An overview of MOSEK

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Introduction

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Background

■ MOSEK ApS is a Danish company.

■ Vision: Create and sell software for solving linear and convex optimization problems.

■ Located in Copenhagen at Symbion Science Park.

■ Daily management: Erling D. Andersen.

■ Currently 4 full-time, 4 part-time employees and 1 phd student.

Product overview

■ Main product: MOSEK optimization tools.

■ Solves generic:

◆ Linear, quadratic, and nonlinear problems. Only convex cases.

◆ Conic optimization problems.

$$
\begin{aligned}
\min \quad & c^T x \\
\text{st.} \quad & Ax \;=\; b, \\
& x \in K
\end{aligned}
$$

where K is a convex cone (only linear, quadratic, semidefinite).

◆ Integer optimization problems.

■ Same as above but some variables are integer constrained.

■ The software is **NOT** application specific.

Customers

Types of customers

- Structural design.

  - Arch Bridge Analysis.

- Financial industry.

  - Portfolio optimization.
  - Trading and cash optimization.

- Power industry.
- Forestry.
- Bus crew scheduling.
- Analogue circuit design.
- Bio tech.
- Advertisement.
- + more.

■ End customer size.

◆ Small with 1 user.
◆ Large with users e.g. large banks.

■ OEM.

◆ Integrate MOSEK into a another product.

■ Value added resellers.

Geographical markets:

■ North America.
■ Europa (few Danish customers).
■ Japan.
■ Australia.
■ South America.

Product details

■ Primal and dual simplex for linear problems.

■ Primal network simplex for network flow problems.

■ Interior-point for linear, conic and nonlinear problems.

■ Two branch and bound and cut optimizers.

◆ Freely included. Tuned for conic problems.

◆ Paid addon: Tuned for linear problems.

- Optimizer API

    - Matrix orientated.
    - C, Java, .NET and Python.

- Fusion

    - Object orientated.
    - Only linear and conic problems.
    - Java, MATLAB, .NET and Python.

- Other

    - AMPL
    - MATLAB toolbox.
    - R package.

- Third party links:

    - AIMMS, CVX, GAMS, MPL (soon), Woodstock.
    - Coin OSI, Raven Toolbox, Yalmip, ...

Getting started

Useful links

- **Software download:**

  - `http://mosek.com/download/`

- **Trial license:**

  - `http://mosek.com/resources/trial/`

- **Documentation:**

  - `http://docs.mosek.com`

- **Support:**

  - `http://mosek.com/support/`

- **Social medias:**

  - `http://mosek.com/resources/social-media/`

Licensing

Floating licenses

■ PTS: Linear and quadratic optimization + integer variables.

■ PTON: Nonlinear and conic extension + integer variables.

■ PTOM: Mixed-integer optimizer extension.

■ One usage at any computer in the network. Token server required.

■ Pricing:

◆ `http://mosek.com/sales/pricing/`

Server licenses

- PTS-NODE: Linear and quadratic optimization + integer variables.
- PTON-NODE: Nonlinear and conic extension + integer variables.
- PTOM-NODE: Mixed-integer optimizer + integer variables.
- No token server.
- Unlimited use on a single prespecified computer.
- Pricing:

  ◆ `http://mosek.com/sales/pricing/`

- A rental license.
- Unlimited use of 1 or more features.
- One organizational unit e.g. one department.
- No license token server.
- Price negotiated every third year.

- Free for both personal and classroom usage.
- Visit:

  -
    `http://mosek.com/resources/academic-license/`

Present and future of MOSEK

■ MOSEK version 7 released sping 2013.

◆ Added support semidefinite optimization.
◆ Added the linear and conic Fusion modeling API.
◆ Added a new mixed integer optimizer.

■ Strong emphasize on linear and conic problems.

■ Continued strong emphasize on linear and conic optimization + integer variables.

■ Emphasize improvements:

   ◆   Improve speed and stability.

   ◆   Exploit hardware better. E.g. AVX and Intel

■ New features:

   ◆   Add mixed-integer semidefinite optimization.

   ◆   Add nonsymmetric cones (if algorithms deemed good enough).

Summary

Final comments

■ Presented MOSEK.

■ Slides are available at:

◆ `http://www.mosek.com/presentations/`