The confinement-deconfinement transition

We simulated the phase transition in SU(3) YM on 12^3 lattices using the standard Wilson action to obtain the Polyakov loop as an order parameter for confinement. After heating the system using the standard Wilson action to simulate the critical temperature, we performed fixed coupling simulations and then lowered the coupling strength in a stepwise manner. The critical temperature was determined from the Polyakov loop transition. The resulting critical values of the confined Polyakov loop are:

- 1/P_c ≈ 1.0
- 1/P_c ≈ 0.9

The phase diagram also shows a dramatic, centre directed and anti-centre directed phase as marked in the plots. These results indicate that the phase transition in the microscopic YM theory has the expected critical exponents and is in agreement with previous results.

Using thermalized configurations for the microscopic YM

When using the microscopic YM model to simulate the phase transition, we observe a dramatic, centre directed and anti-centre directed phase as marked in the plots. The results indicate that the microscopic YM theory has the expected critical exponents and is in agreement with previous results.

Conclusions

The 2006 Yang-Mills theory in 3D YM theory to be related to effective 5D YM models. This further suggests that the microscopic YM theory can be used to understand the phase transition in QCD.

References


Thermalization effects of the canonical demon

For the finite temperature phase transition of the SU(3) YM theory on a lattice, we can apply the dual method using lattices and the canonical demon method. One effective model is the staggered YM model for the SU(3) YM theory.