西安电子科技大学
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焊盘分类算法设计

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- 问题描述：从现有的板子中扫描得到焊盘的坐标数据和器件的坐标数据，给出每个焊盘所对应的器件。
- 输入：两个数据文件。

- 输出：按顺序给出每个焊盘所对应器件的具体名称。

输入数据：

dfm-0803_Part.txt - 记事本

文件(F) 编辑(E) 格式(O) 查看(V) 帮助(H)

;PartX	PartY	Angle	PartName	PackageName
247.5314	22.4699	180.00	"X1"	"DB9SL"
212.7123	48.4886	0.00	"R46"	"0805-IPC"
212.7123	46.0502	0.00	"R23"	"0805-IPC"
86.2076	83.0453	270.00	"R44"	"0805-IPC"
86.2076	87.2363	270.00	"R16"	"0805-IPC"
231.8487	40.8569	0.00	"R94"	"0805-IPC"
200.7337	77.8650	180.00	"C47"	"0805-IPC"
215.1355	22.7216	0.00	"R43"	"0805-IPC"
211.7446	23.6741	90.00	"C65"	"0805-IPC"
211.7954	27.9921	270.00	"C63"	"0805-IPC"
219.4281	22.6962	0.00	"C62"	"0805-IPC"
212.7733	31.4846	0.00	"C61"	"0805-IPC"
190.9450	59.7624	270.00	"C100"	"0805-IPC"
212.1723	59.7952	0.00	"C71"	"0805-IPC"
208.8490	27.1285	270.00	"C70"	"0805-IPC"
189.0558	88.8759	90.00	"R92"	"0805-IPC"
187.6334	84.1261	270.00	"R91"	"0805-IPC"
183.1122	89.1299	90.00	"C64"	"0805-IPC"
189.0050	95.2767	90.00	"C97"	"0805-IPC"
184.2425	62.6250	0.00	"C39"	"0805-IPC"

dfm-0803_Pad.txt - 记事本

文件(F) 编辑(E) 格式(O) 查看(V) 帮助(H)

;ROUND	PadX	PadY	PadSize	PartName		
;RECT	MinX	MinY	MaxX	MaxY	PartName	
;POLY	PadX	PadY	PartName			
POLY	"X1"					
241.2040	23.4960					
241.5977	23.1023					
242.3851	23.1023					
242.7788	23.4960					
242.7788	24.2834					
242.3851	24.6771					
241.5977	24.6771					
241.2040	24.2834					
241.2040	23.4960					
241.2040	23.4960					
ENDPOLY						
ROUND	244.7615	23.8897	1.5748	"X1"		
ROUND	247.5314	23.8897	1.5748	"X1"		
ROUND	250.3013	23.8897	1.5748	"X1"		
ROUND	253.0714	23.8897	1.5748	"X1"		
ROUND	243.3764	21.0500	1.5748	"X1"		
ROUND	246.1466	21.0500	1.5748	"X1"		
ROUND	248.9162	21.0500	1.5748	"X1"		
ROUND	251.6863	21.0500	1.5748	"X1"		
ROUND	260.0312	22.4699	4.0640	"X1"		

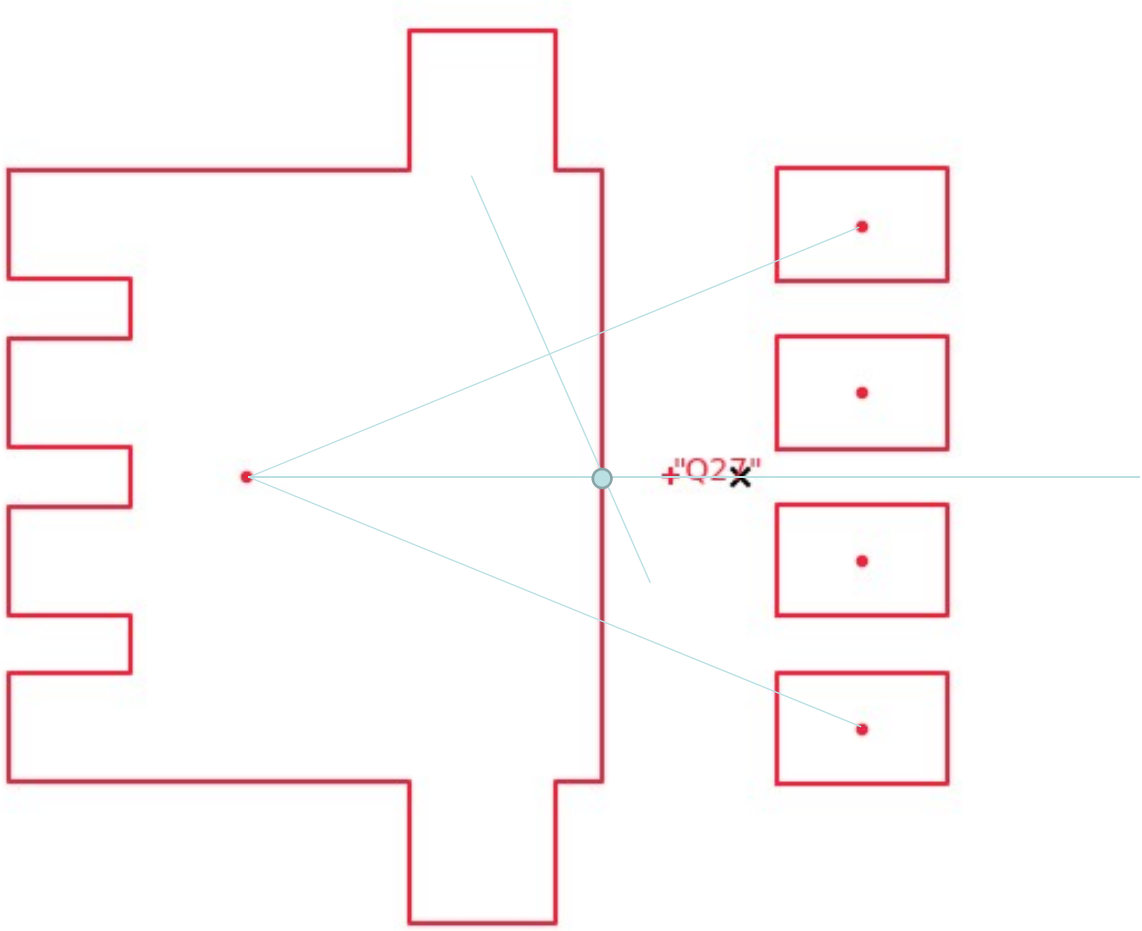
问题难点分析：

- 1. 给定一个状态，如何给出当前状态是否正确的置信度。
- 2. 如何在短时间内，高效地搜索优质的可能解。
- 3. 如何避免对称干扰。

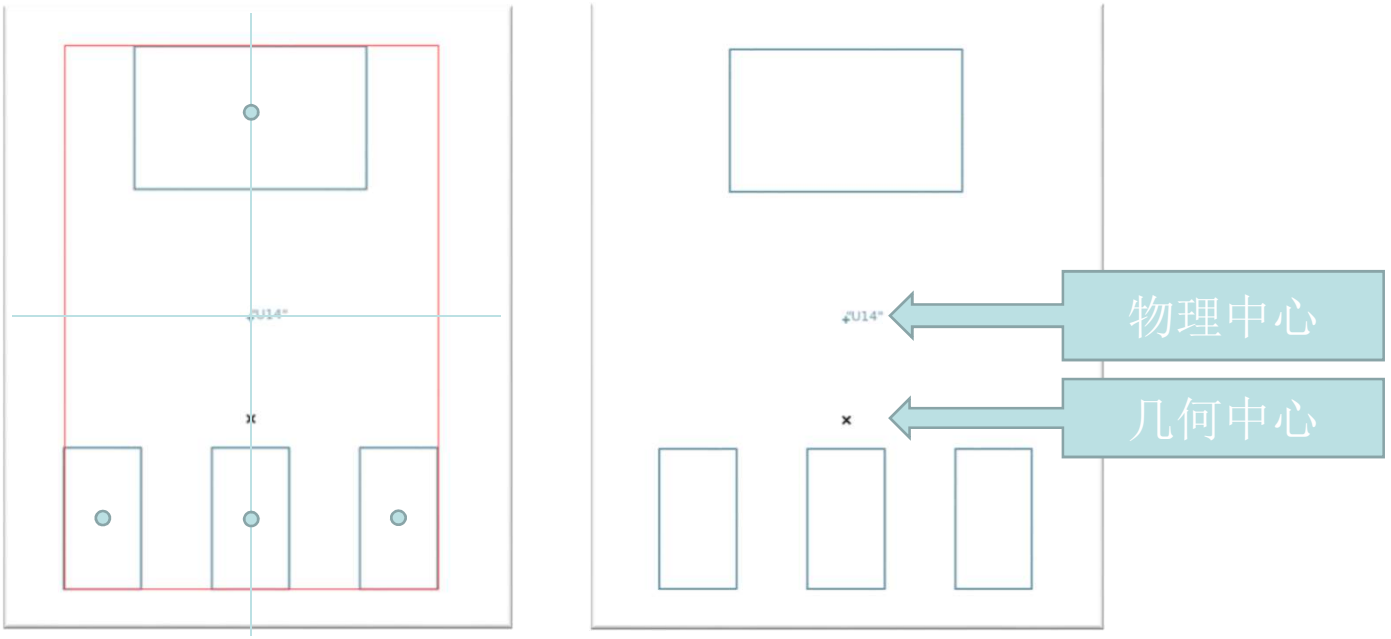
难点：

- 计算机无法精确表示浮点数。
- 加工误差和检测误差是普遍存在的。
- 数据可视化的重要性。

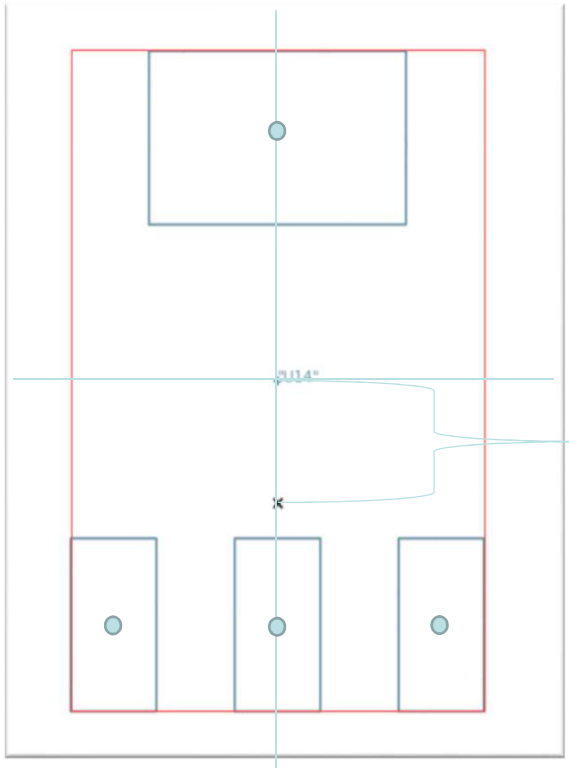
策略：1. 给定一个状态，如何给出当前状态是否正确的置信度。



几何中心和物理中心：

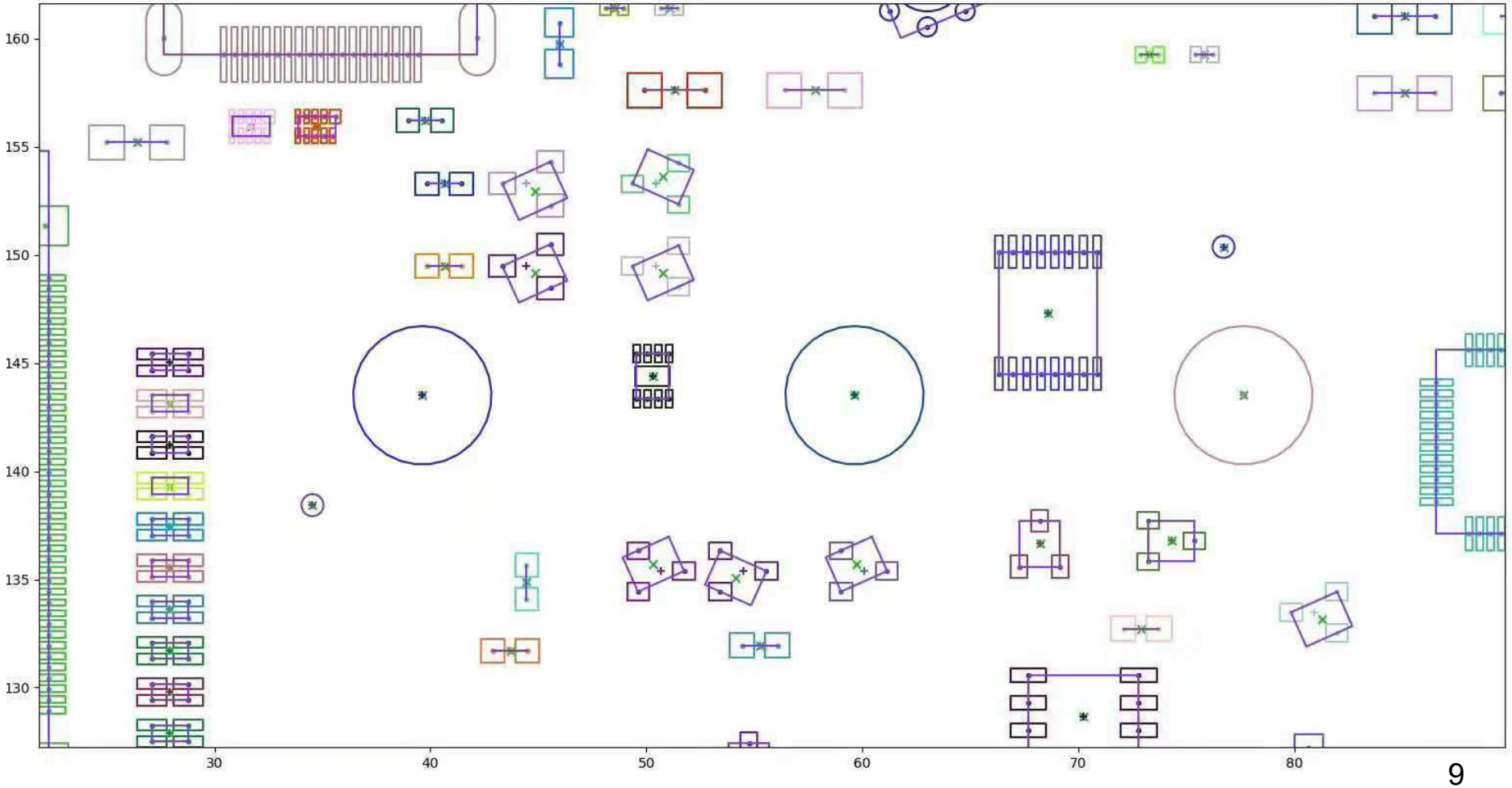


中心偏移距离：

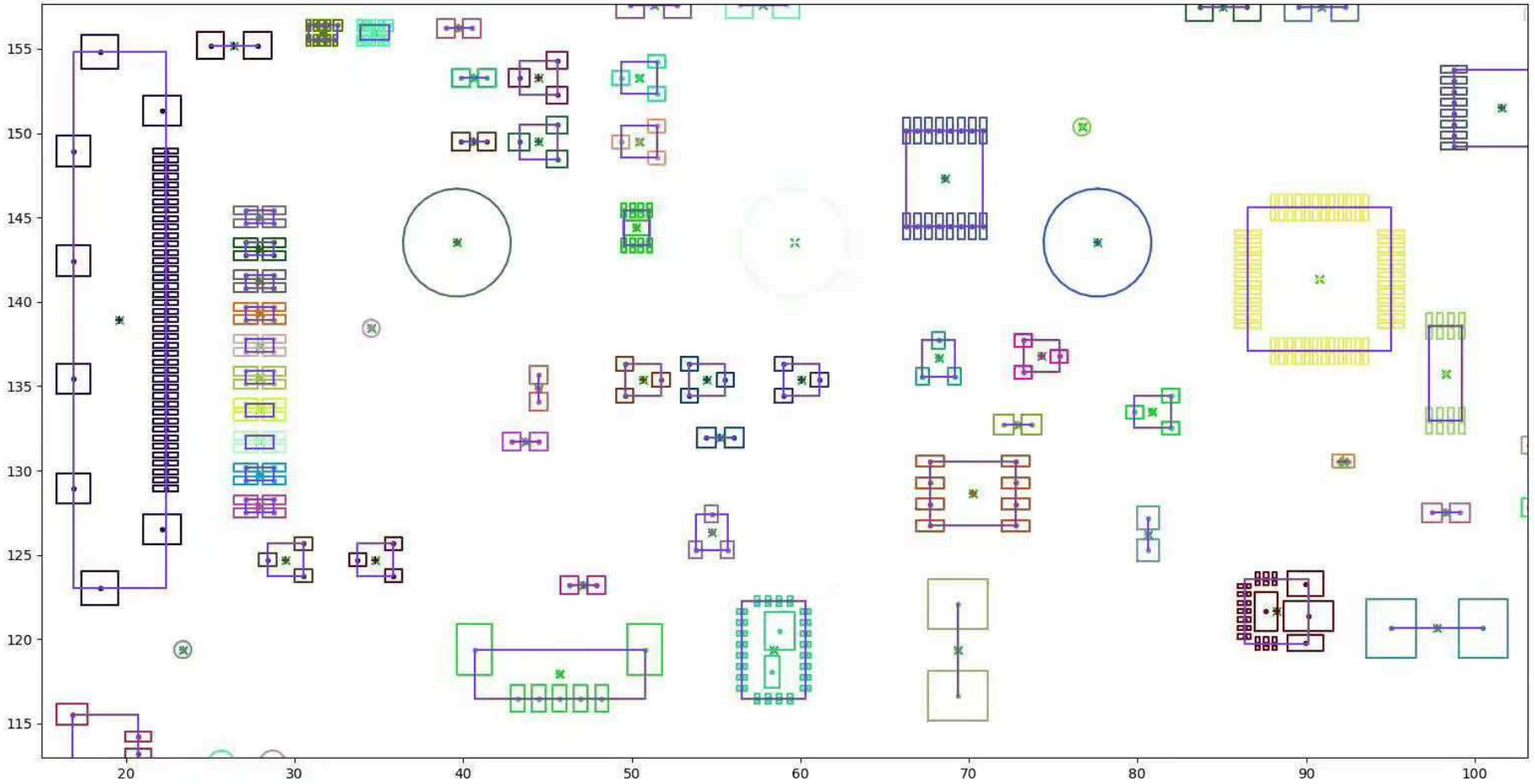


两种中心度量方式的对比：

Min Rect



Bound Rect



两种中心度量方式中心偏移距离的对比：

	data1		data2		data3	
中心偏移距维度：	32		59		345	
中心偏移距度量方式：	Min rectangle	Bound rectangle	Min rectangle	Bound rectangle	Min rectangle	Bound rectangle
中心偏移距1范数：	0.470079	0.001107557	2.041112	0.001671	17.91838346	5.504047715
中心偏移距无穷范数：	0.468682	8.06384E-05	1.150023	7.14E-05	0.635008376	0.457021633
中心偏移距分布：	0.468682	8.06384E-05	1.150023	7.14E-05	0.366360434	0.456975751
	0.000176	7.55068E-05	0.444494	6.12E-05	0.366339012	0.456974594
	0.00013	7.48118E-05	0.444467	5.82E-05	0.366338115	0.456973248
	7.43E-05	7.16058E-05	0.000193	5.76E-05	0.000248542	0.000248542
	7.35E-05	5.6596E-05	0.000163	5.32E-05	0.000242721	0.00022217
			0.000117	5.2E-05	0.000241144	0.000216949
中心偏移距0范数与维度比：	1/32	0/32	3/59	0/59	40/345	12/345
物理中心偏移距1范数：	physicsDist: 3.99195636987		physicsDist: 1.65500449398		physicsDist: 40.5221446289	
几何中心偏移距1范数：	geoDist: 1.86994287552		geoDist: 6.58115113859		geoDist: 61.981862542	
混合中心偏移距1范数：	halfDist: 1.76443150968		halfDist: 4.11789989952		halfDist: 36.4093616842	

2. 如何在短时间内，高效地搜索优质的可能解。

1.缩小搜索范围

2.只收集高质量的候选解方案

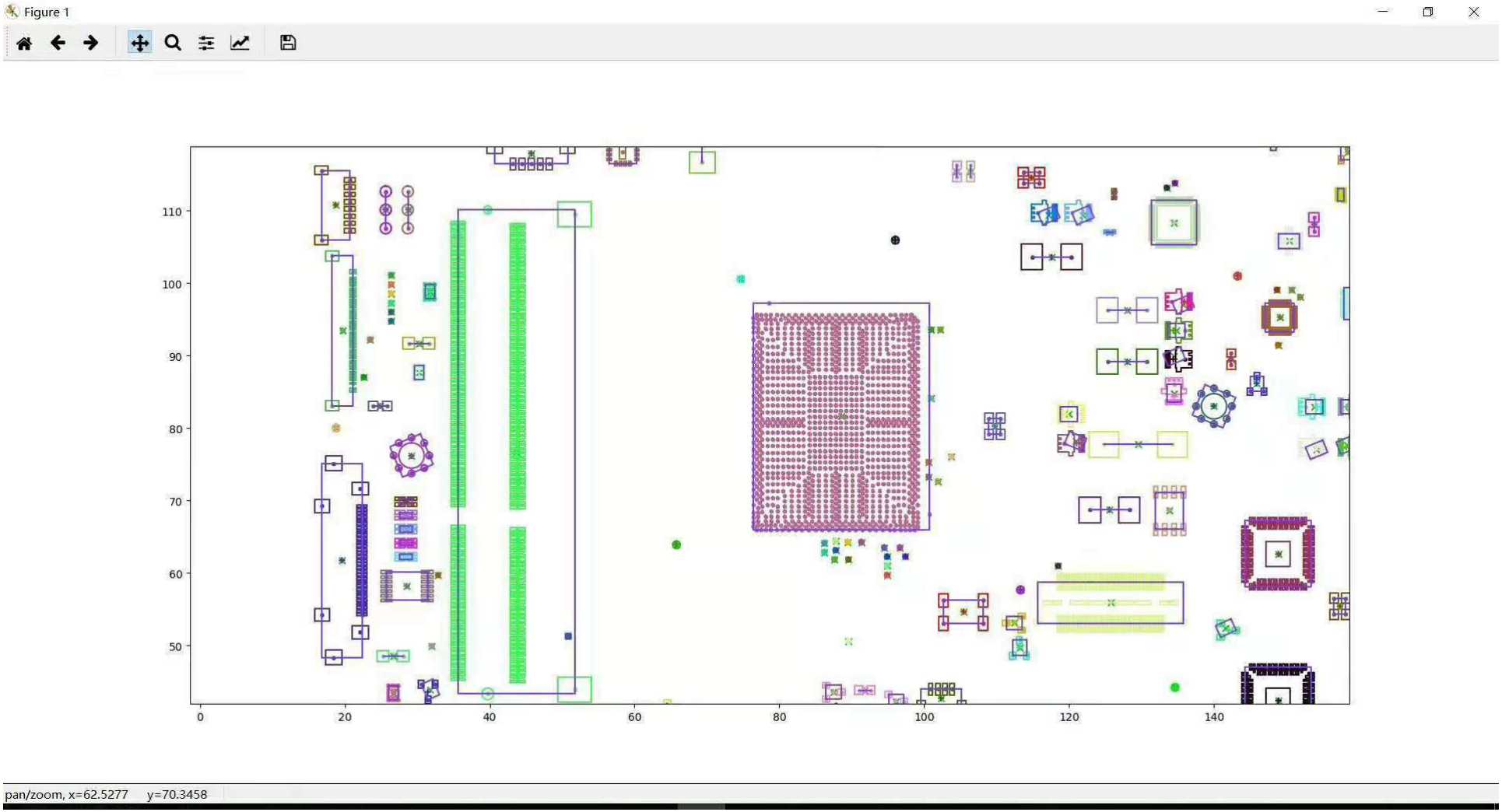
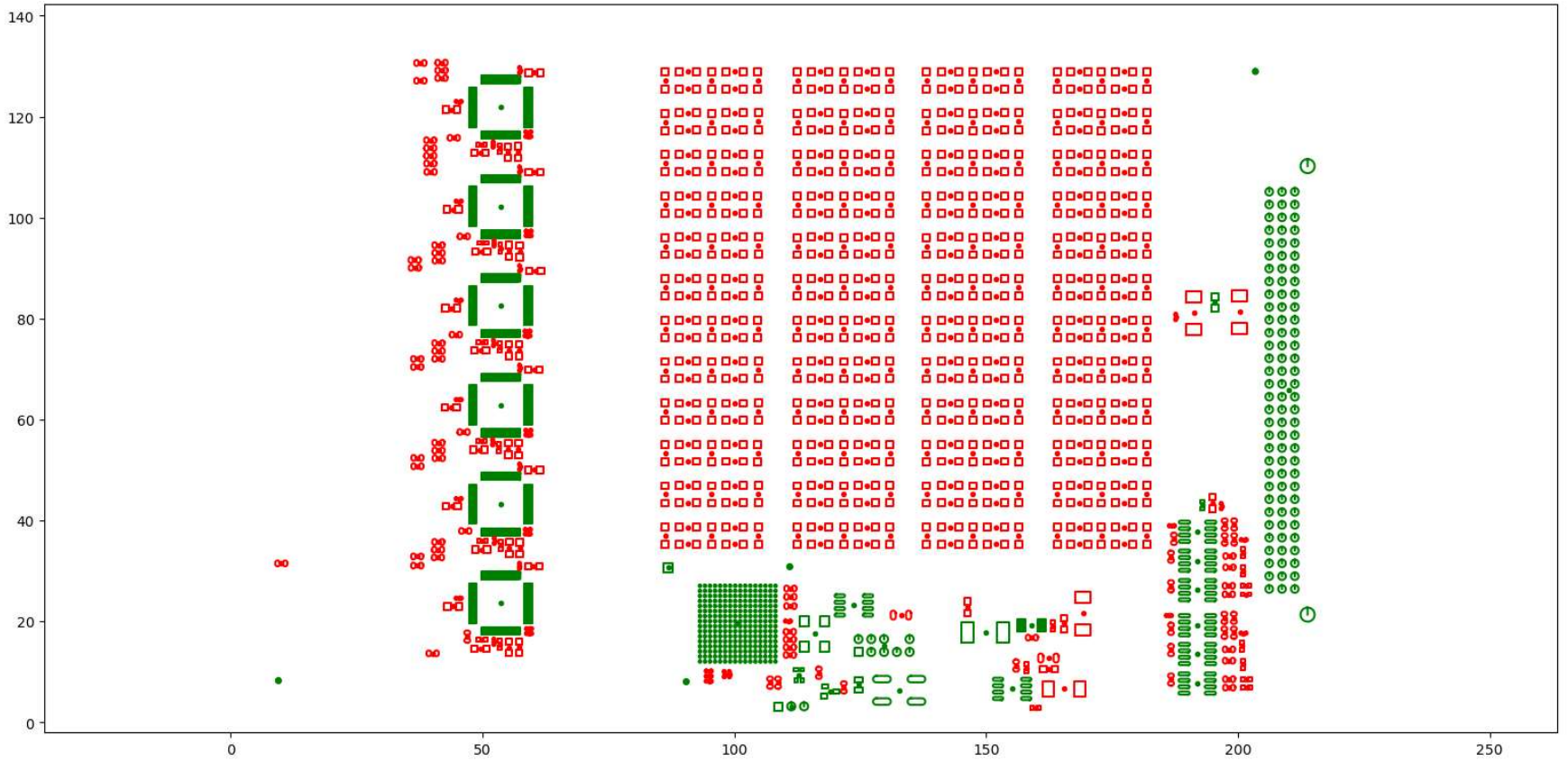
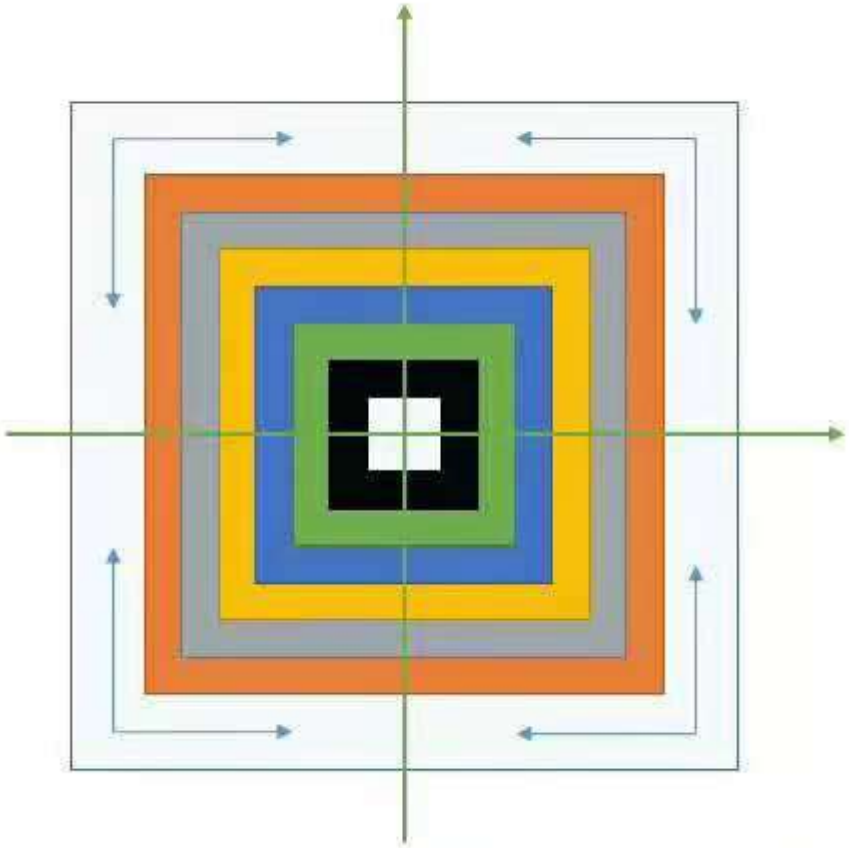


Figure 1
110
100
90
80
70
60
50
0
20
40
60
80
100
120
140
pan/zoom, x=62.5277 y=70.3458

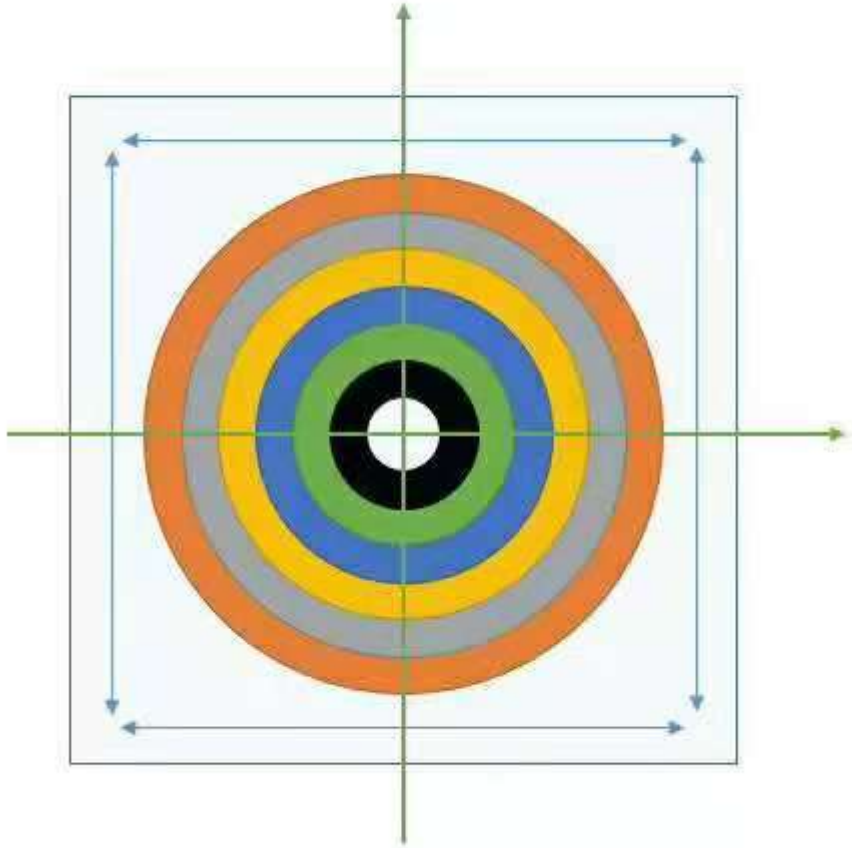
3. 如何避免对称干扰。



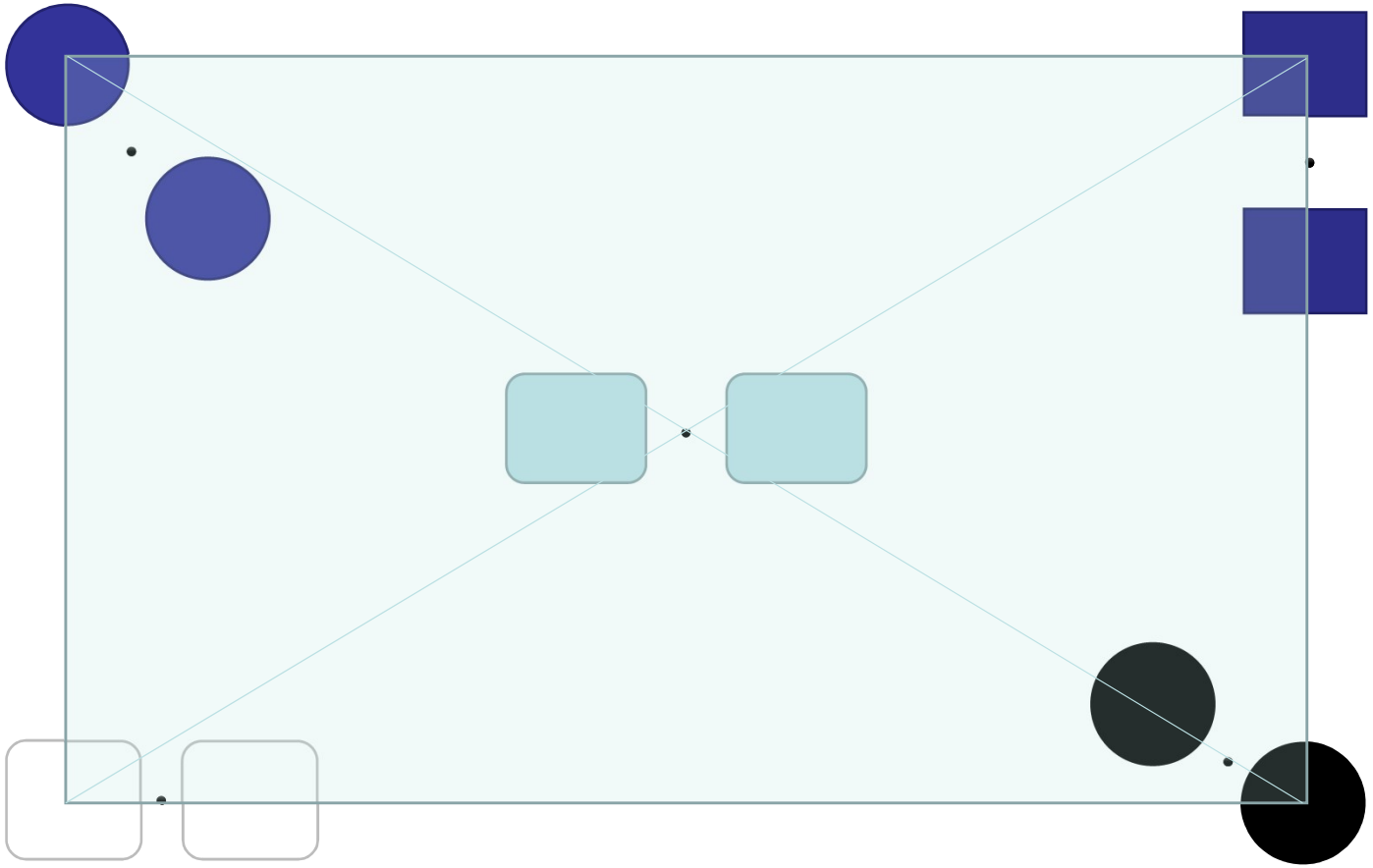
旋转一范数、旋转无穷范数

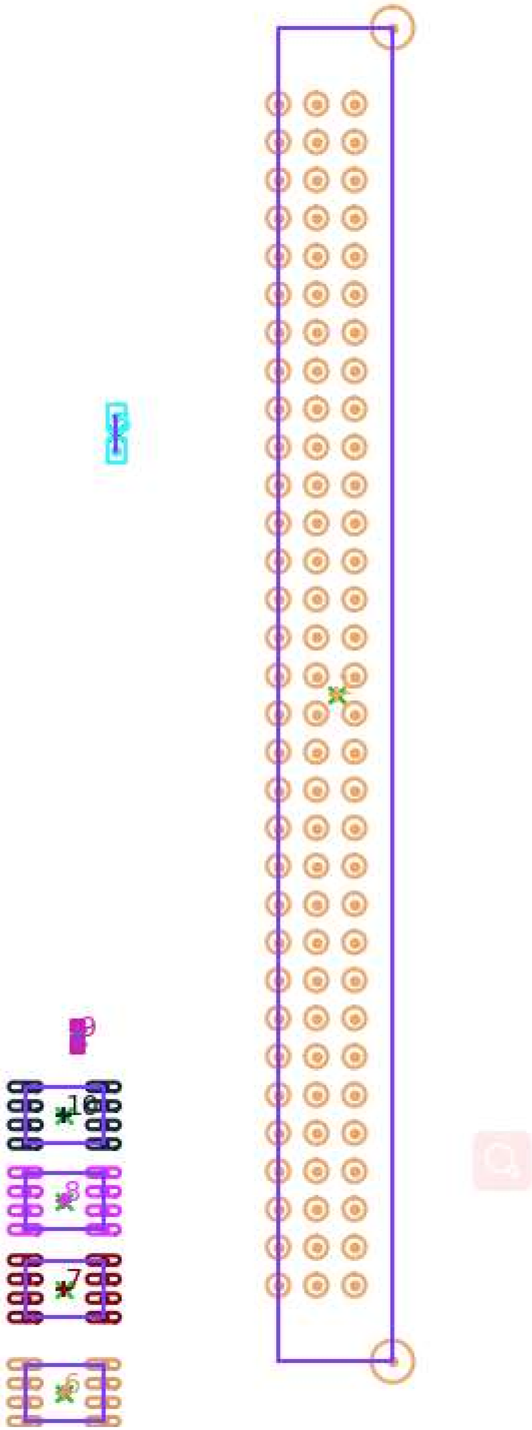


二范数、无穷范数



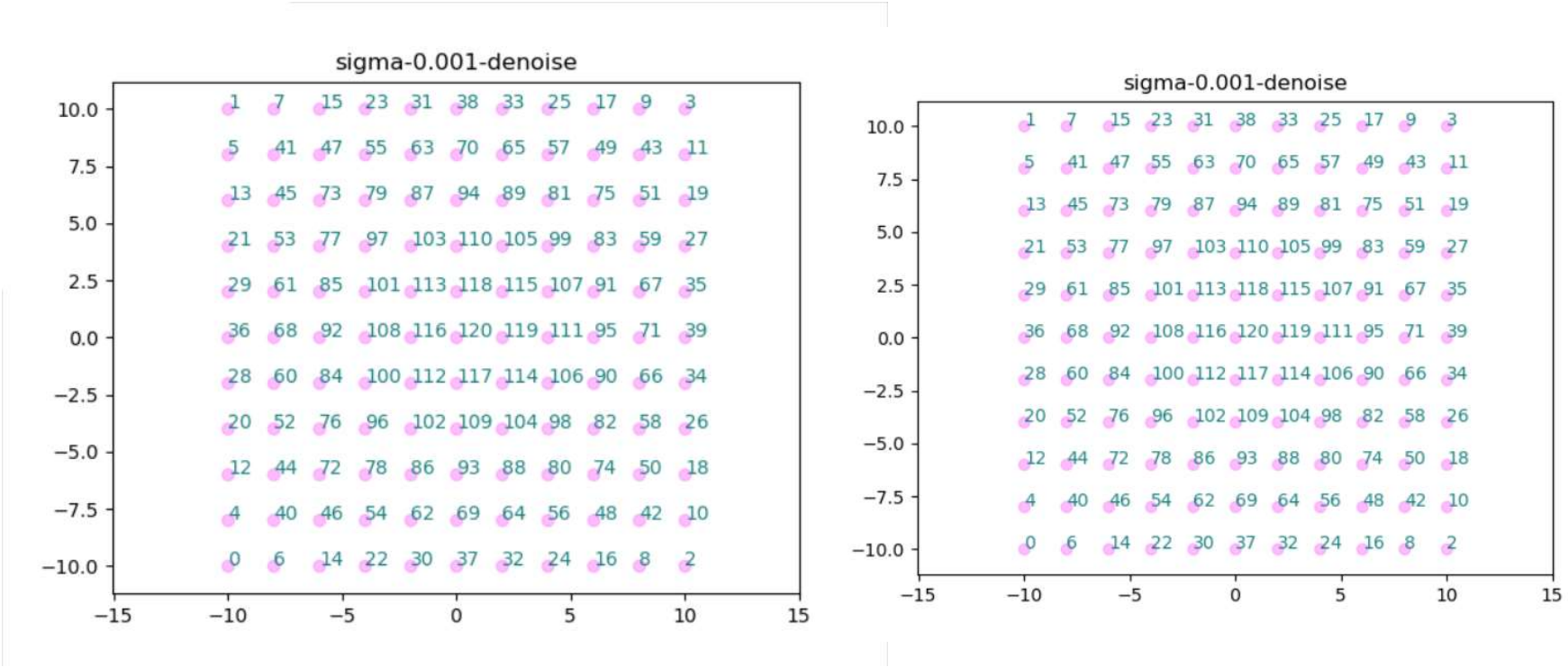
Max(min(width , height)) st. dist<1e-3

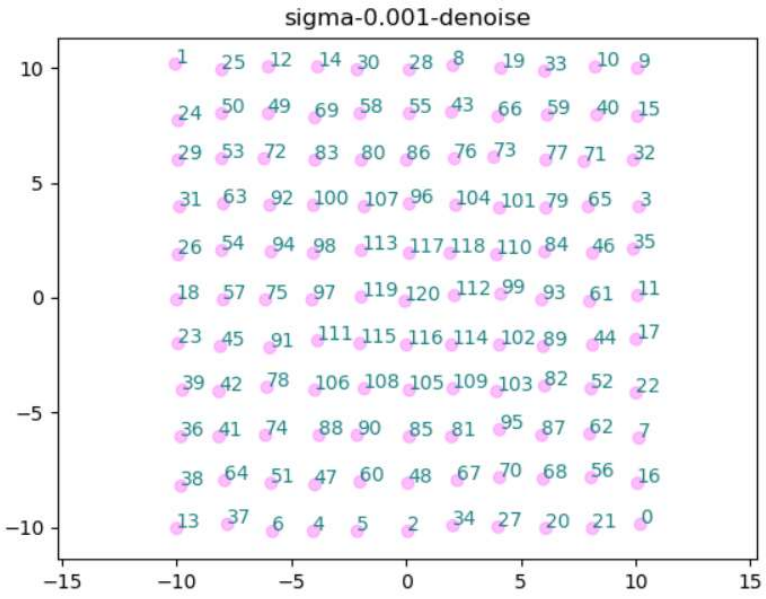


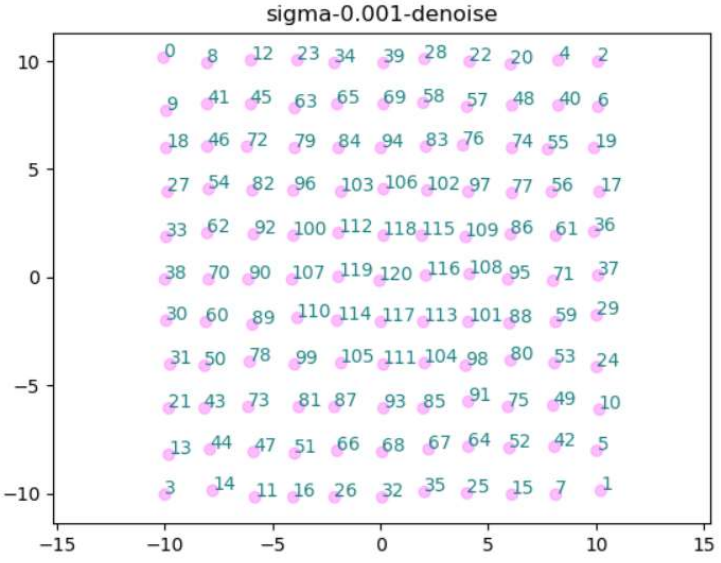


两种排序的对比：

```
points_list=sorted(points_list,key=lambda x:(max(abs(x[0]),abs(x[1])),
                                             (abs(x[0])+abs(x[1]))),reverse=True)
points_list2=sorted(points_list,key=lambda x:(0.9*max(abs(x[0]),abs(x[1]))+0.1*(abs(x[0])+abs(x[1]))),reverse=True)
```




sigma-0.001-denoise
1 25 12 14 30 28 8 19 33 10 9
24 50 49 69 58 55 43 66 59 40 15
29 53 72 83 80 86 76 73 77 71 32
31 63 92 100 107 96 104 101 79 65 3
26 54 94 98 113 117 118 110 84 46 35
18 57 75 97 119 120 112 99 93 61 11
23 45 91 111 115 116 114 102 89 44 17
39 42 78 106 108 105 109 103 82 52 22
36 41 74 88 90 85 81 95 87 62 7
38 64 51 47 60 48 67 70 68 56 16
13 37 6 4 5 2 34 27 20 21 0
10
5
0
−5
−10
−15 −10 −5 0 5 10 15


sigma-0.001-denoise
0 8 12 23 34 39 28 22 20 4 2
9 41 45 63 65 69 58 57 48 40 6
18 46 72 79 84 94 83 76 74 55 19
27 54 82 96 103 106 102 97 77 56 17
33 62 92 100 112 118 115 109 86 61 36
38 70 90 107 119 120 116 108 95 71 37
30 60 89 110 114 117 113 101 88 59 29
31 50 78 99 105 111 104 98 80 53 24
21 43 73 81 87 93 85 91 75 49 10
13 44 47 51 66 68 67 64 52 42 5
3 14 11 16 26 32 35 25 15 7 1
10
5
0
−5
−10
−15 −10 −5 0 5 10 15

指标对比：

Max(width , height) st. dist<1e-3

	ACC	DACC	NDR	PCB_Name	Pad_num	Part_num	Time
0	0.984196	1	0.015804	288	2531	1125	3.793
1	1	1	0	8XJ038048	1880	546	1.107
2	0.638835	0.999662	0.360949	CC0_100500-B	4635	561	8.535
3	0.983926	1	0.016074	DVI10_V2.4.2_ODB_20180411	3235	743	4.784
4	0.990654	1	0.009346	MU_V3_A3AASC2_V2	428	167	0.187
5	0.785734	0.998002	0.212693	n-5180	14622	5411	569.377
6	0.872204	0.999139	0.127044	T6-532J3701-R (TGZ)	5321	1180	43.585
7	0.812072	0.99626	0.184879	USa	14761	2223	88.872

Max(min(width , height)) st. dist<1e-3

	ACC	DACC	NDR	PCB_Name	Pad_num	Part_num	Time
0	1	1	0	288	2531	1125	4.825
1	1	1	0	8XJ03804	1880	546	1.351
2	0.961597	0.999776	0.038188	CC0_1005	4635	561	11.246
3	0.998764	1	0.001236	DVI10_V2.	3235	743	6.307
4	0.990654	1	0.009346	MU_V3_A3	428	167	0.296
5	0.97579	0.99881	0.023047	n-5180	14622	5411	432.599
6	0.942868	0.999203	0.05638	T6-532J3	5321	1180	43.151
7	0.864508	0.996486	0.132444	USa	14761	2223	95.614

	ACC	DACC	NDR	PCB_Name	Pad_num	Part_num	Time
0	1	1	0	11504-K1603A9500-01	6533	464	11.401
1	0.99921	1	0.00079	288	2531	1125	6.874
2	1	1	0	8XJ038048	1880	546	1.721
3	1	1	0	AC02IQQ-0323	459	172	0.252
4	0.907233	0.999423	0.092243	ASY_180902RB-0514	1908	356	3.3
5	0.996641	0.999545	0.002905	BackDrill	11015	1167	32.146
6	1	1	0	BMS_CTL_IF_0426	376	140	0.44
7	0.989213	1	0.010787	CC0_100500-B	4635	561	13.243
8	0.974869	1	0.025131	dfm-0803	955	318	0.573
9	0.998764	1	0.001236	DVI10_V2.4.2_ODB_20	3235	743	6.761
10	0.984351	0.998413	0.014085	GLN000820C-Routing-	639	243	0.524
11	1	1	0	MU_V3_A3A-0530	428	167	0.17
12	1	1	0	MU_V3_A3AASC2_V2	428	167	0.161
13	0.975927	0.99888	0.022979	n-5180	14622	5411	579.032
14	0.980543	0.999237	0.018709	P01BTA-171000-2018.(	5345	1313	106.564
15	0.989213	1	0.010787	ST-TEST09	4635	561	12.794
16	0.94362	0.999204	0.055629	T6-532J3701-R (TGZ)	5321	1180	52.851
17	0.869724	0.998367	0.128853	USa	14761	2223	116.336
							945.143

小技巧：