KTH Royal Institute of Technology

Machine Department

Project Plan of IDIOM Group

Author:

Anqing Duan
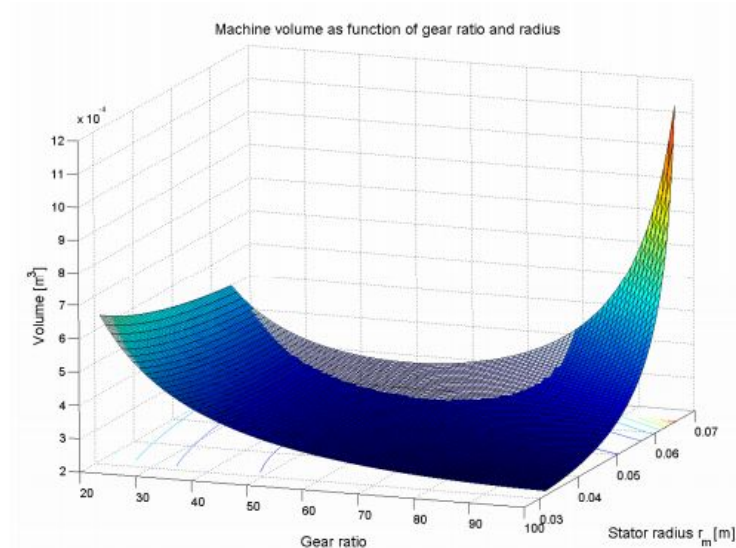
Alexander Gratner

Yuchao Li

Supervisor:

Dr. Jad El-Khoury

Assoc. Prof. Lei Feng

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Contents

1   Preliminary Title

This section presents the key words of the research and preliminary title.

1.1   Key Words

There has been an agreement reached within the group that the title should indicate both the research context and mathematical tool. Therefore *mechatronic system* and *convex optimization* should be included in the title. Since the purpose of research is mainly focus on the modification of optimization algorithms, *methodology* has not been included in the title.

1.2   Title

The preliminary title at this stage is *Convex Optimization for Mechatronic System Design*.

2   Background and Problem Description

This section presents the background and purpose to the research. The research question is formulated in the end.

2.1   Backgroud

The background is stated in two perspectives. Since the target of this research is to explore the possibility of increasing the efficiency of one specific mechatronic design method by introducing new algorithm to the solver, those two aspects are concerning the design method and algorithm respectively.

2.1.1   Integrated Design and Optimization of Mechatronic Products

The development process of mechatronic products is challenging because it involves multiple engineering domains at the same time. In order to deal with them in an integrated manner as early as possible, several generic methodologies have been created, such as *V-model* and *Ulrich and Eppinger's model*. *V-model*, presented in [1], features frequent verification and validation against the requirements during

the integration phases. *Ulrich and Eppinger's model* can be adopted in accordance with an unique context [2].

Although these methods have different formats, they do share something in common. According to [1] and [2], the detailed design is carried out based on rather abstract design in early phase, which means if some problems occur, chances are that the design in early stages needs to be modified as well. Moreover the lack of knowledge in early phase makes this kind of traceback inevitable [3]. Therefore the *Integrated Design and Optimization of Mechatronic Products* (*IDIOM*) is created to explore the potential of concept design with limited information.

The *IDIOM* method treats the mechatronic system in a holistic pattern, integrating different domains in early design phase and optimizing parameters of designed structure with respect to one or multiple targets. Fredrik Roos contributed to the models of the method [4] and Malmquist et al. extended the capability of the method to attack several optimal objects at the same time. At this stage, controller has been included in the process to achieve true synergistic integration.

There has been a model library set up inside the *IDIOM* system with respect to both static and dynamic characteristics of those components. The approaches in different domains have been picked carefully to make the problem easy to solve under different configurations without too much lost detail. Therefore designers only need to pick and configure models from the model library and specify the design goal(s), the optimal solution of this specific design concept would be provided by the system [4].

2.1.2 Generic Algorithm and Convex Optimization

3 Conclusion

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References

[Figueredo and Wolf, 2009] Figueredo, A. J. and Wolf, P. S. A. (2009). Assortative pairing and life history strategy - a cross-cultural study. *Human Nature*, 20:317–330.

Appendices

Convex

Convex

2015 — August | September | October | November | December — **2016** January

Task	%	Schedule
Course Introduction	0%	
◇ Course Introduction	0%	You + 2 others responsible
Individual Literature Study Report	0%	
Individual Literature Study	0%	You + 2 others (25 days)
◇ Individual Literature Study Report	0%	You + 2 others responsible
Common Project Plan Report	0%	
Writing of Project Plan	0%	You + 2 others (18 days)
◇ Handin of Common Project Plan Report		You + 2 others responsible
Convex Optimization Study	0%	
CVX Toolbox Hands On	0%	You + 2 others (12 days)
IDIOM Software Study	0%	
IDIOM Hands On	0%	You + 2 others (12 days)
Convex Optimization of Basic Systems in IDIOM	0%	
Volume C.O in IDIOM, Basic Case	0%	You + 2 others (14 days)
New Task	0%	You + 2 others (7 days)
Switch Optimization Target	0%	
Other Optimization Criteria in IDIOM, Basic Case	0%	You + 2 others (33 days)
Do Case Study on More Advanced Model	0%	
Opt. in IDIOM on Advanced Case	0%	You + 2 others (33 days)
Write Publication Paper	0%	
Writing Final Publication Paper p1	0%	You + 2 others (79 days)
◇ Final Publication and Master Proposal		You + 2 others responsible
Final Presentation	0%	
◇ *Final Presentation*		*Alexander G. + 2 Others*