汕頭大學
SHANTOU UNIVERSITY

基于传统TSP的机器人路径规划问题优化

Optimization of Robot Path Planning Problem based on Traditional TSP

答辩人：辛佳铭　　指导教授：范衡　　16级电子信息工程

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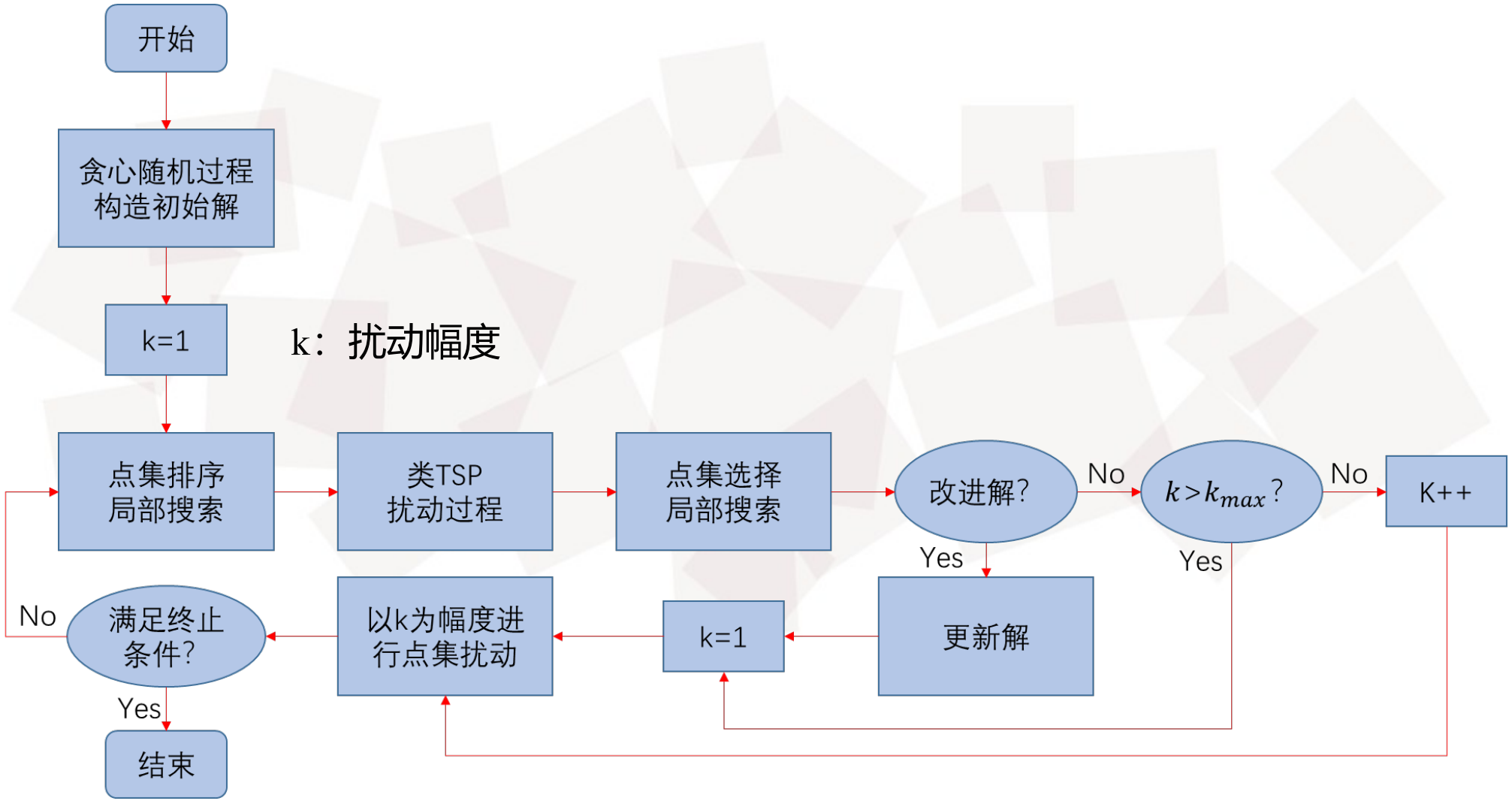
一、研究内容

1.1 整体算法流程



详见论文p8

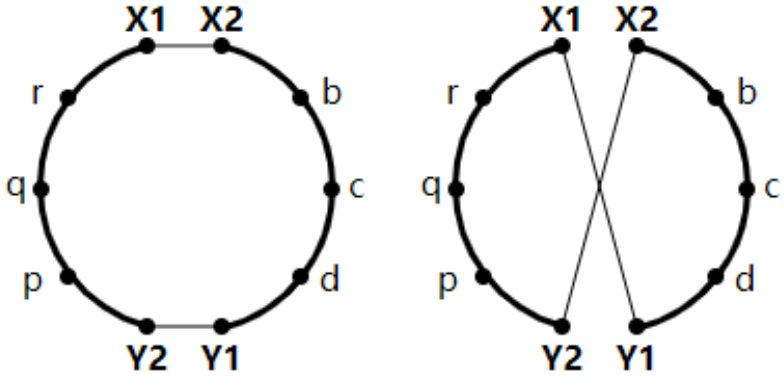
1.2 局部搜索过程--
常见的q-opt搜索算符

可选重连边数随q的增长速度：

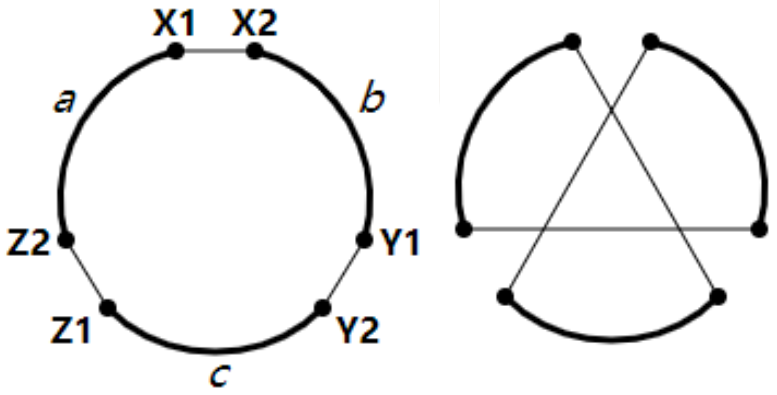
$$2^q \times (q-1)!$$

不是感叹号~

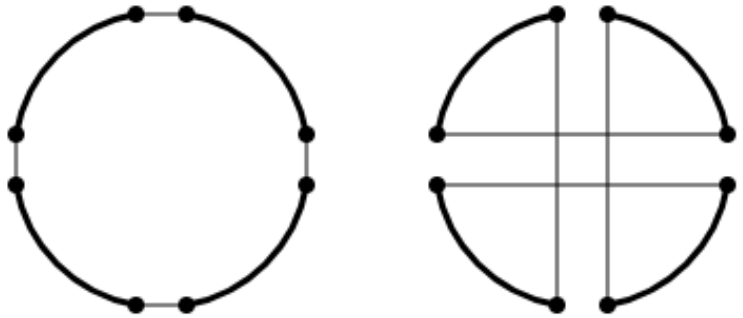
2-opt：
可选重连边数：2



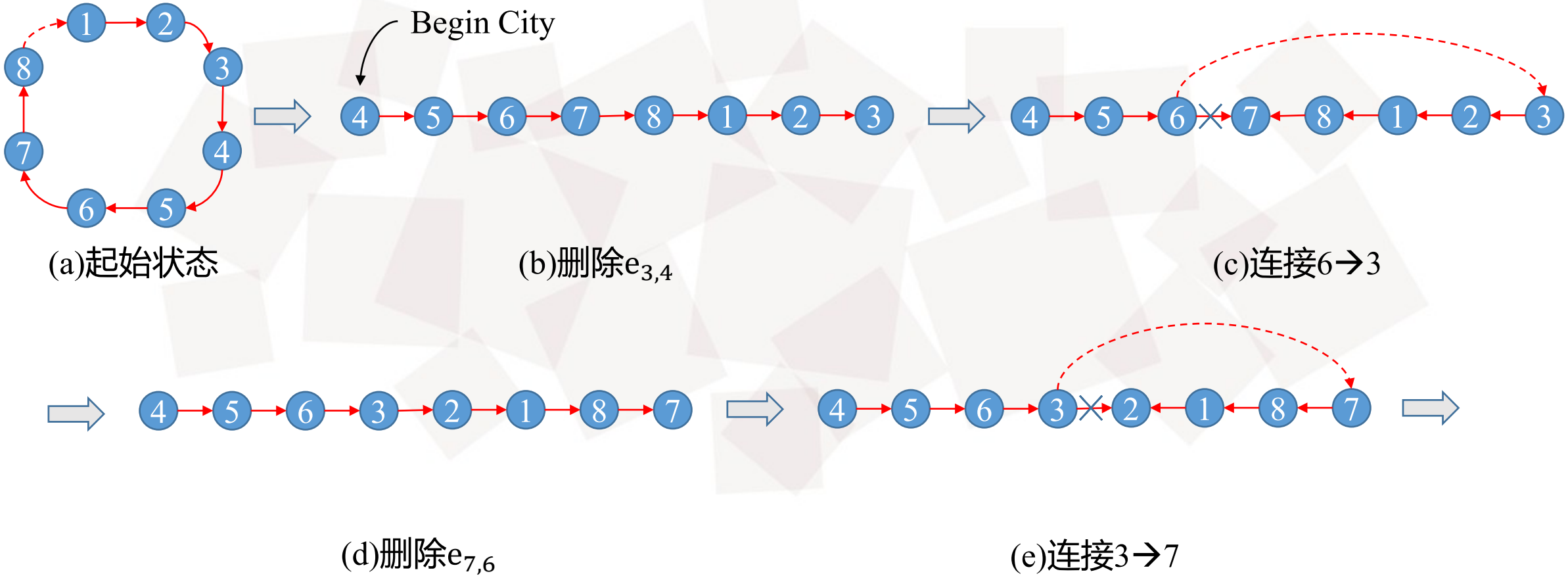
3-opt：
可选重连边数：8



4-opt：
可选重连边数：48

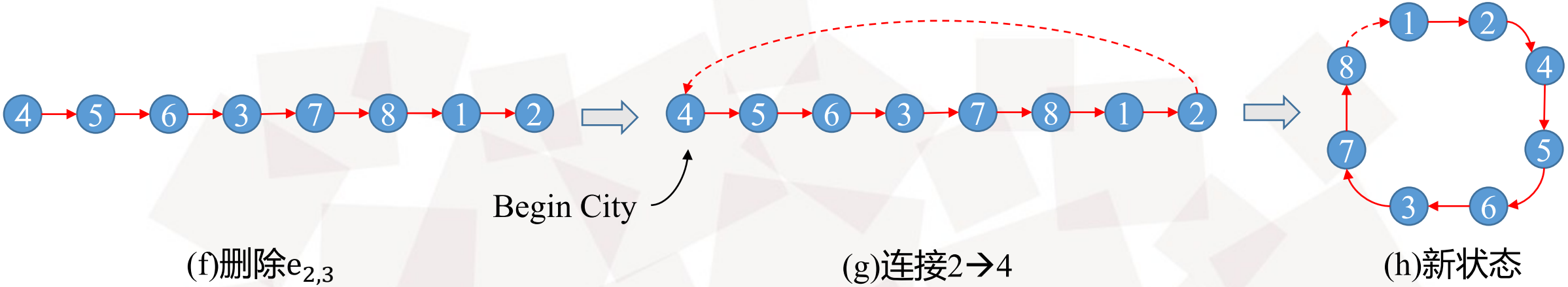


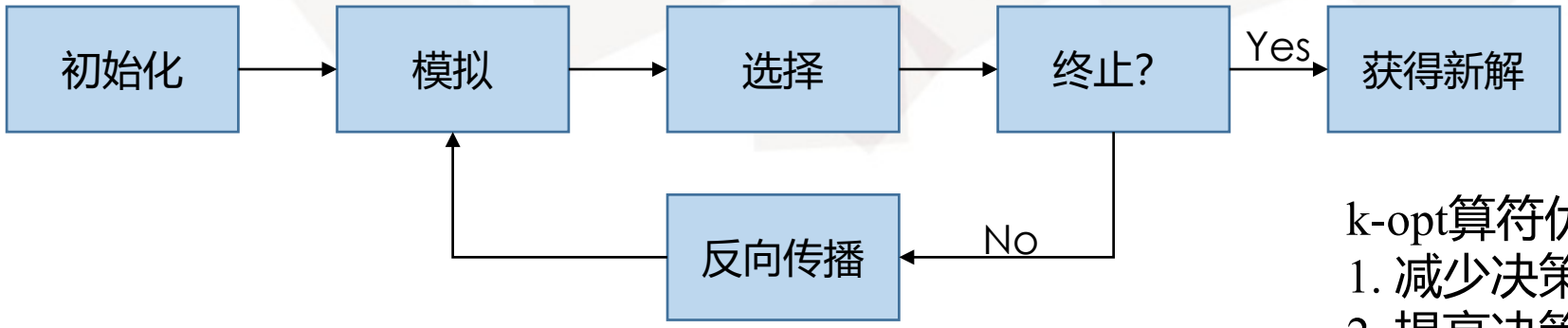
1.2 局部搜索过程--
提出基于强化学习的k-opt搜索算符



详见论文p17

1.2 局部搜索过程--
提出基于强化学习的k-opt搜索算符

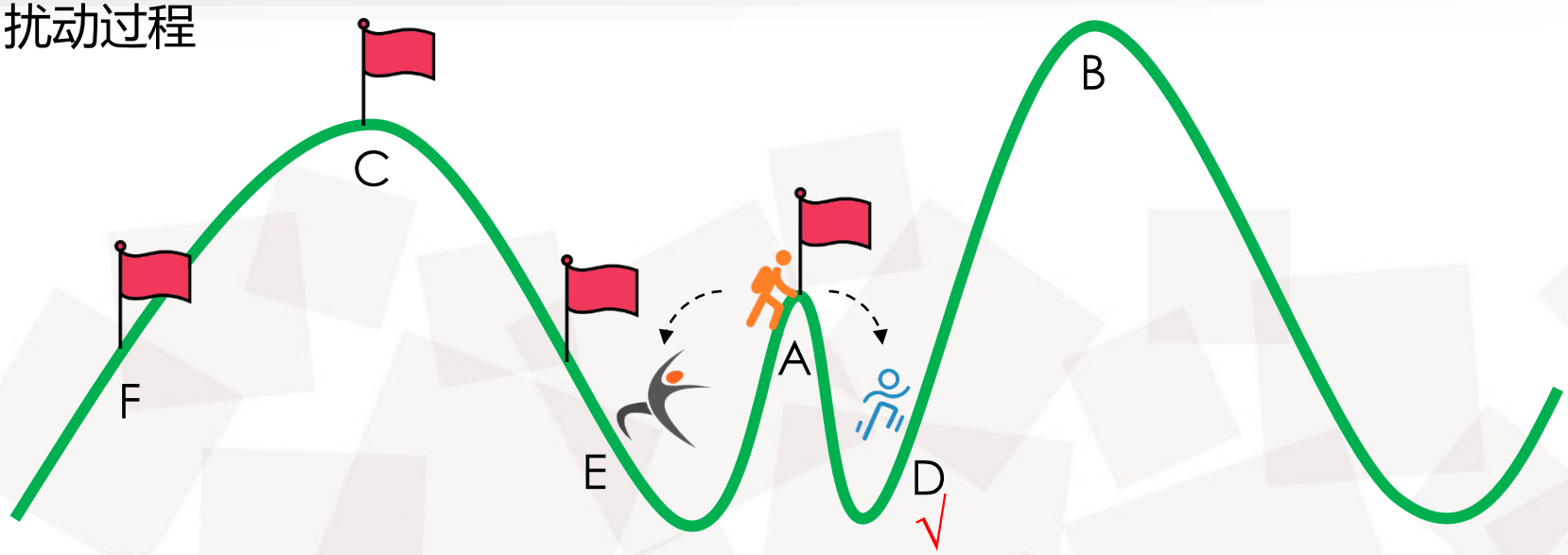




k-opt算符优点:
1. 减少决策步骤
2. 提高决策准确性

详见论文p17, p19

1.3 定向扰动过程



详见论文p21

1.4 算法特点总结

1. 局部搜索过程方向明确鲁棒性高
2. 定向扰动使算法兼顾分散性与集中性
3. 采用强化学习思想边搜索边训练能够最大化搜索效率

二、研究结果

Information Sciences 502 (2019) 91–108

Contents lists available at ScienceDirect

Information Sciences

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Hybrid evolutionary search for the traveling repairman problem with profits

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6.9
CiteScore

5.524
Impact Factor

Heuristics for the traveling repairman problem with profits

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Computers & Industrial Engineering 113 (2017) 323–332

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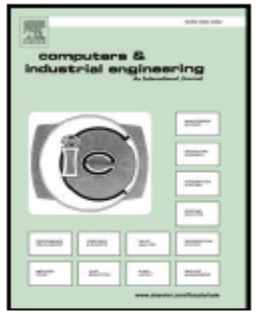

A GRASP with iterated local search for the traveling repairman problem with profits

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2 研究结果

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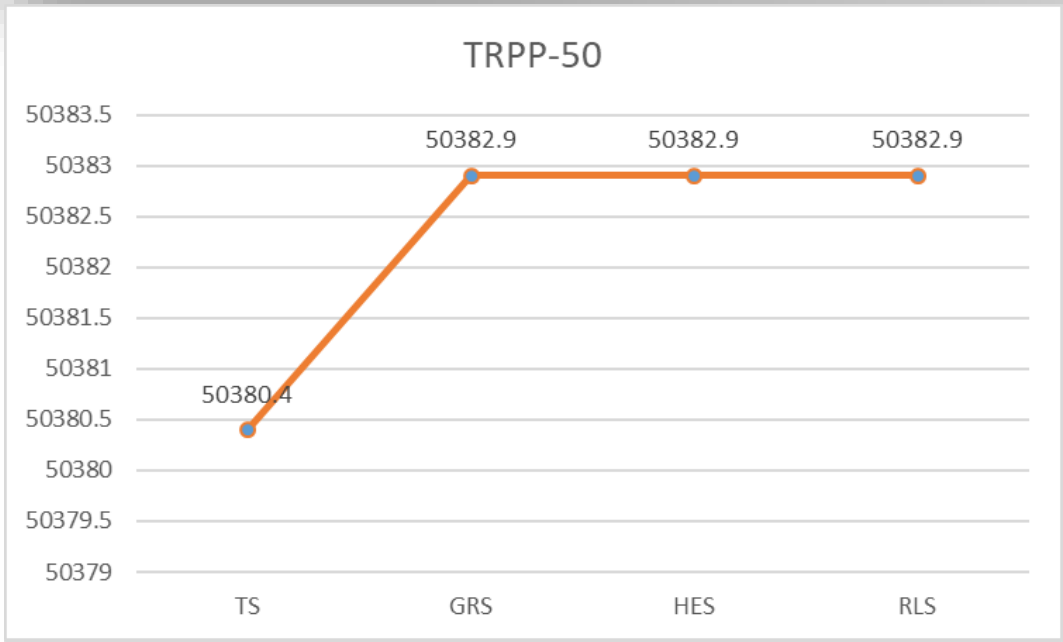
$$\mathrm{Ip.G}(\%) = 100\% \times \frac{(Av.R_{Algrithom} - Av.R_{RLS})}{Av.R_{RLS}}$$

	TS			GRS			HES			RLS(本文方法)		
	Av.R	Av.T(s)	Ip.G	Av.R	Av.T(s)	Ip.G	Av.R	Av.T(s)	Ip.G	Av.R	Av.T(s)	Ip.G
50	50380.4	14.2	**-0.005%**	50382.9	9.4	0.000%	50382.9	9.4	0.000%	50382.9	**7.7**	
100	211857.8	149.9	**-0.0104%**	211867.9	106.6	**-0.0055%**	211879.4	106.7	**-0.0001%**	211879.7	**50.5**	
200	850836.5	1436.2	**-0.0728%**	851141.9	1086.7	**-0.0369%**	851437.8	1088.5	**-0.0017%**	851451.9	**650.6**	
500	6549673.0	2855.8	**-0.7125%**	6576988.5	1963.0	**-0.2949%**	6589292.0	1967.1	**-0.1073%**	6596363.4	**1805.4**	
	Intel(R) Core(TM) 2 Duo 3.00 GHz			Intel Core Duo 2 T 7500 2.20 GHz			Intel Xeon(R) CPU E5-2695 v4 2.10 GHz			Intel(R) Core(TM) i5-6200U 2.30 GHz		
	Computers & Operations Research (2013)			Computers & Industrial Engineering (2017)			Information Sciences (2019)					

详见论文p30~p31

研究结果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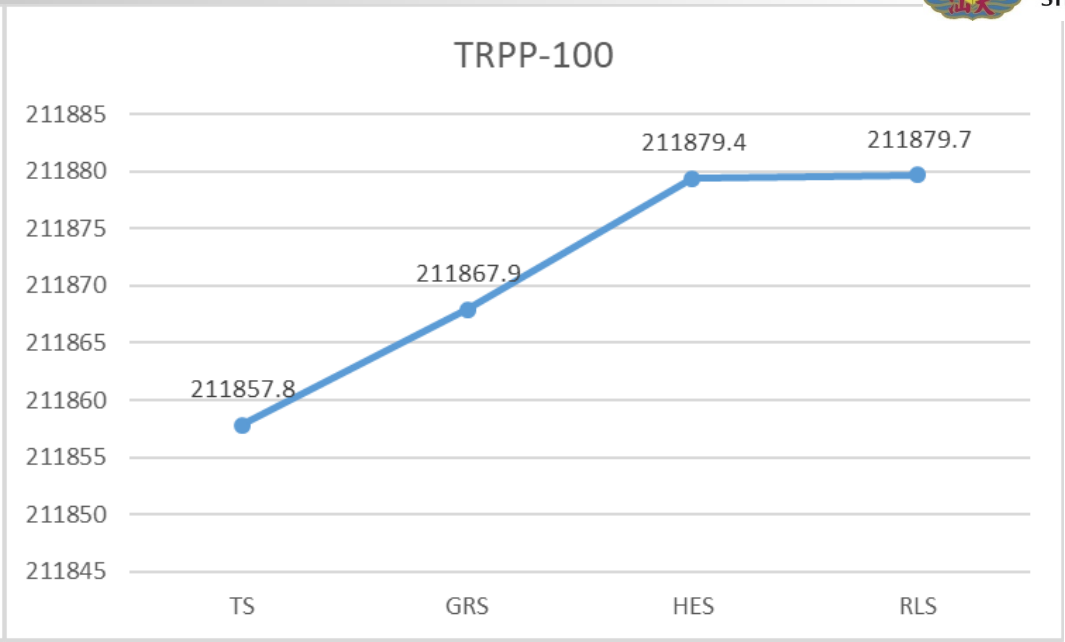
50382.5
50382
50381.5
50381
50380.5
50380
50379.5
50379
50380.4
50382.9
50382.9
50382.9
TS
GRS
HES
RLS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211870
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211860
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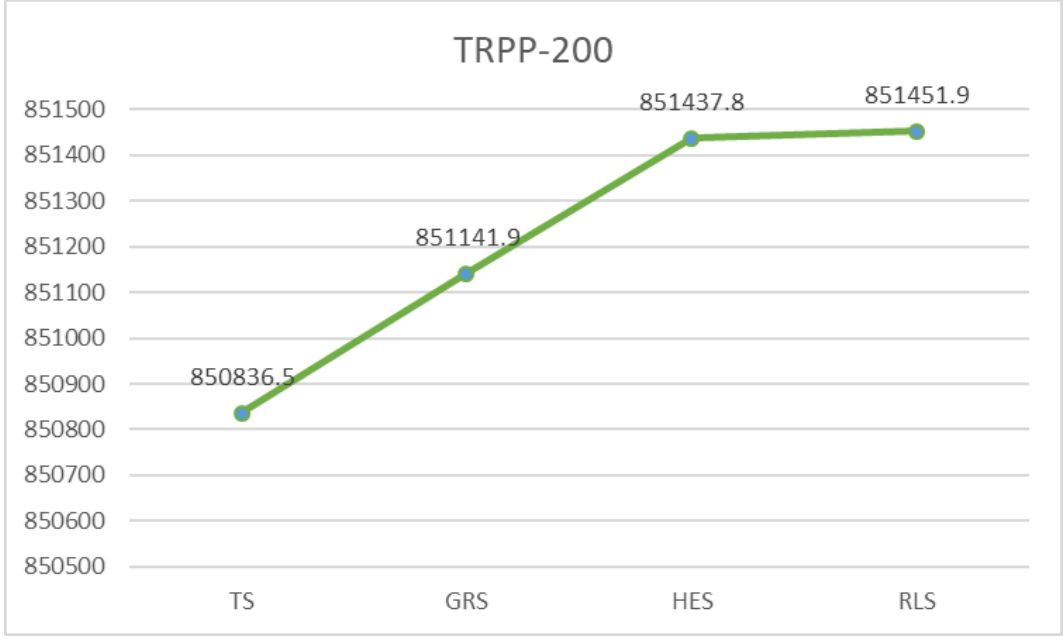
211867.9
211879.4
211879.7
TS
GRS
HES
RLS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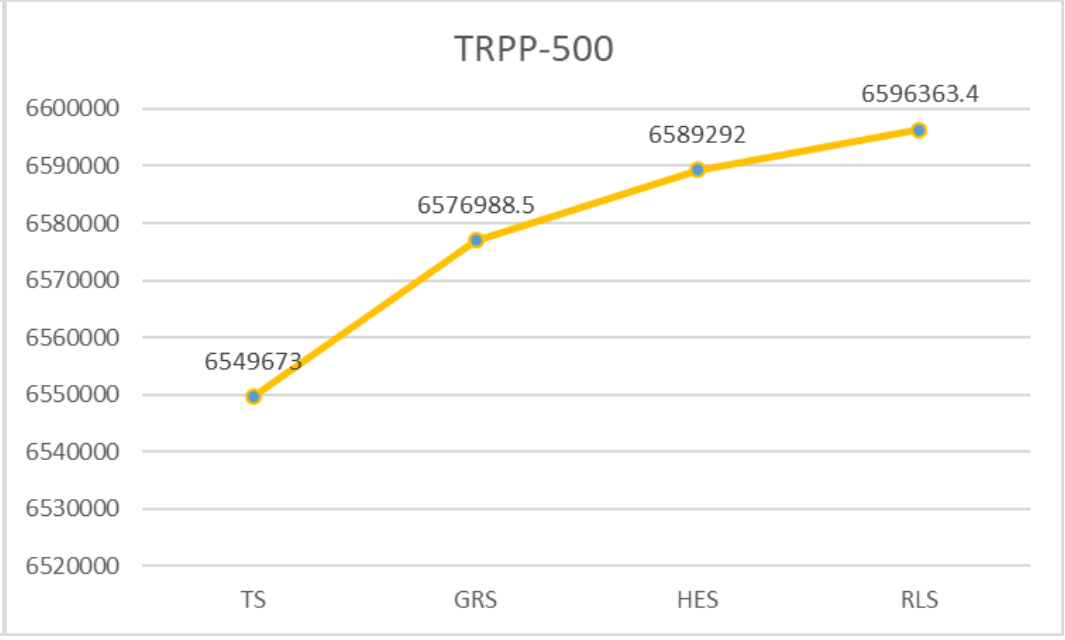
851300
851200
851100
851000
850900
850800
850700
850600
850500
850836.5
851141.9
851437.8
851451.9
TS
GRS
HES
RLS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6549673
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6596363.4
TS
GRS
HES
RLS

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