

AUTOMATED ASSIGNMENT PROCESS FOR EXPANDING YOUR HORIZONS

STUDENT PAPER

Heather Simmons, hs552@hotmail.com

Natalie Bickley, nbic1278@aol.com

Faculty Advisor: Dr. Lisa Burnell, burnell@acm.org

Mathematics and Computer Science Department

Texas Wesleyan University

1201 Wesleyan

Fort Worth, Texas 76105

Texas Wesleyan University annually hosts Expanding Your Horizons (EYH), a one-day conference that encourages girls in the seventh and eighth grades to pursue careers in mathematics, science, and engineering. EYH brings professional women working in math and science related careers together with the girls for a day of exploration, hands-on activities, and fun. Approximately four hundred junior high girls and sixty presenters participate in this event. Scheduling the speakers and assigning groups of girls to speakers is currently a manual, error-prone, and time consuming process. We are investigating automated techniques to achieve better schedules in less time.

Three techniques that are appropriate for the EYH scheduling problem include integer programming, constraint satisfaction search, and genetic algorithms. Integer programming techniques are similar to constraint satisfaction techniques, in that a solution is sought that satisfies a set of constraints. Integer programming represents a problem as a set of linear equations. Integer values for variables, which might represent the number of presenters available to be scheduled or the number of girls in a group, are found that satisfy the given constraints. A constraint might represent that a maximum of twenty girls can be assigned to a group.

Constraint satisfaction, on the other hand, uses symbols, organized as rules and facts, instead of numbers to represent the variables and constraints. This symbolic representation may make the constraint satisfaction technique easier to use for beginners. The third technique is Genetic Algorithms, which uses ideas from evolution to represent potential solutions to a problem (a schedule, for example) and “evolves” those solutions toward those of increasingly better quality. Genetic Algorithms generally use bit strings to represent a candidate solution, and then manipulate the string based on genetic operations that create new candidate solutions from current ones.

We are conducting a comparative analysis of these three techniques for the EYH problem. Through research and study, we have identified software tools to use for implementing prototypes in each of these methods. In our first prototypes, we have chosen to solve a subset of the problem in order to test our understanding of the techniques and tools. By doing this, we have furthered our understanding of how each technique applies to the EYH problem. These initial prototypes schedule speakers only. From the knowledge we gain through these prototypes, we will select the best technique to implement a complete solution. We selected tools for developing the prototypes based on availability, cost, and ease of use. These tools are LINDO, a commercial linear programming package, Prolog for constraint satisfaction, and GAC, a freeware program for genetic algorithms.

In our presentation, we will describe the EYH scheduling problem, provide an overview of the methods we are using, offer our criteria for choosing the best technique and discuss our implementation and results. Through this automated scheduling program the process of assigning the girls to their groups will be simplified, and much more efficient.