Monte Carlo algorithm

**We have applied 3 Monte Carlo algorithms that differ in the probability function of accepting a worse solution:**

1. Linear Monte Carlo(LMC).
2. Exponential Monte Carlo(EMC).
3. Exponential Monte Carlo with counter(EMCQ).

Delta = f(sol) – f(prev\_sol)

**The probability function is:**

1. P = M – delta. Where M is a constant between 0 and 100.
2. P = exp(-delta).
3. P = exp(-(delta\*t)/q)

**parameters used in the EMCQ and their initial values:**

T = iteration counter = 0

Q = control parameter that represents consecutive non-improving iterations = 1

No\_improvement = non\_improving solutions counter = 0

Max\_no\_improvement = maximum number of consecutive non\_improving solutions to accept a worse solution = 1000

**LMC results:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **instance** | **best** | **average** | **Std.** | **M** |
| **Instance\_1** | **1431** | **1462** | **24.3803** | **15** |
| **Instance\_2** | **1498** | **1498** | **0** | **15** |
| **Instance\_3** | **8582** | **8769.9** | **133.851** | **15** |
| **Instance\_4** | **17445** | **18323.1** | **326.485** | **15** |
| **Instance\_5** | **729** | **767.5** | **34.0154** | **15** |
| **Instance\_6** | **2857** | **3426.9** | **330.825** | **15** |
| **Instance\_7** | **31850** | **33269.8** | **914.852** | **15** |
| **Instance\_8** | **4330** | **4331.8** | **0.6** | **15** |
| **Instance\_9** | **83044** | **92674.5** | **5868.62** | **15** |
| **Instance\_10** | **112940** | **124422** | **6668.52** | **15** |
| **Instance\_11** | **52166** | **63864.7** | **6479.18** | **15** |
| **Instance\_12** | **85391** | **102714** | **7625.66** | **15** |
| **Instance\_13** | **123606** | **139470** | **10538.4** | **15** |
| **Instance\_14** | **-** | **-** | **-** | **15** |

**EMC results:**

|  |  |  |  |
| --- | --- | --- | --- |
| **instance** | **best** | **average** | **Std.** |
| **Instance\_1** | **1407** | **1460.6** | **20.8816** |
| **Instance\_2** | **1498** | **1498** | **0** |
| **Instance\_3** | **8582** | **8769.9** | **133.851** |
| **Instance\_4** | **17445** | **18323.1** | **326.485** |
| **Instance\_5** | **745** | **842** | **53.3966** |
| **Instance\_6** | **3642** | **4146.6** | **280.999** |
| **Instance\_7** | **32243** | **34299.9** | **1762.93** |
| **Instance\_8** | **4079** | **4124.1** | **29.1563** |
| **Instance\_9** | **84550** | **94680.7** | **6853.27** |
| **Instance\_10** | **110421** | **119482** | **6930.54** |
| **Instance\_11** | **53346** | **63510.7** | **5964.85** |
| **Instance\_12** | **85864** | **101767** | **7919.97** |
| **Instance\_13** | **123606** | **138693** | **10416.9** |
| **Instance\_14** | **-** | **-** | **-** |

**EMCQ results:**

|  |  |  |  |
| --- | --- | --- | --- |
| **instance** | **best** | **average** | **Std.** |
| **Instance\_1** | **1407** | **1450.8** | **20.4441** |
| **Instance\_2** | **1498** | **1498** | **0** |
| **Instance\_3** | **8582** | **8769.9** | **133.851** |
| **Instance\_4** | **17445** | **18323.1** | **326.485** |
| **Instance\_5** | **750** | **817.9** | **26.4025** |
| **Instance\_6** | **3468** | **3963.5** | **338.917** |
| **Instance\_7** | **32272** | **33775** | **1302.95** |
| **Instance\_8** | **4065** | **4107.5** | **26.7516** |
| **Instance\_9** | **87268** | **98049.7** | **7162.46** |
| **Instance\_10** | **118971** | **142847** | **13762.4** |
| **Instance\_11** | **53346** | **63841.4** | **5977.08** |
| **Instance\_12** | **86614** | **101943** | **8310.08** |
| **Instance\_13** | **123425** | **138634** | **10377.6** |
| **Instance\_14** | **-** | **-** | **-** |