

**Max generation: 300**

**Population size: 400**

**N: 10**

**Mutation case: Case2**

**Survivor selection type: Generational**

### Results of x\_over methods:

(The green color shows the value in this dimension is approximately zero)  
(f\_array is function values in different dimensions)

- **XOVER\_METHOD = LOCAL\_DISC**

fitness = 0.00012727566263492918 (the result rounded)

x = [420.9687468, 420.9687467, 420.9687462,  
420.968746, 420.9687451, 420.9687469,  
420.9687472, 420.9687453, 420.9687467,  
420.968745]

f\_array = [1.2727566286230285e-05, 1.2727566286230285e-05,  
1.2727566229386866e-05, 1.2727566229386866e-05,  
1.272756651360396e-05, 1.2727566343073704e05,  
1.2727566343073704e-05, 1.2727566399917123e-05,  
1.2727566286230285e-05, 1.272756651360396e-05]

- **XOVER\_METHOD = LOCAL\_INT**

fitness = 1362.1149460891397

x = [420.9687465, 203.8142529, 65.5478653,  
65.5478648, 203.8142533, 420.9687462,  
203.8142524, 420.9687466, 420.9687466,  
420.9687463]

f\_array: [1.2727566229386866e-05, 217.13968211813918,  
355.34791804844554, 355.34791804844554,  
217.13968211813923, 1.2727566229386866e-05,  
217.13968211813915, 1.2727566286230285e-05,  
1.2727566286230285e-05, 1.2727566229386866e-05]

- **XOVER\_METHOD = GLOBAL\_DISC**

fitness = 0.00012727566263492918

x = [420.9687471, 420.9687455, 420.9687457,  
420.9687475, 420.9687471, 420.9687469,  
420.9687465, 420.9687475, 420.9687467,  
420.9687475]

f\_array: [1.2727566343073704e-05, 1.2727566343073704e-05,  
1.2727566343073704e-05, 1.2727566399917123e-05, 1.2727566343073704e-05,  
1.2727566343073704e-05, 1.2727566229386866e-05, 1.2727566399917123e-05,  
1.2727566286230285e-05, 1.2727566399917123e-05]

- **XOVER\_METHOD = GLOBAL\_INT**

fitness = 868.5588048379536

x = [203.8142527, 203.8142524, 203.814253,  
420.968746, 203.8142524, 420.968746,  
420.9687462, 420.9687469, 420.9687465,  
420.9687462]

f\_array: [217.13968211813918, 217.13968211813915,  
217.1396821181392, 1.2727566229386866e-05, 217.13968211813915,  
1.2727566229386866e-05, 1.2727566229386866e-05, 1.2727566343073704e-05,  
1.2727566229386866e-05, 1.2727566229386866e-05]

**Max generation: 200**

**Population size: 400**

**N: 10**

**Xover method: LOCAL\_DISC**

**Survivor selection type: Generational**

### Results of mutation methods:

- **MUTATION\_MODE = CASE1**

**fitness = 355.34803259654154**

x = [420.9687455, 420.9687462, 420.9687467,  
420.9687468, 420.9687466, 65.547864,  
420.9687469, 420.9687472, 420.9687462,  
420.968746]

f\_array: [1.2727566343073704e-05, 1.2727566229386866e-05,  
1.2727566286230285e-05, 1.2727566286230285e-05, 1.2727566286230285e-05,  
355.34791804844565, 1.2727566343073704e-05, 1.2727566343073704e-05,  
1.2727566229386866e-05, 1.2727566229386866e-05]

- **MUTATION\_MODE = CASE2**

**fitness = 0.00012727566263492918 (the result rounded)**

x = [420.9687468, 420.9687467, 420.9687462,  
420.968746, 420.9687451, 420.9687469,  
420.9687472, 420.9687453, 420.9687467,  
420.968745]

f\_array = [1.2727566286230285e-05, 1.2727566286230285e-05,  
1.2727566229386866e-05, 1.2727566229386866e-05,  
1.272756651360396e-05, 1.2727566343073704e05,  
1.2727566343073704e-05, 1.2727566399917123e-05,  
1.2727566286230285e-05, 1.272756651360396e-05]

For 10 time running with mutation Case 1 and observe count non zero dimensions every time:

- 1 time non zero appears in two dimensions
- 3 time non zero appears in no dimensions
- 7 time non zero appears in one dimension

For 10 time of Case2:

- 0 time non zero appears in two dimensions
- 7 time non zero appears in no dimensions
- 3 time non zero appears in one dimension

## Compare X-over methods:

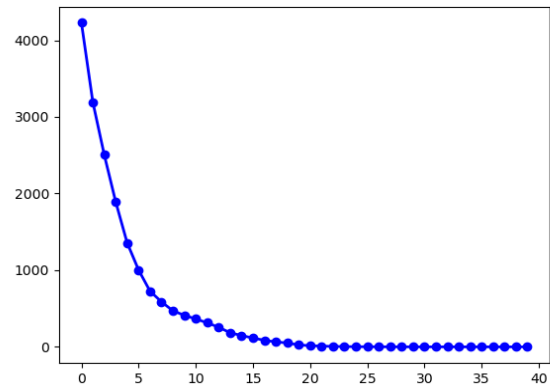
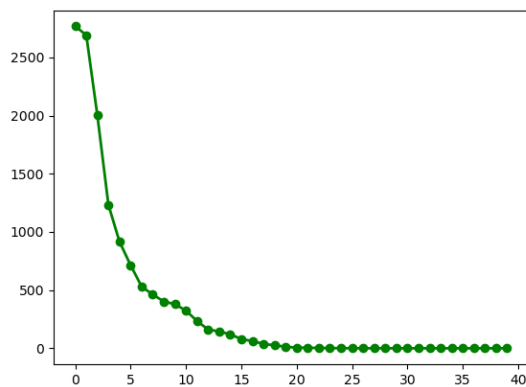
(MUTATION\_MODE = CASE2, SURVIVOR\_SEL\_TYPE = ELITISM, N = 10, MAX\_GENERATION = 40 ,  
POPULATION\_SIZE = 50)

(Blue diagram is Average fitness and Green diagram fitness)

LOCAL\_DISC:

10/10

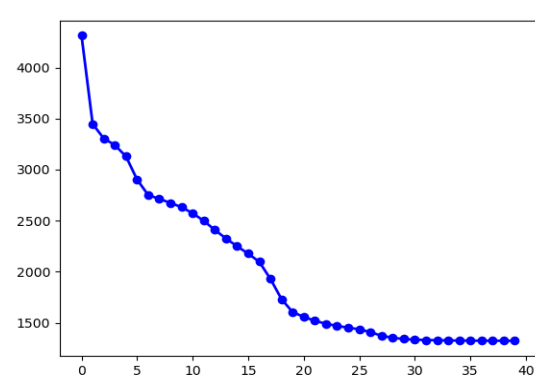
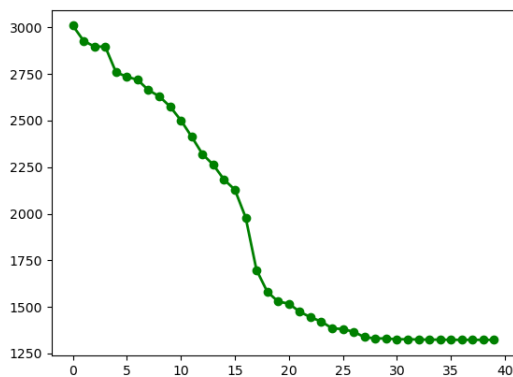
of dimensions get approximate zero



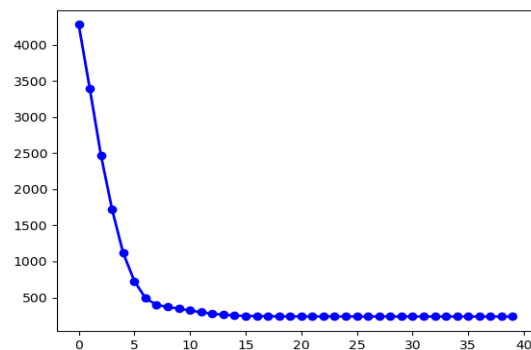
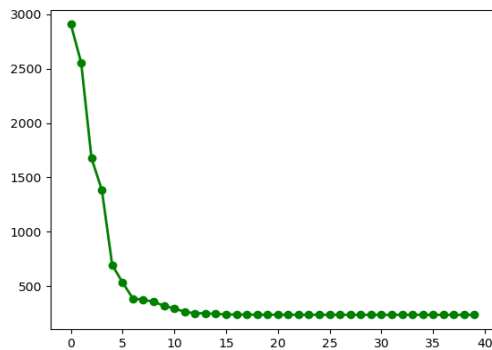
LOCAL\_INT:

5/10

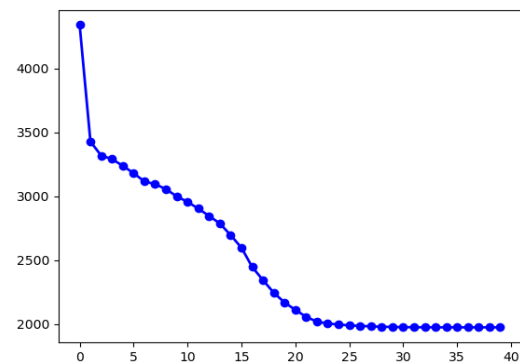
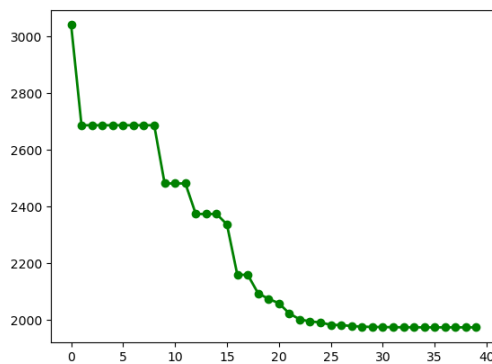
of dimensions get approximate zero



**GLOBAL\_DISC:** 10/10 of dimensions get approximate zero



**GLOBAL\_INT:** 6/10 of dimensions get approximate zero



(The orange color show that this method got better value in compare with other)

### GLOBAL\_DISC

f\_array: [1.2727566286230285e-05, 1.2727566229386866e-05, 1.2727566456760542e-05, 1.2727566286230285e-05, 1.2727566286230285e-05, 1.2727566229386866e-05, 1.2727566286230285e-05, 1.2727566229386866e-05, 1.2727566343073704e-05, 1.2727566172543447e-05]

### LOCAL\_DISC

f\_array: [1.2727566343073704e-05, 1.2727566343073704e-05, 1.2727566343073704e-05, 1.2727566229386866e-05, 1.2727566343073704e-05, 1.2727566286230285e-05,

1.2727566229386866e-05, 1.2727566343073704e-05, **1.2727566286230285e-05**,  
1.2727566172543447e-05]

for comparing **GLOBAL\_DISC** and **LOCAL\_DISC** as we look at their f\_array(function values in dimensions):

in **6** of dimensions **GLOBAL\_DISC** got **better** value.

In **3** of dimensions **LOCAL\_DISC** got **better** value.

and in **1** dimension they **got the same** value.

## 10 time running of each Xover configuration

N = 10

MUTATION\_MODE = CASE2

SURVIVOR\_SEL\_TYPE = GENERATIONAL

MAX\_GENERATION = 40

POPULATION\_SIZE = 50

LOCAL\_DISC solutions:

0.00015094456466613337

**236.8768963543107**

0.0003000986180268228

0.0005415958430603496

0.0001942444359883666

**118.43852588414347**

0.0002481079254721408

0.000507095779539668

0.0002352570727452985

0.0007377771980827674

average: **35.531833735989174**

variance: **75.83748173232169**

LOCAL\_INT solutions:

3099.3409534010916  
2586.238949801562  
2605.753199263469  
2823.480701842223  
3178.8554887896566  
3316.6526517083344  
3040.2350163409747  
2764.4121095245473  
2665.154069110832  
2822.9355104730344

**average: 2890.3058650255725**

**variance: 240.86941088199526**

GLOBAL\_DISC solutions:

0.022856812952340988  
118.45108254002889  
118.48857073668842  
118.44280131897949  
0.008484420666718506  
0.005451880581858859  
0.005813965529341658  
0.023427051593898796  
0.010449188122038322  
0.040173583998694085

**average: 35.549911149914166**

**variance: 54.27793164502578**

GLOBAL\_INT solutions:

2862.703566071283  
2724.314037300498  
2981.4974372961615  
3119.2021268522544  
3040.3268200350035  
3119.165429527669

2428.264431321057  
 2724.2654276406556  
 2310.0546264640657  
 2901.9836770732454

average: 2821.177757958189  
 variance: 263.43883447631646

Method	Average	Variance
Local discrete	35.531833735989174	75.83748173232169
Local intermediate	2890.3058650255725	240.86941088199526
Global discrete	35.549911149914166	54.27793164502578
Global intermediate	2821.177757958189	263.43883447631646

## 10 time running of each Mutation configuration

N = 10

XOVER\_METHOD = LOCAL\_DISC

SURVIVOR\_SEL\_TYPE = GENERATIONAL

MAX\_GENERATION = 40

POPULATION\_SIZE = 50

Method	Average	Variance
Non Adaptive	207.38739721690513	125.17673368351377
Adaptive (Case 2)	35.531833735989174	75.83748173232169



## 10 time running of each Survivor Selection configuration

N = 10

XOVER\_METHOD = LOCAL\_DISC

MUTATION\_MODE = CASE2

MAX\_GENERATION = 40

POPULATION\_SIZE = 50

Method	Average	Variance
<b>generational</b>	35.531833735989174	75.83748173232169
<b>Elitism</b>	23.688428345270175	47.37508298528252

## Conclusion

Discrete methods of recombination's are performing better than intermediate methods. intermediate method instead of combining the goodness of parents,

Calculate their genes average and it may not mean any good feature. (can be really bad even).

Other side discrete methods just transfer genes from parent and doesn't change them.

Discrete Methods have Xover properties but intermediate methods acts like mutation.