

## SUPPLEMENTARY MATERIAL

# Results for the EA4OP using different solution initialization parameter values

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### Abstract

In this document we show supplementary results of part of the experiments for the paper *An efficient evolutionary algorithm for the orienteering problem*. We detail the results of Section 3.2.1, where the influence of the parameter  $p$  on the population initialization and on EA4OP is checked. Three different choices of  $p$  are tested:  $\alpha^2$ ,  $\alpha$  and  $\sqrt{\alpha}$  where  $\alpha = d_0/v(TSP)$ .

Table 1: Initialization and EA4OP results in generation 1, depending on  $p \in \{\alpha^2, \alpha, \sqrt{\alpha}\}$ , where  $\alpha = d_0/v(TSP)$ .

instname	Gap						Time						Number of visited nodes						B&C
	Initialization			EA4OP			Initialization			EA4OP			Initialization			EA4OP			
	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	
gil262	28.29	22.22	18.67	2.91	2.22	3.23	0.45	0.41	0.55	3.00	3.27	3.14	113.30	122.90	128.50	153.40	154.50	152.90	158
a280	22.59	17.82	13.06	5.10	4.49	6.94	0.57	0.50	0.65	2.59	2.63	2.53	113.80	120.80	127.80	139.50	140.40	136.80	147
pr299	26.48	17.78	13.64	3.52	2.96	2.84	0.66	0.62	0.80	2.90	3.07	2.69	119.10	133.20	139.90	156.30	157.20	157.40	162
lin318	32.49	25.96	24.49	4.20	3.79	4.83	0.79	0.78	1.02	7.83	7.62	7.07	138.40	151.80	154.80	196.40	197.20	195.10	205
rd400	26.03	22.89	20.00	3.85	2.68	3.64	1.01	0.87	1.32	7.93	8.14	6.37	176.80	184.30	191.20	229.80	232.60	230.30	239
pcb3038	22.88	20.54	14.68	2.02	2.96	1.66	53.81	122.50	298.12	468.62	515.92	645.39	1220.80	1257.80	1350.60	1551.10	1536.10	1556.80	.
f3795	32.99	27.82	22.71	2.50	2.29	1.09	199.38	462.18	831.46	2665.55	2939.52	4538.55	1217.60	1311.50	1404.40	1771.60	1775.30	1797.20	.
fnl4461	16.12	21.85	15.34	1.63	0.36	0.60	201.57	328.56	909.11	1914.74	2094.99	2805.33	1951.10	1817.70	1969.20	2288.10	2317.60	2312.00	.
rl5934	32.82	21.62	14.10	4.08	4.41	1.53	552.88	1410.71	2648.46	3925.22	4451.34	6476.74	2127.50	2482.20	2720.40	3037.70	3027.40	3118.60	.
pla7397	48.73	32.53	20.41	7.06	6.61	3.58	341.21	1347.14	3256.91	15276.42	-	-	2665.90	3508.30	4138.60	4832.70	4856.50	5013.90	.

Table 2: Initialization and EA4OP results in generation 2, depending on  $p \in \{\alpha^2, \alpha, \sqrt{\alpha}\}$ , where  $\alpha = d_0/v(TSP)$ .

instname	Gap						Time						Number of visited nodes						B&C
	Initialization			EA4OP			Initialization			EA4OP			Initialization			EA4OP			
	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	
gil262	32.76	22.28	16.89	3.34	2.30	3.25	0.43	0.44	0.59	3.80	3.32	3.39	100.50	112.10	116.70	134.50	134.70	132.20	133
a280	27.06	18.15	14.16	2.32	1.57	3.44	0.57	0.56	0.71	3.00	2.85	2.61	109.40	116.80	121.60	132.30	132.70	131.30	135
pr299	25.69	17.58	12.53	1.55	2.13	2.40	0.66	0.67	0.85	3.99	3.51	3.57	120.00	127.70	133.30	147.80	146.20	145.10	148
lin318	33.15	23.18	18.72	3.07	2.22	2.06	0.81	0.81	1.06	8.41	7.39	7.89	125.90	142.20	150.90	180.30	183.80	184.40	189
rd400	29.98	25.75	19.80	2.66	2.61	2.73	0.94	0.92	1.38	7.81	7.78	7.79	171.90	169.20	179.90	213.40	214.00	214.20	218
pcb3038	30.38	24.00	17.16	1.09	1.68	0.95	50.66	141.91	323.32	482.04	568.30	738.34	1181.10	1187.40	1261.60	1468.40	1453.50	1471.00	.
f3795	40.86	29.24	25.73	6.87	3.69	2.55	211.15	482.52	853.80	3074.42	5410.46	5654.73	1061.50	1213.90	1288.00	1630.20	1682.20	1696.80	.
fnl4461	26.18	27.70	20.03	2.50	1.94	1.53	185.30	387.57	984.93	1971.86	2481.72	2827.26	1871.60	1695.20	1824.10	2155.90	2152.90	2153.50	.
rl5934	34.97	21.88	16.61	4.25	4.93	3.23	584.43	1488.55	2752.74	3833.70	4823.62	5862.78	2030.90	2384.80	2550.40	2885.10	2872.90	2959.80	.
pla7397	49.14	31.72	21.36	3.68	2.05	2.38	370.41	1637.00	3973.10	-	-	-	2593.40	3285.80	3674.00	4375.60	4444.60	4434.80	.

Table 3: Initialization and EA4OP results in generation 3, depending on  $p \in \{\alpha^2, \alpha, \sqrt{\alpha}\}$ , where  $\alpha = d_0/v(TSP)$ .

instname	Gap						Time						Number of visited nodes						B&C
	Initialization			EA4OP			Initialization			EA4OP			Initialization			EA4OP			
	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	
gil262	31.01	20.96	15.31	2.79	2.05	2.07	0.44	0.43	0.57	4.06	3.66	3.80	104.50	115.90	124.10	143.40	143.80	143.60	148
a280	30.35	26.04	20.78	12.91	12.55	12.30	0.56	0.52	0.66	3.44	3.44	3.40	115.50	118.80	121.60	133.80	134.30	132.20	139
pr299	29.98	22.19	15.20	4.41	4.43	3.96	0.65	0.62	0.82	4.71	4.67	4.47	115.70	124.80	130.20	143.40	142.50	144.80	149
lin318	34.76	27.90	22.21	3.78	3.03	2.04	0.76	0.78	1.05	7.70	7.42	6.46	127.10	136.50	143.00	178.90	180.10	182.90	193
rd400	29.61	25.38	17.82	2.18	1.91	1.55	0.98	0.92	1.39	8.26	7.43	7.36	175.90	176.40	184.20	218.90	217.00	218.20	223
pcb3038	37.37	28.49	19.07	3.05	1.86	1.14	51.42	129.64	302.42	828.24	903.64	1126.98	1194.90	1240.90	1342.90	1568.00	1578.60	1576.60	.
f3795	33.67	30.87	23.46	3.87	3.20	2.26	229.70	488.03	861.10	2231.22	3077.29	3711.79	1146.10	1217.20	1305.70	1666.80	1668.60	1654.50	.
fml4461	30.52	29.89	18.97	1.98	1.69	0.92	190.53	359.64	933.53	3054.00	2903.93	3163.09	1897.80	1742.50	1927.90	2257.10	2251.60	2246.30	.
rl5934	39.99	24.10	17.01	8.29	4.51	2.79	578.97	1474.82	2707.07	4126.14	5053.15	6080.23	2106.30	2511.40	2671.90	2980.90	3062.20	3078.90	.
pla7397	53.86	33.00	21.55	1.02	1.10	0.88	348.59	1497.58	3733.19	17495.11	16255.44	17604.69	2563.80	3436.60	3825.40	4790.20	4774.50	4742.10	.

Table 4: Initialization and EA4OP results in generation 4, depending on  $p \in \{\alpha^2, \alpha, \sqrt{\alpha}\}$ , where  $\alpha = d_0/v(TSP)$ .

instname	Gap						Time						Number of visited nodes						B&C
	Initialization			EA4OP			Initialization			EA4OP			Initialization			EA4OP			
	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	$p = \alpha^2$	$p = \alpha$	$p = \sqrt{\alpha}$	
gil262	17.71	12.51	16.69	2.21	0.96	3.39	0.67	0.45	0.59	1.65	1.48	1.48	31.10	35.30	30.50	37.00	37.00	34.40	36
a280	17.09	9.69	5.58	0.52	0.57	0.31	0.39	0.47	0.58	4.08	3.51	4.19	181.30	189.50	197.30	202.60	203.30	204.20	204
pr299	3.96	1.31	0.84	0.05	0.04	0.03	0.40	0.46	0.48	5.71	4.67	5.17	273.50	276.70	278.20	280.40	281.20	280.00	280
lin318	11.51	7.09	3.88	0.23	0.15	0.54	0.57	0.67	0.79	9.78	10.70	7.86	249.60	257.40	265.60	277.90	277.30	276.10	280
rd400	4.06	2.32	0.96	0.08	0.03	0.05	0.46	0.59	0.70	9.66	12.03	12.14	375.60	372.40	373.70	382.90	382.70	382.50	382
pcb3038	27.52	23.07	16.28	1.48	1.40	1.10	61.75	141.89	314.50	631.88	694.24	840.03	1344.80	1335.90	1420.10	1628.00	1630.00	1634.50	.
f3795	40.88	36.28	28.16	4.54	1.75	2.62	157.26	251.02	573.68	3293.72	3752.92	4276.60	811.90	822.40	921.50	1233.30	1245.80	1249.70	.
fml4461	24.08	37.84	28.53	2.35	2.50	2.67	251.78	224.61	734.87	1139.14	981.03	1530.37	1099.90	873.00	957.30	1275.10	1278.90	1260.00	.
rl5934	48.66	32.45	20.80	8.93	9.09	2.46	423.93	981.89	2181.46	2014.67	2822.77	4658.60	1313.90	1664.40	1932.30	2206.80	2186.30	2384.50	.
pla7397	58.45	35.30	26.62	1.82	6.00	6.24	405.62	859.67	2853.34	3734.00	4771.74	7490.28	1106.90	1606.50	1804.20	2240.80	2194.20	2214.20	.