Collaborative Research: Organizational and Uncertainty Impacts of Couplings in a System Design Framework

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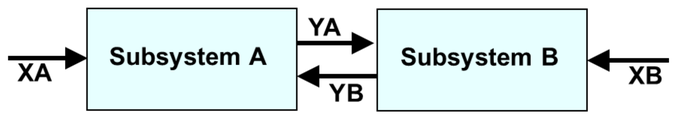

USC University of Southern California

NSF Award CMMI-1300921
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PhD: Benjamin Kwasa
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- System couplings must be represented for highly coupled systems to capture the physics
- MDO with VDD leads to higher value systems
- Value framework has been developed to support system optimization
- Uncertainty in design variables, models, and couplings in general have major impact on design decisions
- Decision Analysis is incorporated in framework to capture both risk and value preferences
- Value gap between requirements-based SE and value-based SE are being explored

NSF Award CMMI-1301150
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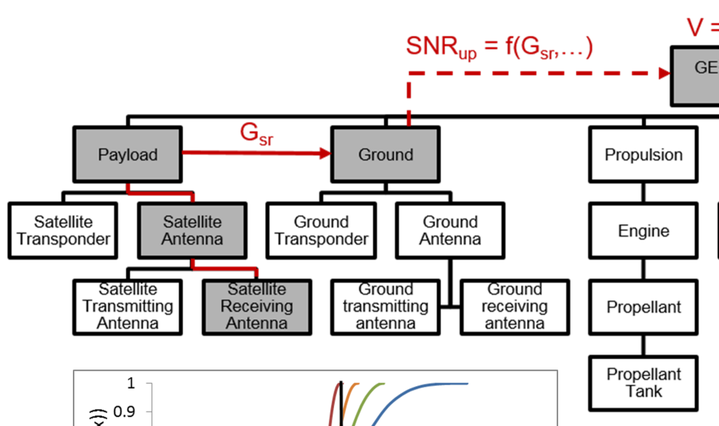
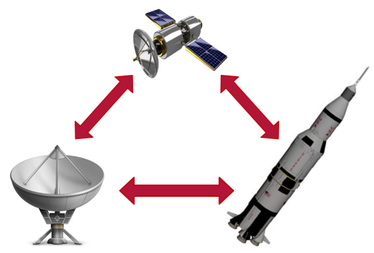
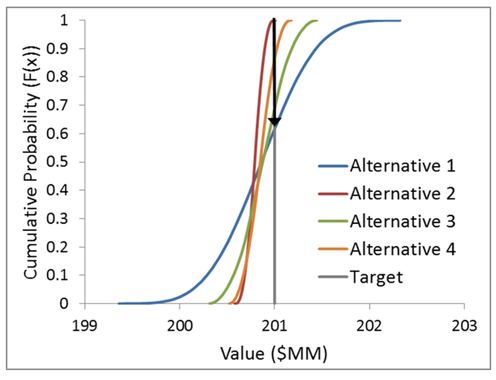
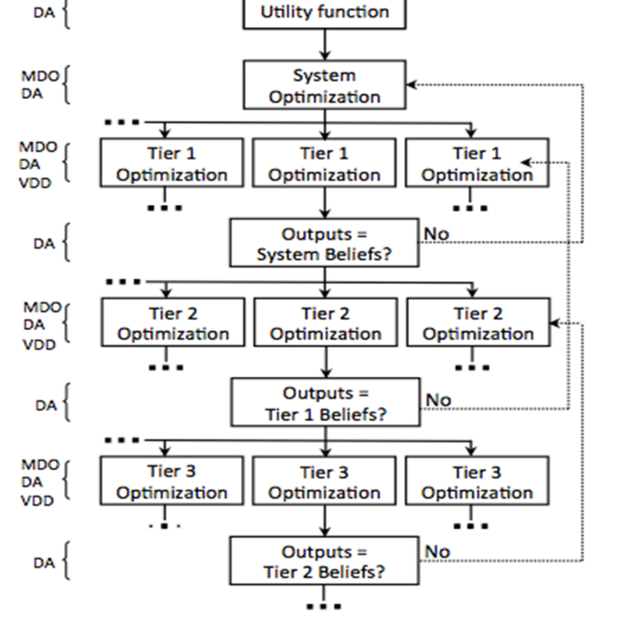






	Attributes		Change in status	x	Gradient	=	Change in value
SSL3 SS2	Gsr	With coupling	263.55	x	$\left[\frac{dV}{dG_{sr}}\right]_0 = 39.7021$	=	10463
		Without coupling	263.55	x	$\left[\frac{\frac{\partial V}{\partial Revenue}\frac{\partial Revenue}{\partial SNR_d}}{\frac{\partial SNR_d}{\partial G_{sr}}}\right]_0 = 0$	=	0



Proposed Value-Based Model for SE

Collaborative Research: Visual Analytics for Creation of Value Functions in Complex Systems Design Under Uncertainty

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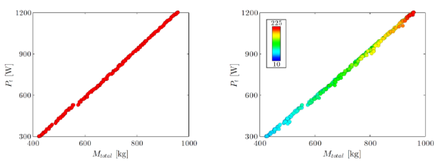

PennState

NSF Award CMMI-1436285
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- Design decision-making involves trade-offs between many design variables and attributes
- Tradeoffs are difficult to model and capture in complex engineered systems
- Tradespace exploration tools explored to enable better design decisions
- Parallel Coordinate Plots (PCP) - Visualization of tradespace that shows design alternatives with respect to different attributes and design variables
- Tradespace Visualization—shows traditional requirements-based designs (blue) versus VDD designs (red)

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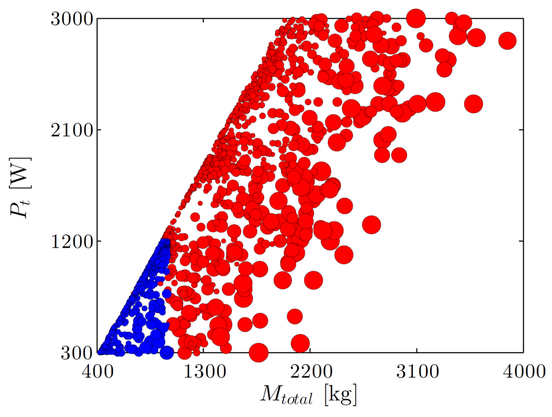
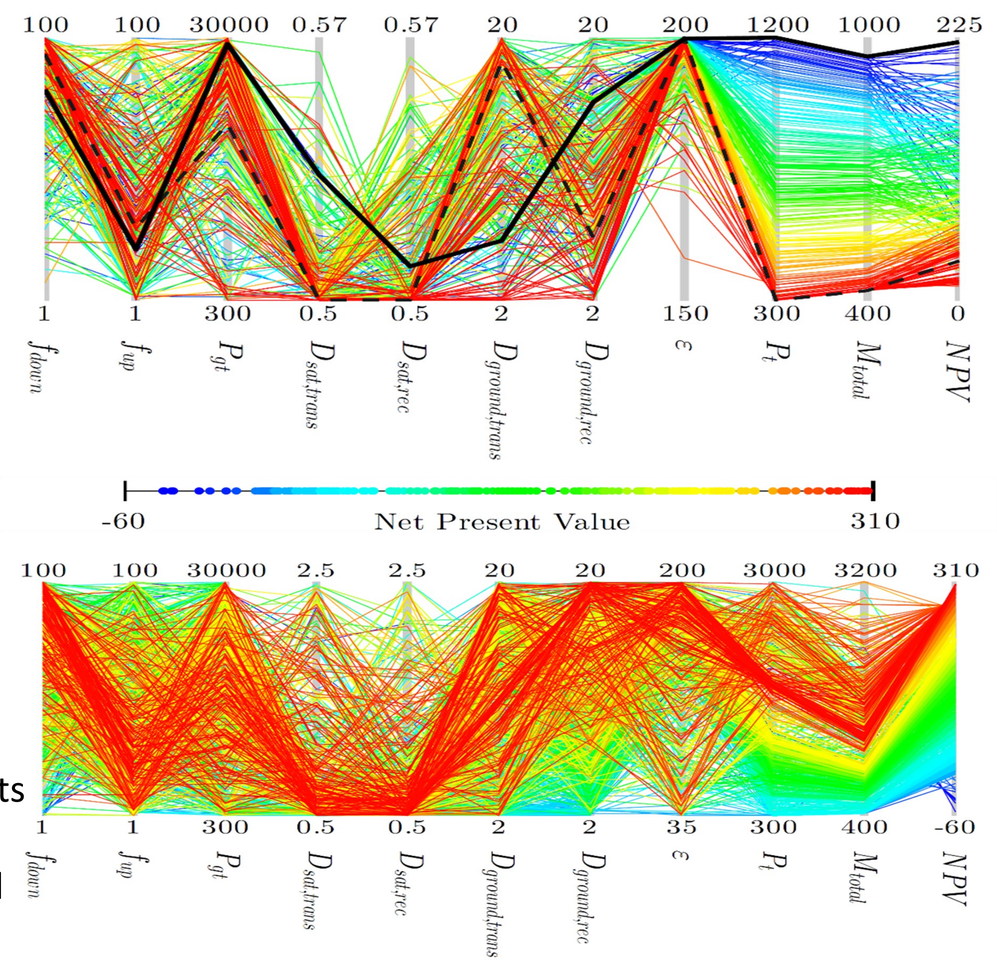
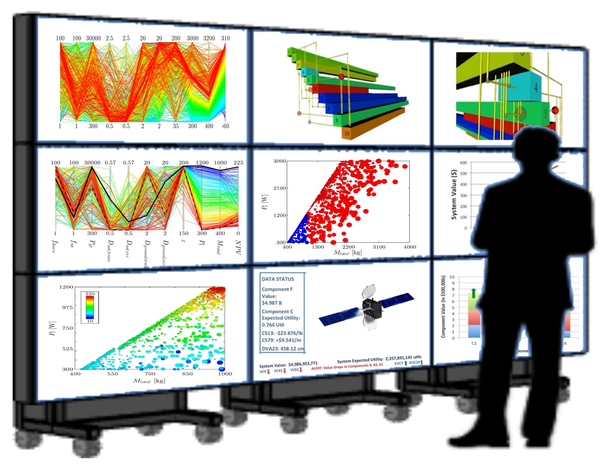
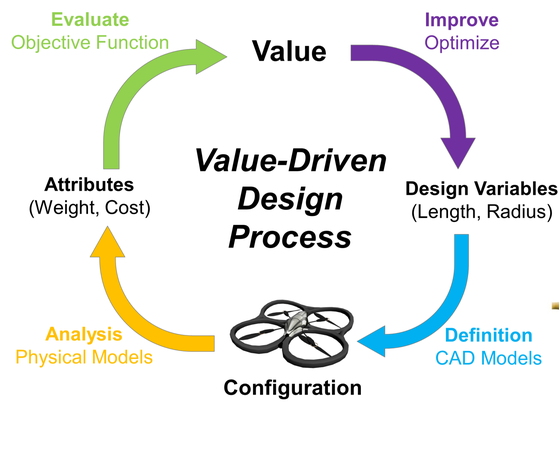
Tradespace Visualization







Parallel Coordinate Plots
Top—Reqs Based
Bottom—Value Based



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