

The Hierarchical Fair Competition (HFC) Model for Parallel Evolutionary Algorithms

Abstract -The HFC model for evolutionary computation is inspired by the stratified competition often seen in society and biology. Subpopulations are stratified by fitness. Individuals move from low-fitness subpopulations to higher-fitness subpopulations if and only if they exceed the fitness-based admission threshold of the receiving subpopulation, but not of a higher one. HFC's balanced exploration and exploitation, while avoiding premature convergence, is shown on a genetic programming example.

I. INTRODUCTION

A. Previous Work on the Premature Convergence Problem

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and foster

II. HIERARCHICAL FAIR COMPETITION IN SOCIETAL AND BIOLOGICAL SYSTEMS

A. The Fair Competition Principle in Societal Systems

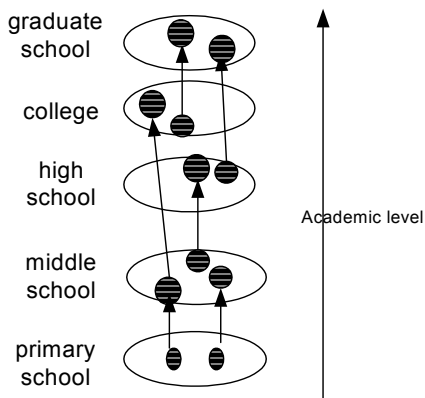


FIGURE 1: In education system, low level students compete to get admission to higher level schools.

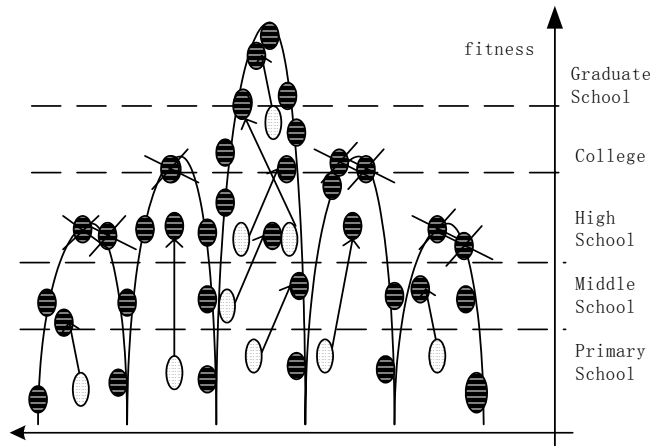


FIGURE 2: HFC model extends the search horizontally in search space and vertically in fitness dimension and kills bad individuals at appropriate times while allowing promising young individuals grow up continuously

III. THE HIERARCHICAL FAIR COMPETITION PARALLEL MODEL

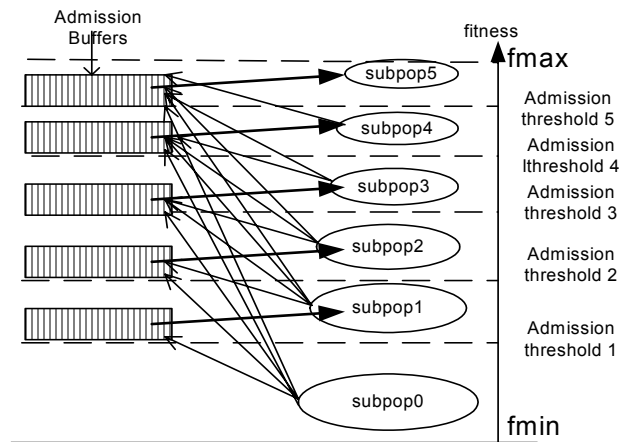


FIGURE 3: In HFC model, subpopulations are organized in a hierarchy with ascending fitness level. Each subpopulation accommodates individuals within a certain fitness range determined by the admission thresholds

threshold

admission

export threshold

sliding

IV. EXAMPLE PROBLEMS

A. Some Characteristics of the HFC Model

A. Experiments on an Analog Circuit Synthesis Problem

TABLE 1 TARGET EIGENALUES

$- \frac{+}{-} i$	$- \frac{+}{-} i$	$- \frac{+}{-} i$			
$- \frac{+}{-} i$	$- \frac{+}{-} i$	$- \frac{+}{-} i$	$- \frac{+}{-} i$		
$- \frac{+}{-} i$	$- \frac{+}{-} i$	$- \frac{+}{-} i$	$- \frac{+}{-} i$	$- \frac{+}{-} i$	$- \frac{+}{-} i$
$- \frac{+}{-} i$	$- \frac{+}{-} i$	$- \frac{+}{-} i$			
$- \frac{+}{-} i$	$- \frac{+}{-} i$	$- \frac{+}{-} i$			

et al.,

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VI. CONCLUSIONS AND FUTURE WORK

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Acknowledgment