Integrative Computational Studies

Seminar Series

Topology-changing shape optimization of mechanical structures using a binary genetic algorithm

Steven E. Lamberson, Jr.

CS&E Doctoral Student

School of Aeronautics and Astronautics

Purdue University

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Abstract

Topology optimization for mechanical structures attempts to find an optimal distribution of material in space subject to various constraints by changing the connectivity of the structure. This contrasts with shape optimization and sizing optimization, where the connectivity of the structure is predetermined and only the shapes or sizes of the structural features are allowed to change. Current approaches to topology optimization in mechanical structures use specific knowledge of the problem space as they search for optima, which limits the types of cost and constraint functions that can be considered during the optimization. This talk discusses a new technique that places no technical limits on the number and / or type of constraint functions that can be considered during the optimization by posing the problem as a mixed integer non-linear

programming (MINLP) problem. This class of problems is very computationally expensive to solve, so a parallel binary genetic algorithm is employed to mitigate this expense.

Steven Lamberson is a graduate student in the School of Aeronautics and Astronautics, and is registered in the Computational Science and Engineering Program at Purdue University. He received both his B.S. and M.S. degrees from Purdue University; the B.S degree in May, 2003, and the M.S. degree August, 2005. He hopes to obtain his Ph.D. by August 2009.