

A multi-crossover and adaptive island based population algorithm for solving routing problems

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- ❑ The proposed method is a **variant** of the traditional **Island Based Genetic Algorithm**
- ❑ Our algorithm **reverses** the classical **philosophy** of genetic algorithms, giving priority to local improvement
- ❑ Every subpopulation has a **different crossover function**, which **can change** depending on its efficiency
- ❑ Our technique **adapts** its **crossover probability and function** to the search performance
- ❑ The presented meta-heuristic **outperforms** the classic Island Based GA in terms of **runtime** and **result quality**

Pseudo code of our proposal

1. Create the whole population
2. Create the subpopulations
3. Assign the crossover functions
4. **while** the termination criterion is not reached **do**
5. **for** each subpopulation **do**
6. Mutation process
7. Crossover process
8. Survivor selection
9. Update the crossover probability
10. **end**
11. Individual migration process
12. **end**
13. Return the best individual of the system

Some results

- Results of our technique (MAIPA) compared with a basic Island Genetic Algorithm (IGA) applied to the Capacitated Vehicle Routing Problem

Instance	Optimum	Average		Standard deviation		Best		Time (s)		$t^{\#}$
		MAIPA	IGA	MAIPA	IGA	MAIPA	IGA	MAIPA	IGA	
En22k4	375	391.1	401.0	8.54	15.30	375	375	1.59	3.80	+
En23k3	569	599.9	656.2	31.75	23.44	571	601	2.05	3.14	+
En30k3	534	557.7	561.6	16.00	19.41	544	542	2.16	4.23	+
En33k4	835	899.5	911.0	23.30	27.18	864	888	2.85	6.52	+
En51k5	521	619.3	628.4	45.15	31.65	561	572	4.15	25.10	+
En76k7	682	799.9	814.1	37.34	31.43	752	764	8.83	64.12	+
En76k8	735	860.5	881.3	21.72	32.40	829	834	9.27	66.54	+
En76k10	830	963.0	971.0	19.88	24.54	935	945	7.89	55.10	+
En76k14	1021	1179.1	1183.1	33.15	52.70	1139	1142	9.54	41.16	*
En101k8	815	997.2	1004.5	46.92	67.43	919	924	14.14	52.43	*
En101k14	1071	1221.7	1246.7	34.49	56.19	1173	1182	12.15	114.55	+

[#] '+' indicates MAIPA is better than IGA; '*' indicates the difference between the two algorithms is not significant (at 95% confidence level)