A Brief Overview of Diversity-Preservation Methodologies in Evolutionary Optimization

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Proposed Taxonomy

Divergence of character is a cornerstone of natural evolution. On the contrary, evolutionary optimization processes are plagued by an endemic lack of diversity: all candidate solutions eventually crowd the very same areas in the search space.

The goal of tutorial T7P2 at the *2014 IEEE World Congress on Computational Intelligence* is to re-order and re-interpret different approaches for promoting diversity into a single comprehensive framework, and to define a taxonomy that enables the comparison of techniques originally presented in different evolutionary algorithms.

Methodology	**Element**	**Selection**		**Context dep.**
		Parent	**Survival**	
Allopatric Selection [TLS12]	Lineage	no	yes	n.a.
Cellular EAs [Rob87]	Lineage	yes	yes	yes
Deterministic Crowding [Mah95]	Lineage	no	yes	n.a.
Gender [All92]	Lineage	yes	no	yes
Island Models [WRH99]	Lineage	yes	yes	yes
Segregation [Aff01]	Lineage	yes	yes	yes
Clearing [Pét96]	Genotype	yes	yes	no
Delta (pseudo) entropy [ST08, SSS11]	Genotype	yes	no	no
Diversifiers [KB95]	Genotype	yes	yes	no
Fitness Sharing [DG89]	Genotype	yes	yes	no
FOCUS [DJWP01]	Genotype	no	yes	no
Gender[1] [All92]	Genotype	yes	no	yes
GDEM [TB03]	Genotype	no	yes	no
Reference points partitioning [DJeda, DJedb]	Genotype	no	yes	no
Restricted Tournament Selection [Har95]	Genotype	no	yes	no
Sequential Niching [BBM93]	Genotype	no	yes	no
Standard Crowding [DJ75]	Genotype	no	yes	no
Two-level Diversity Selection [BB02]	Genotype	yes	no	yes
Crowded-Comparison Operator [DPAM02]	Phenotype	yes	no	no
Extinction [GFC99]	Phenotype	no	yes	no
Hierarchical Fair Competition [HGS+05]	Phenotype	yes	yes	yes
Random Immigrants [Gre92]	Phenotype	yes	yes	no
Tarpeian Method [Pol03]	Phenotype	yes	yes	no
VEGA [Sch85] [HL92]	Phenotype	yes	no	yes

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