



TECHNOLOGY

Multi-Objective Collaborative Robust Optimization (McRO)

OVERVIEW

Background

Engineering design optimization methods involving “complex” systems often fall under Multi-disciplinary Design Optimization (MDO), where complex refers to a system whose analysis involves multiple coupled subsystems (or disciplines). Several techniques have previously been developed and applied to single-objective optimization problems (i.e., problems where each subsystem has only one design objective to meet). In contrast with single-objective optimization, Multi-objective MDO (M-MDO) approaches have received very little attention. The research in MDO problems with multi-objective subsystems is important because: i) it allows the flexibility in each subsystem to have multiple conflicting objectives, and ii) it accounts for cases where one or more objectives are important and considered at a subsystem, but not at the system, level.

In order to fill this void created by the non-existence of M-MDO approaches, researchers at the University of Maryland have invented a technique to obtain optimal solutions to M-MDO problems in a decentralized (multi-subsystem) fashion and have those solutions be insensitive (or robust) to the uncertainty (or uncontrollable variations) that exist in the parameters of an MDO problem. A patent application is pending.

Advantages

McRO can find robust solutions, especially for M-MDO problems which have the following properties:

- Each subsystem can have multiple objective functions and mixed continuous design variables
- Subsystems can be fully coupled (i.e., have a two-way connection)
- Probability distributions for the MDO parameters, which are difficult to estimate or obtain, are not necessary
- Functions used to evaluate designs in all subsystems can be black-box simulations

Applications

Engineering design optimization problems, including:

- Automobile design
- Aerospace engineering
- Power tool design
- Any area involving “complex” systems

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Additional Information

INSTITUTION

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PATENT STATUS

Patent(s) pending

LICENSE STATUS

Contact OTC for licensing information

CATEGORIES

- Software + Algorithm
- Information Technology
- Engineering

EXTERNAL RESOURCES

IS-2008-068