

COURSE ANNOUNCEMENT
[offered every other spring semester]

Evolutionary Computation in Engineering Systems Analysis

[CE 791 – Advanced Topics in Civil Engineering Computing]

Course Description

Overview

The field now known generally as evolutionary computation (EC) has its roots in the 1930s but has coalesced as a well-defined field of study in the last 30 years with substantial definition in the last decade. Researchers and practitioners from multiple disciplines, including computer science, mathematics, statistics, complex systems, and engineering, continue to investigate this topic that is based on the mechanics of natural genetics and natural selection. Evolutionary computation includes several sub-areas, including genetic algorithm (GA), genetic programming (GP), evolution strategy (ES), and evolutionary programming (EP). Techniques within these areas offer alternative and powerful ways to analyze and solve complex engineering design problems. Increasing study and fundamental understanding of these emerging techniques continue to enhance their applications in many real engineering problems.

Objectives

The main objectives of the course include the following:

- to study the basics of EC procedures and the theories that describe them
- to identify and develop improvements to advanced EC operators to assist in solving complex engineering problems
- to explore and develop new EC-based procedures important in engineering systems analysis, such as multiobjective analysis, generation of alternative solutions, reliability-based design
- to implement these EC procedures to selected engineering applications
- to develop an understanding about setting appropriate values for algorithmic parameters
- to gain experience on how EC techniques work, how to implement them, and how to apply them in engineering systems analysis

Learning Outcomes

Through understanding of the fundamentals of EC methods, students should be able to explore state-of-the-art use of these methods in engineering applications. Based on readings from research papers and chapters from a variety of textbooks, students should be able to develop advancements to existing procedures and test their applications in engineering systems analysis. Each student will gain deeper understanding and hands-on experience through implementation and testing of different EC-based techniques via a comprehensive semester project, which may focus on a problem related to the area of research interest/specialization of that student.

Textbook: None. Reading will be assigned from journal articles and from several books.
Schedule: every other spring semester; last offering: Spring 2008
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