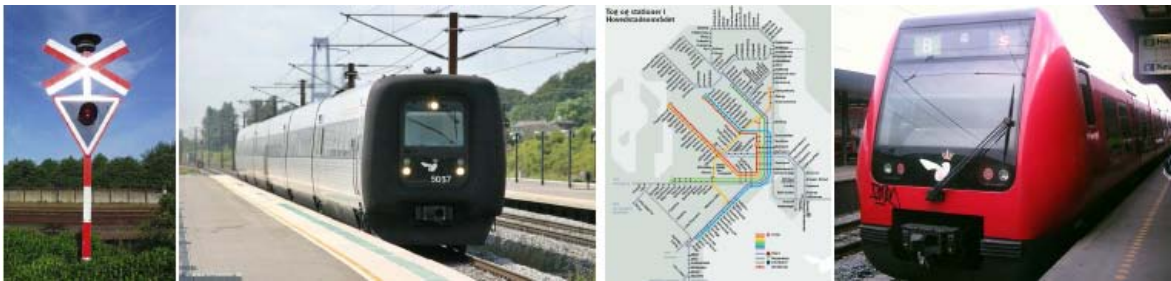
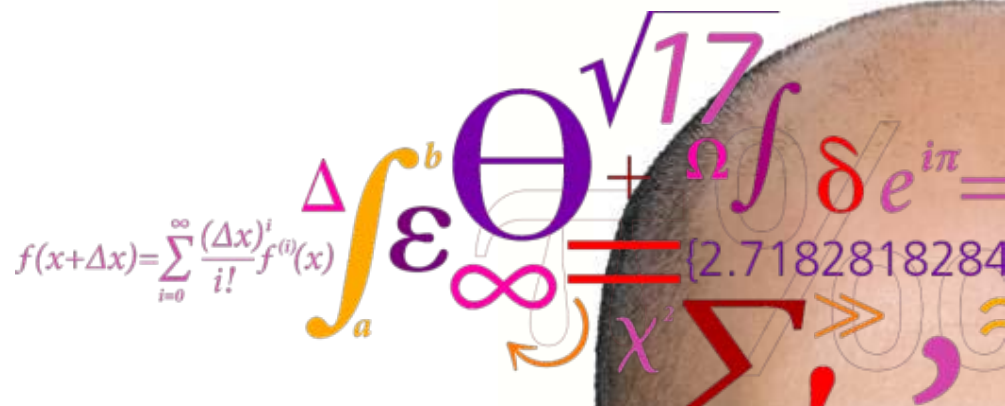


Robust Rails

- Robustness in Railway Operations

MINI CONFERENCE

August 27, 2015



Welcome

- 55 participants
- 16 companies (26 departments)



Robust Railway Operations



RobustRails

Vision

Trains provide an environmentally friendly way of transportation.

If we want more people to use the trains, then the transportation system must be more timely, reliable, high-frequent, and comfortable.

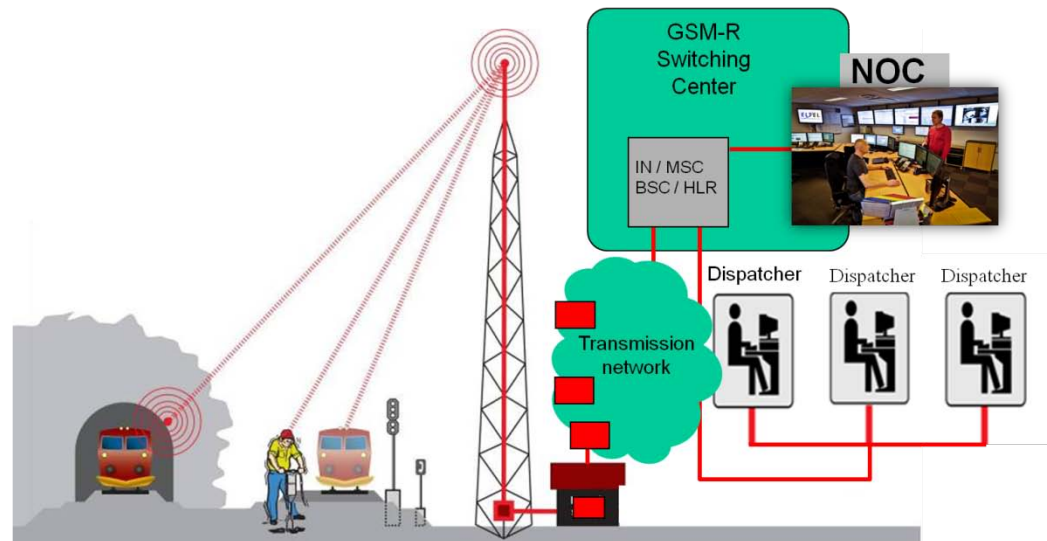
- January 2012 – December 2015
- DTU Management, DTU Transport, DTU Compute, DTU Fotonik



Projects in RobustRails

Infrastructure robustness

- Verification of railway control systems
- Communication technologies support



Projects in RobustRails

Robustness in rail operational process

- Operations planning to prevent delays
- Recovery planning

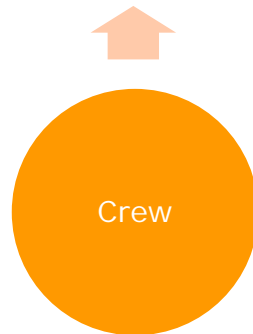
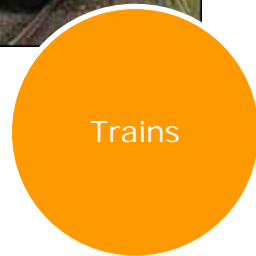
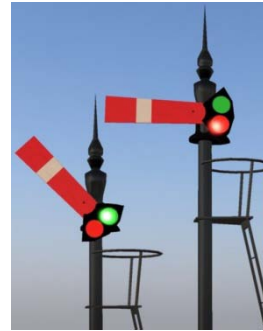


Projects in RobustRails

Passenger viewpoint



Data from many sources



Publications

www.robustrails.man.dtu.dk/Publications (40 publications since 2012)

2015

- Model-checking and Model-based Testing in the Railway Domain.
Anne E. Haxthausen and Jan Peleska.
 To be published in: Formal Modeling and Verification of Cyber-Physical Systems, Lecture Notes in Computer Science. Springer.
no open access
- Formal Modeling and Verification of Interlocking Systems Featuring Sequential Release.
Linh H. Vu, Anne E. Haxthausen, and Jan Peleska.
 In Formal Techniques for Safety-Critical Systems, volume 476 of Communications in Computer and Information Science, pages 223–238, Springer International Publishing Switzerland, 2015.
no open access, 90 % RobustRails financing
- A Graphical Domain-specific Language for Railway Interlocking Systems
Andreas Foldager
 Technical Report, DTU Compute, Technical University of Denmark, 2015
Open access, 100 % RobustRails financing
- [An optimization based method for line planning to minimize travel time](#)
Simon Henry Bull, Richard Martin Lusby and Jesper Larsen
 In Proceedings of the 13th Conference on Advanced Systems in Public Transport (CASPT) 2015, 18 pages, Erasmus University 2015
Open access, 100 % RobustRails financing
- A Formal Specification Language for Generic Railway Control Systems
Jacob Bøgelund Hansen
 Technical Report, DTU Compute, Technical University of Denmark, 2015
Open access, 100 % RobustRails financing

RobustRails Prizes

- Linh Hong Vu, Jan Peleska, Anne Haxthausen "A Domain-specific Language for Railway Interlocking Systems" **Best paper award** FORMS/FORMAT 2014

FORMS/FORMAT 2014
10th Symposium on Formal Methods



- Jørgen Haahr, Richard Lusby, **first prize**, RAS Competition, Railway Application Section, INFORMS, 2014

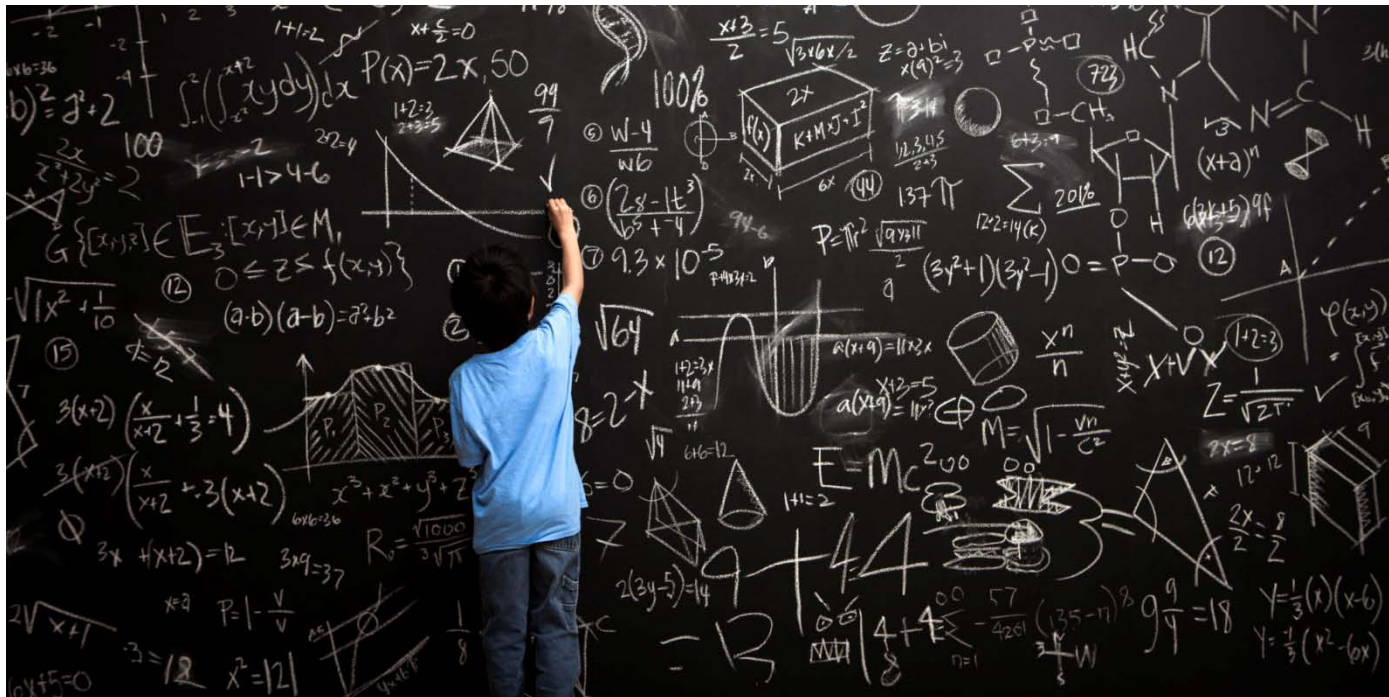


- Jørgen Haahr, Simon Bull, **second prize**, ROADEF/EURO Challenge 2014, junior.



Purpose of this mini-conference

- Tell about our findings
- Listen to feed-back
- Networking
- Discuss future challenges



Program, morning

TIME	EVENT
8.30-9.00	Coffee/tea + light breakfast
9.00-9.10	Welcome , by David Pisinger, Professor, DTU Management Engineering
9.10-9.30	Robustness in Railway Transport by Otto Anker Nielsen, Professor, DTU Transport
9.30-10.10	”Next generation train control communication architectures: Cybersecurity and resilience aspects” , by Marina Aguado, PhD, Associated Professor - University of the Basque Country (UPV/EHU)
10.10-10.30	Coffee/tea break
10.30-12.00	<p>RobustRailS presentations</p> <ul style="list-style-type: none"> • Assessment of robust capacity utilisation in railway networks by Lars Wittrup Jensen, PhD student, DTU Transport • Line Planning in Practice by Simon Henry Bull, PhD student, DTU Management Engineering • Integrated disruption planning by Jørgen Thorlund Haahr, PhD student, DTU Management Engineering
12.00-13.00	Lunch



Program, afternoon

13.00-14.30	<p>RobustRailS presentations</p> <ul style="list-style-type: none"> • Improving Passenger-Oriented Line Planning Algorithm by Jens Parbo Jensen, PhD student, DTU Transport • Communication solutions for the future ERTMS by Aleksander Sniady, Postdoc, DTU Fotonik • Automated, Formal Verification of Safety Requirements for Interlocking Systems by Linh Hong Vu, PhD student, DTU Compute
14.30-14.50	Coffee/tea break
14.50-15.35	<p>”Vehicle rotation planning for ICE highspeed trains” by Ralf Borndörfer, Professor, Dr. habil., The Zuse Institute Berlin, Germany</p>
15.35-15.50	Coffee/tea/cake break
15.50-16.30	<p>”Hand in Glove: Complete Bounded Model Checking and Testing of Interlocking Systems”, by Jan Peleska, Professor, Dr. habil., University of Bremen, Germany</p>
16.30-16.50	Closing , by David Pisinger

Practical information

- Toilets
- Vegetarians
- Cell phones



Enjoy the day



"I know it's yesterday's ticket! That's when I got on this bloody train!"