RO vs PSO

|  |  |
| --- | --- |
| **Model configuration** | |
| Number of fuzzy sets of each input | 3、3 |
| Number of fuzzy rules in the model | 9 |
| Number of fuzzy rules after selected | 7 |
| Number of fuzzy sets is used in model | 7 |
| Number of premise part’s parameters | 12 |
| Fuzzy set type of premise part | Gaussian fuzzy set |
| Number of consequence part’s parameters | 21 |
| Fuzzy set type of consequence part |  |

**Experiment 1(PSO+RLSE) Algorithm parameter configuration**

|  |  |
| --- | --- |
| **PSO** |  |
| Swarm size | 64 |
| Number of iterations | 20 |
| Initial velocity | 0 |
| ω, | (0.8 ,2 ,2 ) |
|  | Random in [0,1] |
| **RLSE** |  |
| Number of consequence part’s parameters | 21 |
|  | αI |
| α |  |
| I | 21 × 27 Identity matrix |
|  | 21 × 1 Matrix |

**Experiment 1 Result**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 前鑑部 | |  | | | | | | |
|  | | Fuzzy set | | | | | | |
|  | | INPUT1 | | |  | INPUT2 | | |
|  | | c |  | |  | c | |  |
| Fuzzy set 1 | | 9.1846e+06 | 7.9922e+06 | |  | -1.8275+e07 | | -6.7818e+06 |
| Fuzzy set 2 | | 1.0699e+07 | -8.5312e+05 | |  | 6.3765e+06 | | 2.7507e+05 |
| Fuzzy set 3 | | -9.6611e+06 | 7.3181e+06 | |  | 1.8520e+07 | | -1.0408e+06 |
| 後鑑部 | | | | | | | | |
| n |  | | |  | | |  | |
| Rule 1 | 3.9724e-13 | | | 3.8607e-09 | | | 3.8929e-09 | |
| Rule 2 | 3.8929e-09 | | | 4.7225e-27 | | | 4.6279e-23 | |
| Rule 3 | 0.9994 | | | 9.7129e+03 | | | 9.7939e+03 | |
| Rule 4 | 1.1881e-14 | | | 1.1547e-10 | | | 1.1643e-10 | |
| Rule 5 | 6.0258e-04 | | | 5.8564 | | | 5.9051 | |
| Rule 6 | 1.7186e-91 | | | 1.6703e-87 | | | 1.6842e-87 | |
| Rule 7 | 8.7166e-81 | | | 8.4715e-77 | | | 8.5421e-77 | |

**Experiment 2(RO+RLSE) Algorithm parameter configuration**

|  |  |
| --- | --- |
| **RO** |  |
| Swarm size | 4 |
| Number of iterations | 320 |
| Initial velocity | 0 |
| Step size | (Iterations-i-15\*(number of Premise parameters))/Iterations |
| **RLSE** |  |
| Number of consequence part’s parameters | 21 |
|  | αI |
| α |  |
| I | 21 × 27 Identity matrix |
|  | 21 × 1 Matrix |

**Experiment 2 Result**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 前鑑部 | |  | | | | | | |
|  | | Fuzzy set | | | | | | |
|  | | INPUT1 | | |  | INPUT2 | | |
|  | | c |  | |  | c | |  |
| Fuzzy set 1 | | -1.4660e+04 | 5.3505e+04 | |  | -1.6421e+04 | | 3.3986e+03 |
| Fuzzy set 2 | | 1.6580e+04 | 8.2276e+03 | |  | -3.2174e+04 | | -4.7195e+03 |
| Fuzzy set 3 | | -3.8098e+04 | 4.6100e+04 | |  | 3.3866e+04 | | 5.6593e+04 |
| 後鑑部 | | | | | | | | |
| n |  | | |  | | |  | |
| Rule 1 | 1.0912e-13 | | | 1.0605e-09 | | | 1.0694e-09 | |
| Rule 2 | 5.9515e-18 | | | 5.7841e-14 | | | 5.8323e-14 | |
| Rule 3 | 8.5423e-14 | | | 8.3020e-10 | | | 8.3712e-10 | |
| Rule 4 | 4.6590e-18 | | | 4.5280e-14 | | | 4.5657e-14 | |
| Rule 5 | 0.5472 | | | 5.3177e+03 | | | 5.3620e+03 | |
| Rule 6 | 3.8559e-18 | | | 3.7475e-14 | | | 3.7787e-14 | |
| Rule 7 | 0.4528 | | | 4.4011e+03 | | | 4.4378e+03 | |

Compare algorithm

|  |  |  |
| --- | --- | --- |
|  | PSO+RLSE | RO+RLSE |
| Train RMSE | 72.1552 | 71.5618 |
| Test RMSE | 44.601 | 43.0671 |