Multi-objective optimization techniques in control systems engineering

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Abstract: Control engineering problems are generally multi-objective problems; that means
that there are several specifications and requirements that must be fulfilled, often in conflict. A
traditional approach for calculating a solution with a desired trade-off is defining an optimization
statement. Multi-objective optimization techniques deal with such problem from a particular
perspective by searching for a set of potentially preferable solutions: the so called Pareto set.
The designer may then analyse the trade-off among solutions in this set, and select the most
preferable alternative according to the problem at hand. The aim of this open track is to provide
the opportunity among practitioners to exchange ideas and to share potential applications of
multi-objective optimization techniques in control systems engineering. This track focuses on
using or extracting information from a Pareto front approximation, in order to solve a control
problem. Topics covered (but not limited to) include insights, tools and theoretical developments
on:
- Multi-objective problem definition
- Multi-objective optimization process
- Multi-criteria decision making stage
- Control applications

Keywords: Multi-objective optimization, parametric optimization, evolutionary algorithms,
process control, decision making.

1. OPEN INVITED TRACK DESCRIPTION

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tion techniques in control systems engineering. This OIT
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front approximation, in order to solve a control problem.
Topics covered (but not limited to) include insights, tools
and theoretical developments (always within the control
systems engineering framework) on:

- Multi-objective problem definition: design objectives
statement, constraints definitions, decision variables,
pertinency and/or preferences statement.
- Multi-objective optimization process: local or global
search; mechanism for handling constraints, prefer-
ences, many-objectives optimizations instances.
- Multi-criteria decision making stage: decision making
techniques; tools and methodologies for visualization
and selection.
- Control applications. Problem solving in control sys-
tems engineering using multi-objective optimization
tools.

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