro systems, fundamental features and basic structure of a typical ATO system. Then, the authors present a comprehensive literature review in this area, in which the current studies are generally classified into three main aspects, i.e., train operation modeling techniques, train trajectory optimization and train speed control methods. Finally, the emerging requirements for current ATO systems and the most promising research directions in this area in the future are discussed explicitly, including (i) the practical implementation of ATO in main line and high-speed railways, (ii) the cooperative train operation methods for energy-saving issues and (iii) the integration of railway traffic control with advanced ATO technology. [View item](#)

Transit Oriented Development

December 2017

What determines rail transit passenger volume? Implications for transit oriented development planning

Pan, H et al

This paper is aimed at empirically examining the effect of rail transit station-based TOD on daily station passenger volume. The main findings are: (1) passenger volume is positively associated with employment density and residents' commuting distance around station; (2) stations with earlier opening dates and serving as transfer nodes tend to have positive association with passenger volumes; (3) metro stations better integrated with nearby commercial development tend to have larger passenger volumes. Several implications are drawn for TOD planning: (1) TOD planning should be integrated with rail transit network planning; (2) location of metro stations should be coupled with commercial development; (3) high employment densities should be especially encouraged as a key TOD feature; and

(4) interchange stations should be more strategically positioned in the planning for rail transit network. [View item](#)

Tunnel

October 2017

Ultimate load-carrying capacity of the longitudinal joints in segmental tunnel linings

Liu, X et al

According to the service conditions of operating metro shield tunnels, segment joints are vulnerable locations in tunnel linings. In addition, the mechanical performance of segment joints directly determines the bearing capacity of segmental tunnel linings. Illustrated with the typical segment joints of the Shanghai Metro rapid transit system, experiments are conducted to investigate the ultimate bearing capacity of the longitudinal joints under different load conditions. [View item](#)

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[National Interest Services supporting an informed land transport community](#)

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