`pilot` benchmarks

May 11, 2020

1 Berg and Luscher 1981: $O(3)$

Reference: B. Berg and M Luscher, *Definition and statistical distributions of a topological number in the lattice O(3) σ-model*, Nucl. Phys. B190 (1981), 412-424.

In this paper, a geometrical definition of topological charge was given for the $O(3)$ and CP^{N-1} non-linear σ models.

They provide results for $O(3)$ on a 100×100 lattice, using the heat bath algorithm. These have been reproduced for a 10×10 lattice using `pilot`.

β	E		χ_m		$10^4\chi_t$	
	BL81	`pilot`	BL81	`pilot`	BL81	`pilot`
1.1	2.295	2.277 ± 0.002	14.4 ± 0.4	13.12 ± 0.07	125 ± 5	127 ± 2
1.2	2.109	2.070 ± 0.002	23.5 ± 0.8	19.00 ± 0.11	98 ± 4	83 ± 2
1.3	1.924	1.870 ± 0.002	39 ± 3	26.2 ± 0.10	64.7 ± 1.8	51.7 ± 1.1
1.4	1.751	1.686 ± 0.002	82 ± 8	33.34 ± 0.10	41.3 ± 1.3	25.9 ± 0.6
1.5	1.592	1.534 ± 0.002	191 ± 21	39.32 ± 0.09	23.7 ± 0.9	13.2 ± 0.5
1.6	1.457	1.4094 ± 0.0013	370 ± 48	44.10 ± 0.10	12.8 ± 0.7	5.9 ± 0.3
1.7	1.342	1.3092 ± 0.0011	871 ± 61	48.0 ± 0.10	5.6 ± 0.3	3.2 ± 0.2
1.8	1.247	1.2202 ± 0.0013	1634 ± 82	51.42 ± 0.07	2.7 ± 0.2	1.37 ± 0.14
1.9	1.167	1.1483 ± 0.0011	2285 ± 58	54.31 ± 0.06	1.05 ± 0.06	0.58 ± 0.07
2.0	1.098	1.0814 ± 0.0011	2720 ± 85	56.83 ± 0.07	0.52 ± 0.03	0.39 ± 0.06

The configuration file was

```
lattice_length:  10
euclidean_dimension:  3
algorithm:  heatbath
sample_size:  10000
sample_interval:  25
thermalisation:  500
bootstrap_sample_size:  100
```