Supplemental material to: **μMOSM: a hybrid micro algorithm for multi-objective optimization problems**

This document includes:

* Experiment results on the ZDT benchmark.

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| **Table 3.** The experimental results of nine algorithms (mean and variance) for *HV* metric on ZDT problems. | | | | | | | | | |
| **Problem** | **μMOSM** | **μFAME** | **ASMiGA** | **MOSM-config3** | **ADE-MOIA** | **MMOPSO** | **NSGA-III** | **SMSEMOA** | **MOEA/D-FRRMAB** |
| **ZDT1** | **7.20E-11.23E-5** | 6.62E-11.53E-5 + | 6.62E-12.6E-5 + | 7.15E-12.02E-4 + | **7.20E-11.48E-4 ≈** | 7.19E-12.33E-4 ≈ | **7.20E-11.60E-4 ≈** | 7.20E-11.45E-5 ≈ | 7.01E-11.49E-2 + |
| **ZDT2** | **4.45E-18.99E-5** | 3.29E-11.05E-5 + | 3.29E-12.3E-5 + | **4.45E-11.29E-4 ≈** | 4.45E-11.34E-4 ≈ | 4.44E-11.83E-4 + | 4.44E-11.68E-4 + | **4.45E-12.07E-5 ≈** | 4.33E-17.95E-3 + |
| **ZDT3** | **6.00E-13.73E-5** | 5.16E-11.06E-5 + | 5.16E-12.5E-5 + | **6.00E-14.89E-5 ≈** | 6.00E-16.41E-5 ≈ | 5.99E-16.54E-5 + | 5.98E-12.68E-4 + | **6.00E-11.03E-5 ≈** | 5.73E-11.77E-2 + |
| **ZDT4** | **7.15E-12.97E-2** | 4.47E-13.25E-1 + | 6.62E-16.3E-4 + | 7.10E-11.44E-4 + | 7.10E-12.14E-4 | 6.55E-11.11E-1 + | 7.11E-11.14E-2 + | **7.15E-14.71E-3 ≈** | 0.00E+00.00E+0 + |
| **ZDT6** | 3.90E-15.71E-5 | **4.00E-18.28E-5 −** | 3.89E-11.6E-5 ≈ | 3.86E-11.16E-4 + | 3.89E-17.62E-5 ≈ | 3.88E-11.49E-4 ≈ | 3.87E-11.05E-3 + | 3.89E-11.27E-4 ≈ | 3.89E-13.12E-4 ≈ |

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| **Table II. Table 3.** The experimental results of nine algorithms (mean and variance) for *IGD+* metric on ZDT problems. | | | | | | | | | |
| **Problem** | **μMOSM** | **μFAME** | **ASMiGA** | **MOSM-config3** | **ADE-MOIA** | **MMOPSO** | **NSGA-III** | **SMSEMOA** | **MOEA/D-FRRMAB** |
| **ZDT1** | 1.05E-57.82E-7 | 2.34E-36.39E-7 + | 8.96E-57.8E−7 + | 1.37E-52.08E-6 + | 1.21E-59.39E-7 + | 1.79E-53.33E-6 + | 9.63E-65.82E-7 − | **7.47E-68.85E-8 −** | 4.42E-46.54E-4 + |
| **ZDT2** | **6.67E-65.34E-7** | 2.19E-35.36E-7 + | 8.42E-57.8E−7 + | 1.16E-51.32E-6­ + | 1.06E-59.80E-7 + | 1.41E-52.06E-6 + | 9.87E-65.10E-7 + | **6.67E-67.95E-8 ≈** | 1.36E-41.61E-4 + |
| **ZDT3** | 4.96E-65.07E-7 | 1.18E-38.85E-7 + | 5.42E-52.6E−6 + | 4.94E-65.97E-7 ≈ | **4.49E-65.55E-7 −** | 5.90E-61.18E-6 + | 7.20E-66.09E-7 + | 5.11E-66.33E-8 + | 2.37E-32.43E-3 + |
| **ZDT4** | **6.04E-53.20E-3** | 1.91E-17.9E-2 + | 9.30E-59.6E−6 + | 7.41E-51.44E-6 + | 8.22E-48.98E-7 + | 1.19E-23.16E-2 + | 4.06E-41.45E-3 + | 8.52E-52.20E-4 + | 2.38E+11.67E+1 + |
| **ZDT6** | **5.80E-63.55E-7** | 2.45E-35.55E-7 + | 9.22E-55.5E−7 + | 8.61E-61.24E-6 + | 7.84E-64.28E-7 + | 1.30E-51.31E-6 + | 1.18E-54.41E-6 + | 5.80E-63.55E-7 ≈ | 6.04E-61.30E-7 ‌+ |

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| **Table II. Table II. Table 3.** The experimental results of nine algorithms (mean and variance) for ε+metric on ZDT problems. | | | | | | | | | |
| **Problem** | **μMOSM** | **μFAME** | **ASMiGA** | **MOSM-config3** | **ADE-MOIA** | **MMOPSO** | **NSGA-III** | **SMSEMOA** | **MOEA/D-FRRMAB** |
| **ZDT1** | 9.54E-37.57E-4 | **5.24E-32.65E-4 −** | 9.88E-33.3E-4 + | 1.33E-22.57E-3 + | 1.07E-21.16E-3 + | 1.53E-23.39E-3 + | 9.17E-34.73E-4 − | 9.64E-31.89E-4 + | 2.56E-21.37E-2 + |
| **ZDT2** | 9.58E-31.39E-4 | **5.12E-31.65E-4 −** | 9.88E-32.9E-4 + | 1.25E-22.59E-3 + | 1.10E-21.71E-3 + | 1.39E-22.66E-3 + | 9.99E-31.54E-4 + | 9.64E-32.65E-4 + | 2.27E-21.65E-2 + |
| **ZDT3** | 7.37E-37.92E-4 | **3.02E-31.95E-4 −** | 7.78E-34.9E-4 + | 7.66E-31.14E-3 + | 7.98E-31.01E-3 + | 8.38E-31.64E-3 + | 7.72E-35.02E-4 + | 7.74E-33.25E-4 + | 9.42E-24.27E-2 + |
| **ZDT4** | **6.15E-32.32E-2** | 2.12E-12.6E-1 + | 6.36E-38.1E-4 + | 1.32E-22.02E-3 + | 1.05E-26.68E-4 + | 7.11E-29.64E-2 + | 3.52E-24.84E-2 + | 2.08E-22.55E-2 + | 4.85E+01.75E+0 + |
| **ZDT6** | 5.42E-35.52E-4 | 5.49E-32.15E-4 + | 6.00E-33.4E-4 + | 9.90E-31.85E-3 + | 8.92E-31.09E-3 + | 1.31E-22.47E-3 + | 6.74E-31.23E-3 + | **5.16E-32.74E-4 −** | 6.03E-31.60E-3  + |