

Development of an Optimization-based Design Support Tool

Status:	Available
Group Member(s):	TBD
Sponsor(s):	Dr. Gary Wang
Supervisor(s):	Gary Wang, PhD, PEng, Professor, Mechatronic Systems Engineering

Project Description

Background:

Though powerful as is, optimization has seen limited use in the industry because of its shortcomings in many fronts, including 1) needs explicit equations and/or reliable gradient information, 2) needs an excessive number of function evaluations, which hinders the direct calling of expensive processes such as FEA or CFD, 3) the process is not sufficiently robust, 4) the optimum result is not intuitive, 5) there lacks of aid in defining the optimization problem, and so on. There also have been some successes in the past decade. This work aims to develop a software tool, built on the research results of Product Design and Optimization Laboratory (PDOL) at SFU and publicly available algorithms and codes, that can overcome the above mentioned obstacles, to some extent. The project will involve:

- Research on existing best optimization tools and algorithms
- Learning of PDOL tools and algorithms including MPS, DMPS, and PSP
- Design of a design support tool including the system framework, components, functions, and graphic user interface (GUI)
- Rewriting the existing Matlab code using a programming language (subject to project specification)
- Development of a convenient interfacing mechanism with existing commercial analysis tools such as ANSYS and COSMOL
- Development of a visualization tool that supports user interaction

- Testing the algorithms and tools with benchmark problems

Requirements:

Background: Optimization, mathematics, computer programming, software design

Software: Matlab, C, C++, JAVA

Deliverable: A software tool that can support

- Visualization of the problem, optimization process, and results
- Interactive definition of an optimization problem
- Global optimization with both continuous and discrete variables
- Multi-objective optimization
- Integration with existing commercial engineering analysis tools