PURDUE UNIVERSITY

Friday, February 13, 2004 1:30 PM ME 256
Joint PRECISE and Design Seminar Series

Transforming Engineering Knowledge through Combinatorial Representations for Design, Analysis and Theoretical Research

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PRECISE

Abstract
A number of general discrete mathematical models called "combinatorial representations" have been developed. As part of this talk, only representations based on graph theory; termed "graph representations" will be introduced. This research is intended to represent the engineering problem through one of the graph representations, then, through a series of transformations between the graph representations, to transform it to another engineering domain, where it is solved. This approach enables to employ the knowledge existing in the transformed domain, in the representations and their interrelations. This talk will introduce a number of practical results that were achieved by employing graph representations:

- **Revealing new relations between different engineering disciplines** - has led to the establishment of a number of essential relations and transformations between different engineering domains.
- **Treating integrated systems in a unified way** - highly coupled systems containing elements from different engineering domains can be handled. This enables a new type of collaboration between engineers from different fields.
- **Deriving methods, theorems, concepts and ideas** - both known and new theorems and methods in one engineering domain can be transformed to other domains through the relations between the representations.
- **Developing conceptual design methods** - the ability to transform engineering designs from one engineering domain to the other through these representations has yielded new techniques for conceptual design.
- **Demonstrating a pedagogical approach**– a novel methodology for engineering education

Biography
Offer Shai received his Ph.D. (Summa Cum Laude) in Mechanical Engineering from Ben-Gurion University, Israel in 1997, and he is currently a faculty member in the Department of Mechanics, Materials and Systems at Tel-Aviv University. His scientific background comprises of several diverse academic fields: mechanical engineering; computer science; advanced discrete mathematics; and operations research; and includes six years as an engineer with the Israel Defense Forces (IDF). This combination of both theoretical and practical training and experience enables Dr. Shai to conduct research in the following variety of scientific fields: combinatorial engineering representations; machine theory; artificial intelligence; structural mechanics; integrated engineering systems; combinatorial optimization; and conceptual design and creativity. The main objective of his research program is to develop methodologies for transforming engineering knowledge through combinatorial representations for both analysis and design.

Contact Prof. Karthik Ramani (ramani@purdue.edu) if you would like to meet with Prof. Offer Shai. Refreshments will be served in ME256 at 1:15PM