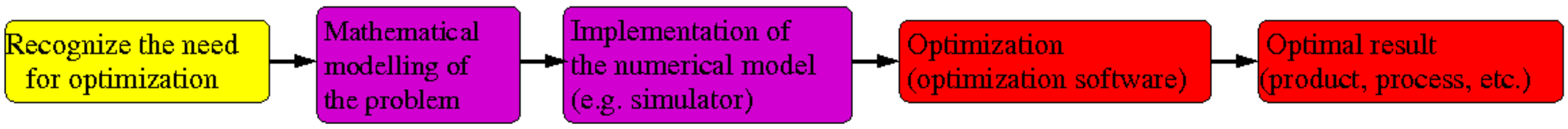
Industrial Optimization

Optimization = scientific approach to decision making (Saul I. Gass)

Industrial optimization means utilizing optimization especially in industrial problems; e.g. improvement of product properties, making production processes and their controls more efficient and finding the best shape or structure.



Potential of optimization

Simulation models are often used in industrial design problems. Traditional design via trial and error does not guarantee optimality. Truly optimal solution can be found by utilizing optimization methods.

Industrial Optimization Group
http://www.mit.jyu.fi/optgroup

Research profile

- Multiobjective optimization
  - MCDM and EMO methods
  - interactive and hybrid approaches
  - software implementations
  - theoretical considerations
  - metamodelling and approximation
- Nonlinear programming
- Research projects and industrial applications

Current members

Prof. Kaisa Miettinen
PhD Timo Aittokoski
PhD Petri Eskelinen
PhD Jussi Hakanen
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PhD student Tomi Haanpää
PhD student Suvi Luoma
PhD student Vesa Ojalehto
PhD student Sauli Ruuska
PhD student Karthik Sindhya

Collaboration (among others)

- Prof. L.T. Biegler (Carnegie Mellon Univ., USA)
- Dr. J. Branke (Univ. of Warwick, UK)
- Prof. K. Deb (HSE, IIT Kanpur, India)
- Prof. K. Klamroth (Univ. of Wuppertal, Germany)
- Profs. P. Korhonen & J. Wallenius (HSE)
- Drs. M. Luque & J. Molina (Univ. of Malaga, Spain)
- Prof. R. Ritala (TTY), Dr. S. Kaijaluoto (VTT)
- Prof. F. Ruiz (Univ. of Malaga, Spain)
- Prof. R. Slowinski (Poznan Univ. of Tech., Poland)
- Profs. L. Thiele & E. Zitzler (ETH, Switzerland)
- Prof. M. Wiecek (Clemson University, USA)

Multiobjective optimization

Typically, we have several conflicting objectives to be optimized. Then, an improvement in some objective leads to an impairment in some other objective. Multiobjective optimization supports finding the *best compromise*.

For example, when designing a new production unit, one must balance between investment and operation costs.

Simultaneously, one can consider e.g.

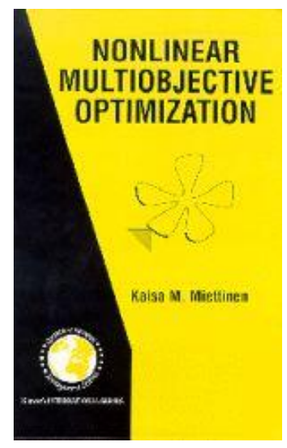
- quality
- durability
- reliability
- costs
- environmental values
- safety

Benefits of multiobjective optimization:

- Conflicting objectives are taken into account simultaneously ⇒ an overall insight
- Managing complex interdependencies and finding the best compromise
- Significant competitive advantage when compared to traditional approaches

Interactive multiobjective optimization

- Supports the decision maker actively in finding the best compromise
- The decision maker learns about the problem/ phenomenon considered and interdependencies between the objectives
- New methods developed: *NIMBUS*, *Pareto navigator* and *Nautilus*



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