X-Method Variational Function Sacle

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1 X-Method Variational Function Scale

The problem will be solved in five steps:

1) Pre-analysis

2) Matlab Program Modification

3) Input/Output

4) Discussion

Notice:
Calculation used these parameters below if no special mention:
kx=0;
ky=0;
kz=0;
tx=1;
ty=1;
tz=1;
U=4;

1.1 Pre-analysis

Model:

$$|\varphi>=\sum_{\overrightarrow{y}} W*\overrightarrow{y}*(e^{\sum_{i,j} y_i*a_{i,j}*n_j}|\phi_{up}>)\bigotimes(e^{\sum_{i,j} -y_i*a_{i,j}*n_j}|\phi_{dn}>)$$

where $|\phi_*>$ is Slater determinant, n_i is particles number operators and a, w are variational parameters and the number of variational parameters is linear to $N\_sites*N\_y$. (the size of lattice: N_sites, the number of walkers N_y.)

Many symmetry can be used in the calculation to accelerate this algorithm. In this report, "half-filled" is used.

N_y is the number of walkers.

1.2 Matlab Program Modification

X_2.m;
Energy_X_RBM3_2.m;
X_RBM_update2_2.m;
X_RBM_Initialzation_2.m;
H_K.m;

1.3 Input/Output

1.fig;

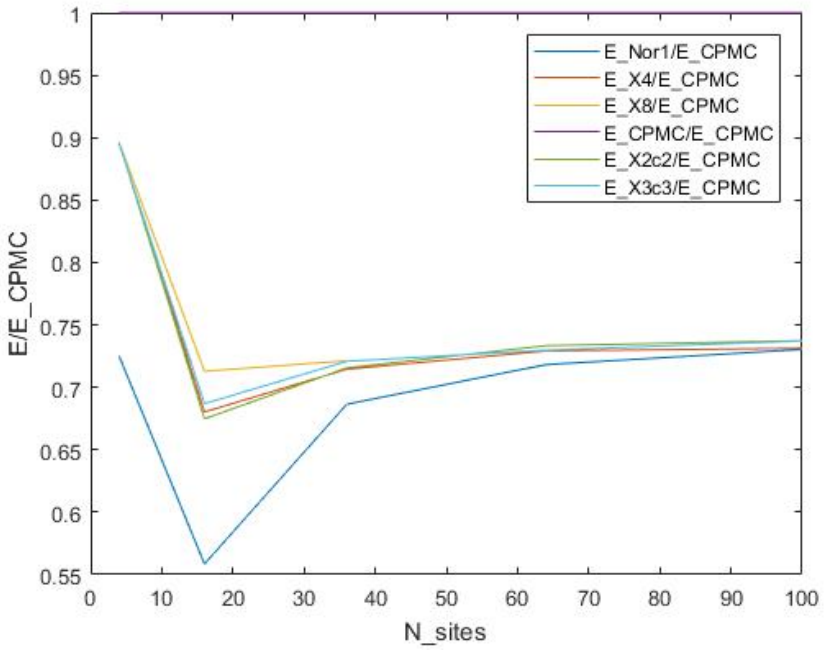

Figure 1: 1.fig; Half-filled; E_Nor1 is the Energy of Trivial K State (The initial state); E_ X4 is the results of X-Method with N_y=4; E_ X8 is the results of X-Method with N_y=8; E_CPMC is the results of CPMC; E_X2c2 is the results of Entangled X-Method with N_y=4; E_X3c3 is the results of Entangled X-Method with N_y=8.

1.4 Discussion

1. The number of walkers needed is still exponential to the system size.