**Multi-objective Brain Storm Optimization Algorithm**

***Part I: Pareto Font***

1. *Schaﬀer’s Min-Min (SCH)* test function with convex Pareto front (which is used to test the effectiveness of algorithms in most multi objective optimization problems) [35]:

|  |  |
| --- | --- |
| a | b |
| c  Figure 1: Pareto front of F1 with different number of iteration: a. N=20, b. N=100, c=200 | |

1. *Test function 2*

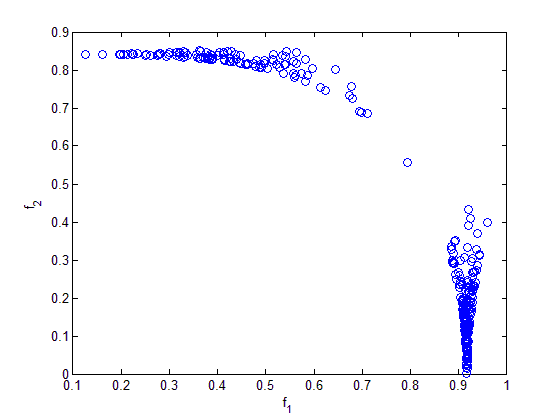


Figure 2: Pareto front of F2 with different number of iteration N=200

1. *Test function 3* has a non-convex front [34] [35]: F\_04

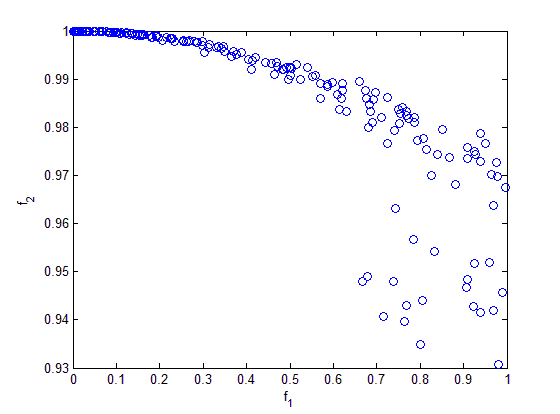


Figure 3: Pareto front of F3 with different number of iteration N=200

1. *Test function 4* has a convex Pareto-optimal front [34] [35]: F\_05

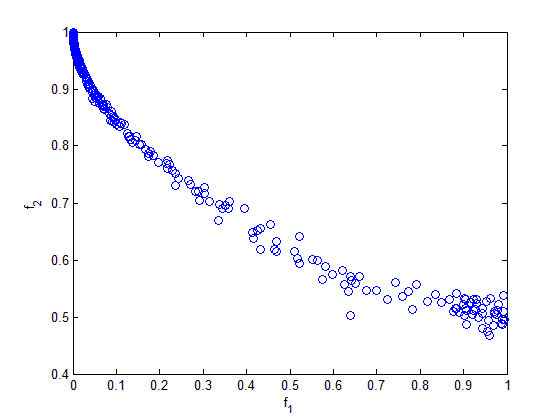


Figure 4: Pareto front of F4 with different number of iteration N=200

1. *Test function 5* represents the discreteness feature; its Pareto-optimal front consists of several noncontiguous convex parts: [34] : F\_06

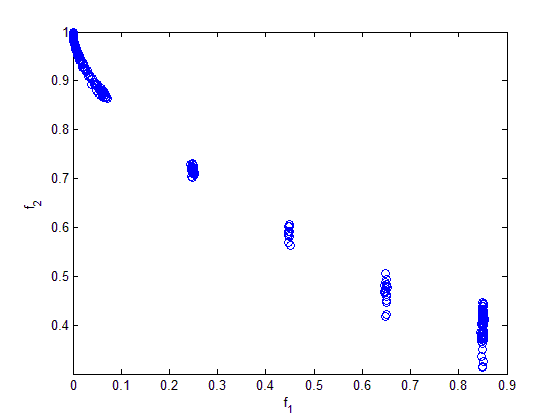


Figure 5: Pareto front of F5 with different number of iteration N=200

**Part II. Using MOBSO to find optimal solution**

1. Test function 6

|  |  |
| --- | --- |
| a | b |
| c  Figure 6: Convergence behavior in a typical run of F6 with different number of iteration: a. N=20, b. N=100, c=200 | |

1. *Test function 7*

|  |  |
| --- | --- |
| a | b |
| c  Figure 7: Convergence behavior in a typical run of F7 with different number of iteration: a. N=20, b. N=100, c=200 | |

1. *Test function 8*

|  |  |
| --- | --- |
| a | b |
| c  Figure 8: Convergence behavior in a typical run of F8 with different number of iteration: a. N=20, b. N=100, c=200 | |

1. *Test function 9*

|  |  |
| --- | --- |
| a | b |
| c  Figure 9: Convergence behavior in a typical run of F9 with different number of iteration: a. N=20, b. N=100, c=200 | |

1. *Test function 10:* Node localization application in WSNs

D=3, R=4, number of iteration N=500

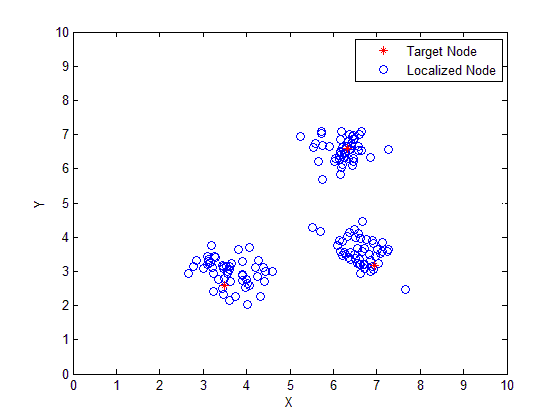


Figure 10: Convergence behavior in a typical run of F10 with number of iteration N=200

Average Localization error (%) with 20 trial runs: 2.8154