

# Slightly Sorted Slides

Thorsten Koch

Zuse Institute Berlin / TU Berlin

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an information service for mathematical software

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## Project

Start 2011 with MFO, FIZ; 2015: ZIB, Modal: [swMATH-about](#)

Open access software database [swMATH.org](#)

Database includes [benchmarks](#), [languages](#), [services](#), ...

Complete coverage of all mathematical topics

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## an information service for mathematical software

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Publication-based approach:

Use [zbMATH](#)-publications to identify software and extract information

MSC-2010 Mathematical Subject Classification, e.g. [90C11](#)

Continuous updates: daily (production) and weekly (swmath.org)

Monthly increase by 100-200 packages with 1500 zbMATH-references

Implementation: PostgreSQL (Full Text Searching), Python, [django](#)

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[zbMATH](#) (Zentralblatt Mathematik) is not open access

Missing references in zbMATH-publications

Time delay with peer reviewed publications

No arXiv, no preprints

No software citation standard for easy identification, e.g. [soplex](#) (?),  
[scip](#) (+)

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# an information service for mathematical software

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## SCIP

SCIP is currently one of the fastest non-commercial solvers for mixed integer programming (MIP) and mixed integer nonlinear programming (MINLP). It is also a framework for constraint integer programming and branch-cut-and-price. It allows for total control of the solution process and the access of detailed information down to the guts of the solver. SCIP is part of the SCIP Optimization Suite, which also contains the LP solver SoPlex, the modelling language ZIMPL, the parallelization framework UG and the generic column generation solver GCG.

### Keywords for this software



URL: [scip.zib.de/](http://scip.zib.de/)

Authors: Gerald Gamrath, Ambros Gleixner, Gregor Hendel, Stephen J. Maher, Matthias Miltenberger, Benjamin Müller, Marc Pfetsch, Felipe Serrano, Dieter Weninger, Jakob Witzig  
 Platforms: Linux, Windows, Mac OS  
 Licence: ZIB academic license  
 Current version: 3.2  
 Dependencies: LP-solver, e.g. SoPlex, CPLEX, XPress, ...

[Add information on this software.](#)

### Related software:

CPLEX  
 MIP LIB  
 MIP LIB 2003  
 Benchmarks for Optimization ...  
 SoPlex  
 FEAS PUMP  
 MINLP Lib  
 LINDO  
 LINDO Global  
 Bonmin

[Show more ...](#)

References in zbMATH (referenced in 155 articles , **4 standard articles** )

Showing results 1 to 20 of 155.

Sorted by year (citations)

1 2 3 ... 6 7 8 next

1. Björkel, Gustav; Monette, Jean-Noël; Renier, Pierre; Pearson, Justin: A constraint-based local search backend for MiniZinc (2015)
2. Eckstein, Jonathan; Hart, William E.; Phillips, Cynthia A.: PEBBL: an object-oriented framework for scalable parallel

Article statistics & filter:

Search for articles



MSC classification

☒ Top MSC classes  
☒ 05 Combinatorics

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## Web-GUI

Simple search in swmath.org: [mixed integer programming](#)

[Browsing](#) or advanced field search, e.g. by [name](#)

Search with URL-parameter (REST), e.g. [Scip](#)

In zbMATH with [software](#) tab page

In zbMATH with software-field: [sw:scip cplex gurobi](#)

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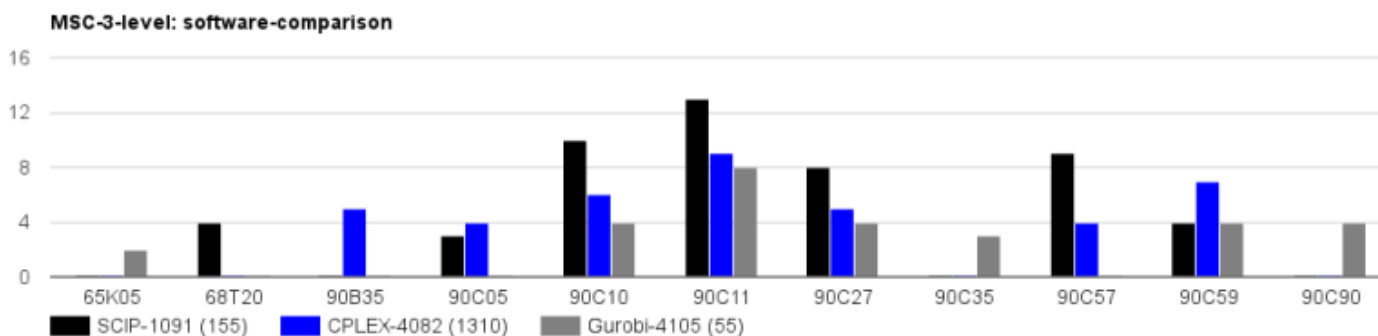
## an information service for mathematical software

### External sites

Double-linked integration with [zbMATH](#) and [ORMS](#)

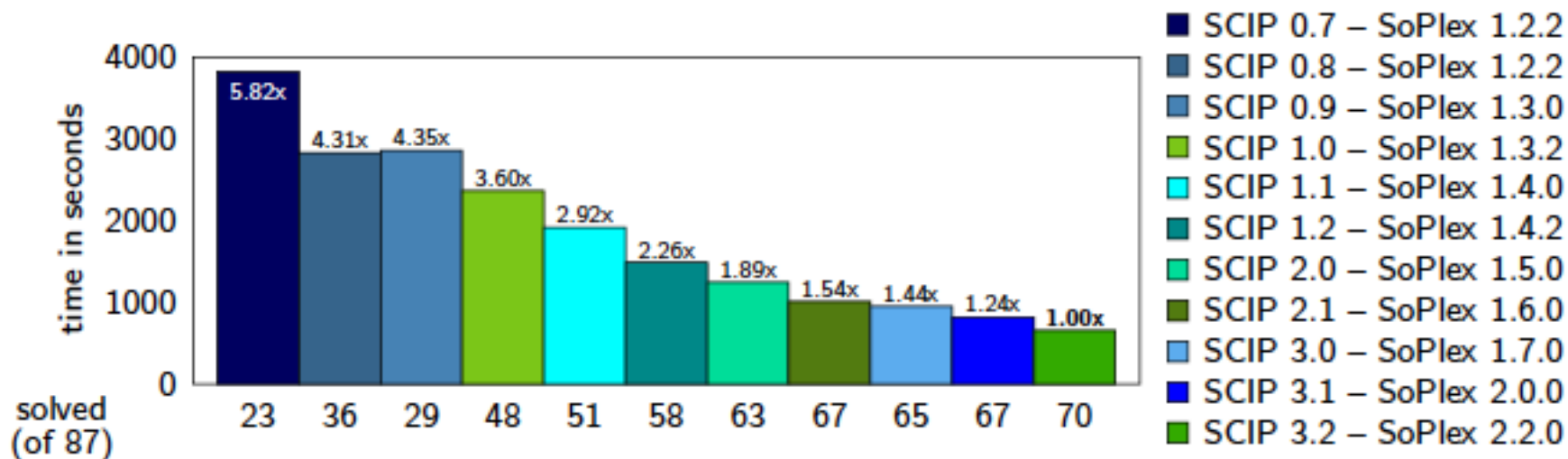
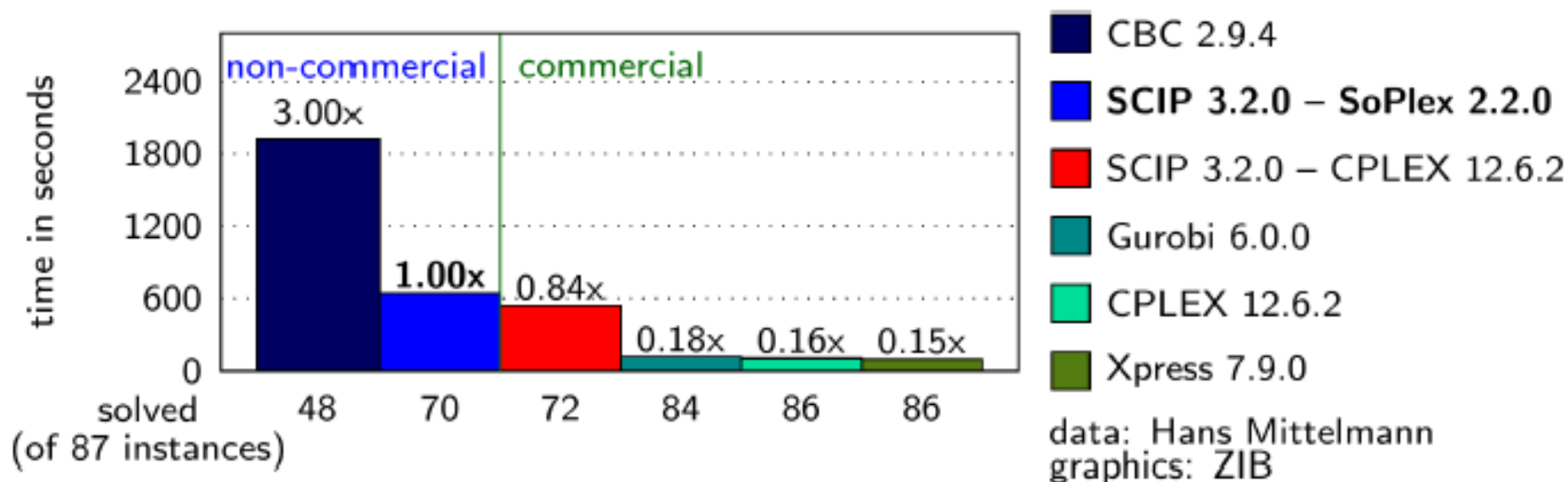
XML export to integrate swMATH-content: [last 10](#) publications of [Singular](#)

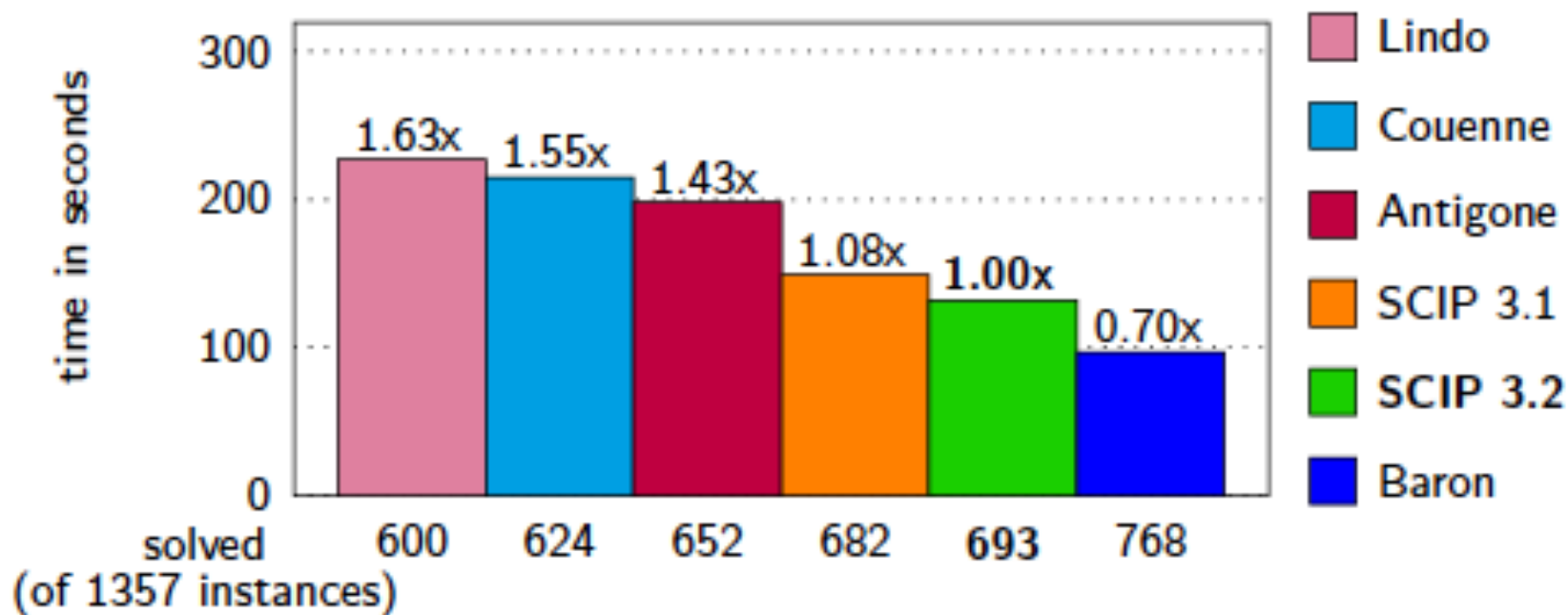
[MSC-export](#) for generating a MSC-Profile or compare software:



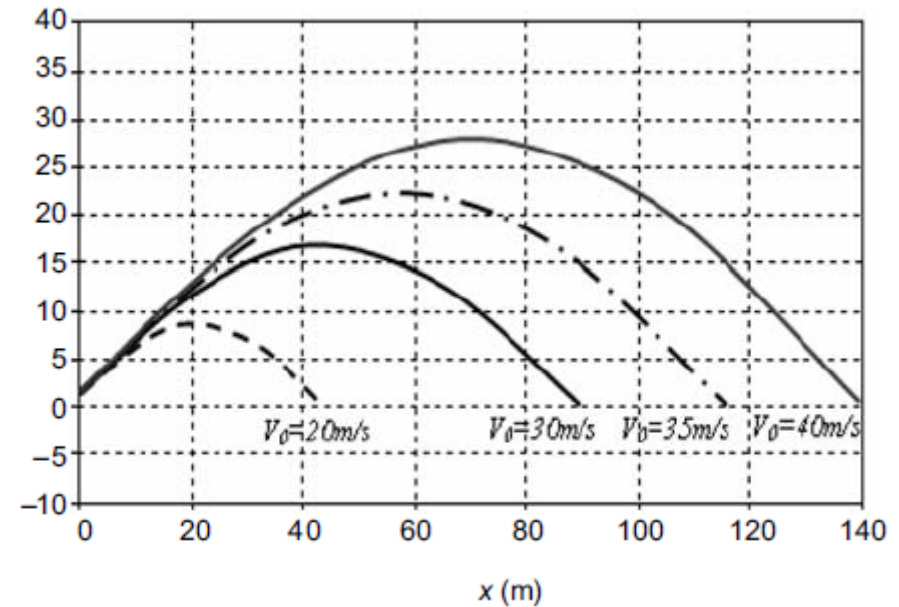
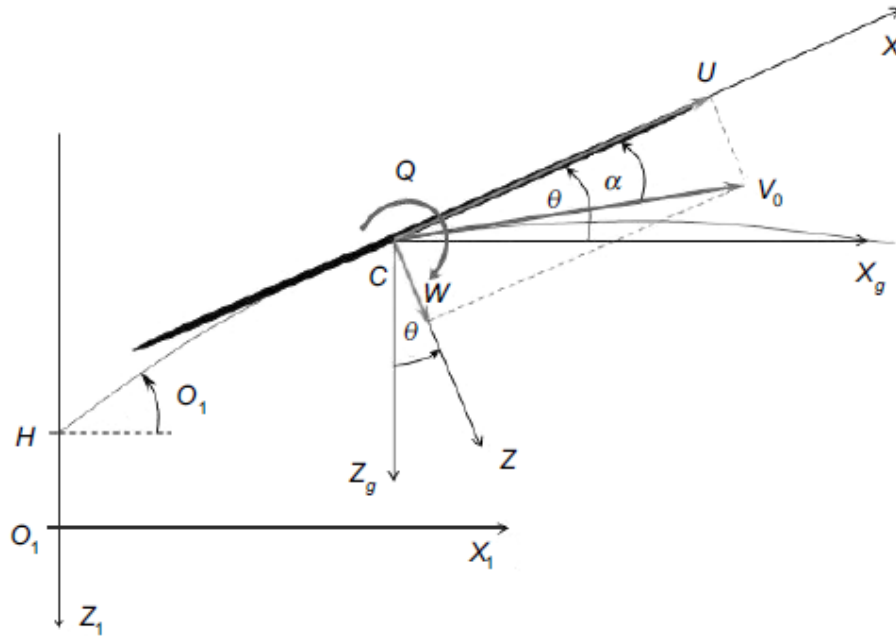
# A quick update on the SCIP Optimization Suite







# Now something completely different

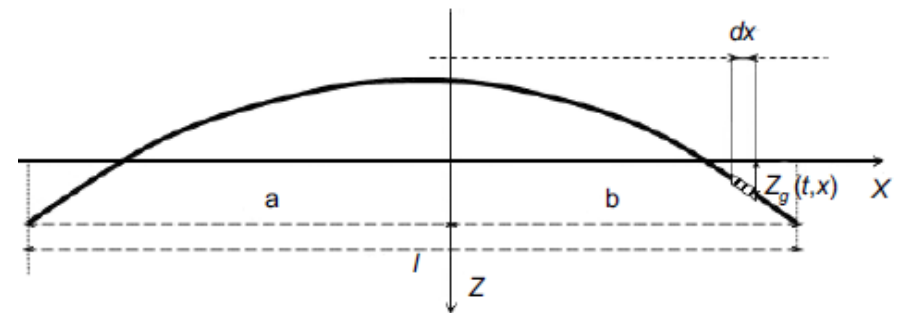


$$\frac{d}{dt} \left( \frac{\partial T^*}{\partial U} \right) + \frac{\partial T^*}{\partial W} Q = Q_U^*$$

$$\frac{d}{dt} \left( \frac{\partial T^*}{\partial W} \right) + \frac{\partial T^*}{\partial U} Q = Q_w^*$$

$$\frac{d}{dt} \left( \frac{\partial T^*}{\partial Q} \right) + \frac{\partial T^*}{\partial U} W - \frac{\partial T^*}{\partial W} U = Q_Q^*$$

$$\frac{d}{dt} \left( \frac{\partial T^*}{\partial q} \right) - \frac{\partial T^*}{\partial q} + \frac{\partial V_{zg}}{\partial q} U = Q_q^*$$



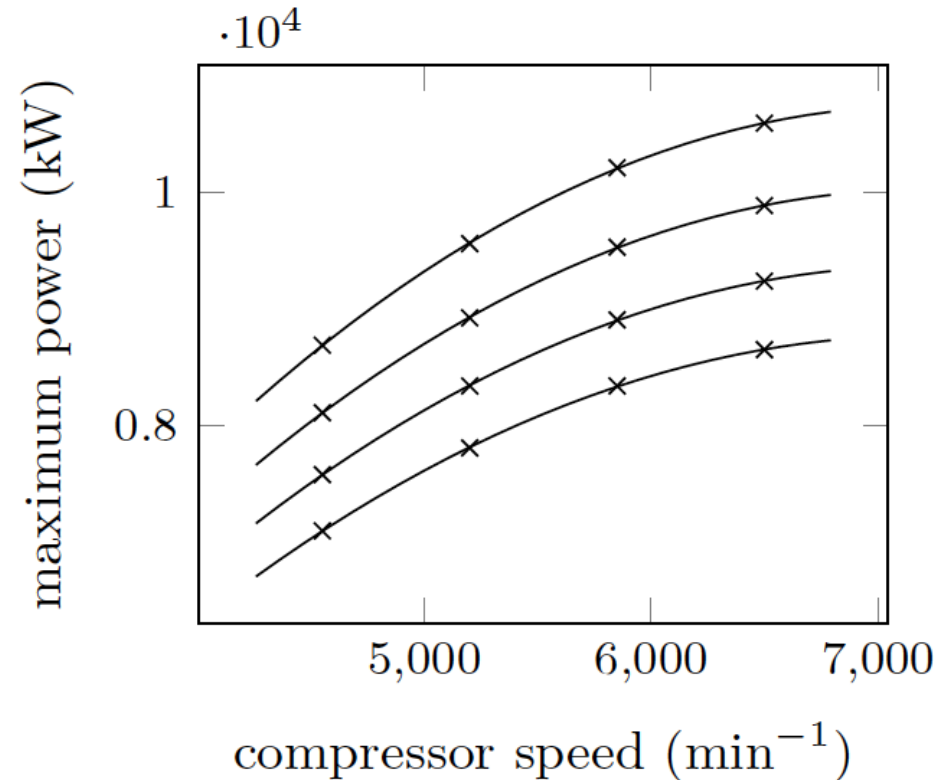
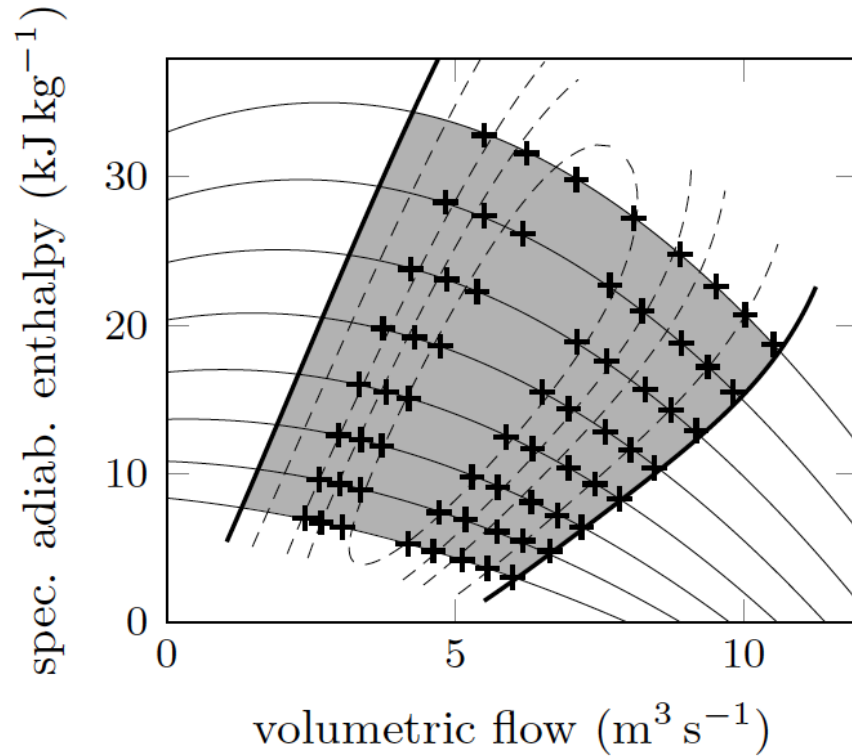
*Mathematical Modeling and Numerical Simulations of Javelin Throw*  
J. Maryniak, E. Ładyżyńska-Kozdraś, E. Golihška  
J. of Human Movement, Vol. 1 (2009), 16-20





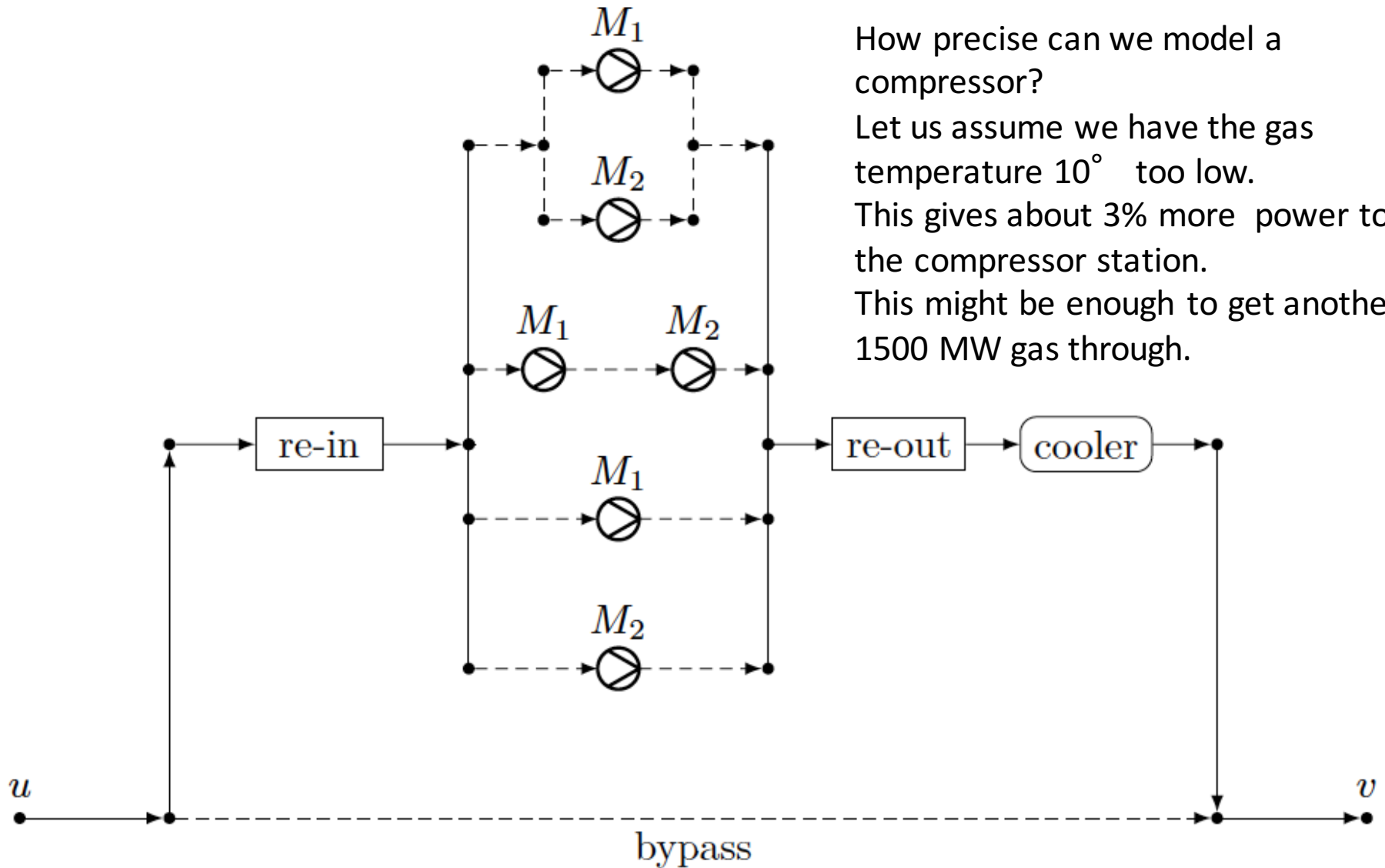


# Notes about gas network



Compressor performance depends on input pressure, output pressure, flow, temperature, composition, compressor power.





How precise can we model a compressor?

Let us assume we have the gas temperature  $10^\circ$  too low.

This gives about 3% more power to the compressor station.

This might be enough to get another 1500 MW gas through.



# Remarks

- ▶ SCADA (supervisory control and data acquisition)  
Several vendors like PSI and Siemens
- ▶ Process-accompanying Simulation  
Standard gas network simulators: Simone, Ganesi, Mynts-G
- ▶ Reconstruction
- ▶ Planning (TSP specific tools like MCA, ForneOS, Excel ☺ )
- ▶ Contracts (SAP)
- ▶ Trading (?)



- Make the Optimization fit into the software/data/transformation stack
- Time resolution / Network resolution / Precision of input data
- Gaining acceptance by using the Google approach:  
do not require the users to work first!
- Everybody is different – so they are the same  
Hard to agree on generalizations of the models between companies
- Difficult to get agreement on acceptable simplifications

## How to make optimization solutions work in industrial practice? Have the right people with the right mindset!

- Industry is full of optimization problems, but they are often not obvious – identifying them is part of the job.
- Excellent mathematics which fits to the challenges of the application is necessary but not sufficient for success.
- Having the right people with the right mindset is a key to success.

Why isn't it considered innovative,  
if a solution works in industrial practice?

	<b>Problem definition</b>	<b>Real world constraints</b>	<b>Data</b>	<b>Code</b>
Pure research	None	None	None	None
Applicable research	General	Unknown	Random/Simplified	Whatever
Applied research	General	Maybe	Random/Simplified	Whatever
Case study	Simplified	Some	Simplified	Whatever
Planning application	Simplified	Some more	Simplified/Real	Production
Control application	Complete	all	Real	24/7

Task:

**Predict the hourly gas demand of the next day at every entry and exit.**

Check quality of forecast with reality.

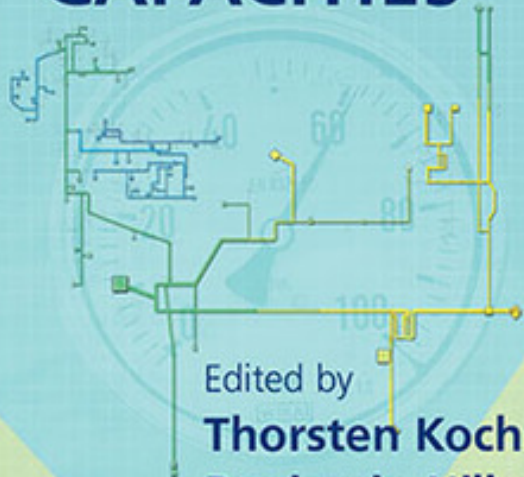
Reality: Is the gas flow at every entry/exit.

Demand: What the TSO customers wanted.

- Why is this not the same?
- interruptible capacities
- TSO nominations (swaps)
- Forced Standard Load Profile nominations
- Balancing energy



# EVALUATING GAS NETWORK CAPACITIES



Edited by  
**Thorsten Koch**  
**Benjamin Hiller**  
**Marc E. Pfetsch**  
**Lars Schewe**

MOS-SIAM Series on Optimization

The *Research Cooperation Network Optimization* ran 6 years, involving more than 30 people from 7 research institutes and Germany's largest gas network system operator.

Here are the results.



# Thank you very much!

# Questions?