Preface

Mark M. Meysenburg

Doane College
Department of Information Science and Technology
Crete, NE 68333
mmeysenburg@doane.edu
http://ist.doane.edu/mark.htm

1 Introduction

The GECCO-2004 Undergraduate Student Workshop is aimed at undergraduate students participating in research activities in the evolutionary computation field.

Goals of the workshop would include:

- providing a forum allowing undergraduate students to put a "capstone" on their undergraduate research activities, through presentation of their work at an international conference;
- encouraging teaching faculty to think about undergraduate research opportunities for their students in the evolutionary computation field;
- preparing stand-out undergraduate students for graduate studies in the evolutionary computation field;
- encouraging more focus on education amongst GECCO participants;
- recruiting opportunities for faculty at advanced degree granting institutions; and
- sharing and networking amongst teaching faculty with students participating in undergraduate research.

The evolutionary computation field provides excellent opportunities for undergraduate research. The basic concepts can be quickly mastered and implemented, and even a very simple EC system can be applied to very complicated, interesting problems. So, undergraduates can participate in research in the field, and produce interesting and meaningful results.

There is more and more emphasis on research activities as a part of a complete undergraduate education. Education becomes much more meaningful with hands-on, in-depth exploration of topics outside of the normal classroom environment. This workshop helps encourage more undergraduate research in the EC field. As students are introduced to the field through undergraduate research projects, they may be more likely to pursue research in the same field as graduate students. In this way, encouraging undergraduate research helps to establish a pipeline of students into our graduate schools.

2 Abstracts

Abstracts for the papers presented in this workshop are reproduced below.

2.1 Truss Optimization Using Genetic Algorithms

Author: Andrew Burton.

Abstract: This paper reports research on the design of structures using genetic algorithms. It presents the design of a program that uses genetic algorithms to optimize a truss structure, along with an example of truss optimization.

2.2 Evolving the Maximum Segment Length of Golomb Ruler

Author: Tiago Leitão.

Abstract: An evolutionary algorithm based on Random Keys to represent Golomb Rulers segments has been found to be a reliable option for finding Optimal Golomb Rulers in a short amount of time, when comparing with standard methods. This paper presents a modified version of this evolutionary algorithm where the maximum segment length for a Golomb Ruler is also part of the evolutionary process. Attained experimental results shows us that this alteration doesn't seems to provide significant benefits to the static version of the algorithm.

2.3 A Genetic Algorithms Approach to Learning Communication and Coordination in Simulated Robots

Author: Chris Sotzing.

Abstract: This project is motivated by an existing robot system for mapping unknown environments and attempts to improve its effectiveness through the use of genetic algorithms. Using the Webots simulator, the mapping system is created using simulated Khepera robots and a simulated environment. The robots are controlled by a supervisor agent that makes the high-level decisions about tasks for individual robots to complete to accomplish the mapping effort. This research investigates the ability of adding a GA learning component to the supervisor to improve its ability to coordinate the robotic agents.

2.4 Evolving a Vision-Based Predator-and-Prey System for Two Robots with a Learning Classifier System

Author: Noah W. Smith.

Abstract: This paper describes an experiment to evolve a predator-and-prey system where the primary input for each robot is a linear camera. The method of learning is a Learning Classifier System. It builds on similar work implemented with an evolved neural network, in which both predator and prey behaviors were learned based mostly upon camera input. It is designed for implementation on two Khepera model robots with standard K213 Vision Turrets from K-Team, but the actual learning will be done in simulation.

2.5 GEVOSH: Using Grammatical Evolution to Generate Hashing Functions

Authors: Patrick Berarducci, Demetrius Jordan, David Martin, and Jennifer Seitzer.

Abstract: In this paper, we present system GEVOSH, Grammatically Evolved Hashing. GEVOSH evolves hashing functions using grammatical evolution techniques. Hashing functions are used to expedite search in a wide number of domains. In our work, GEVOSH created hashing functions that, on average, perform better than many standard (human-generated) hash functions extracted from the literature. In this paper, we present the architecture of system GEVOSH, its main components and algorithms, and resultant generated hash functions along with comparisons to standard, human-generated functions.