

CHAPTER VII

DISCUSSION AND CONCLUSION

The Gaussian model (free field) and the Landau-Ginzburg model of Phase Transitions are formulated in term of the wavelet representation of the order parameter. By means of varying the free energy in Gaussian trial ensemble in wavelet space. In Gaussian model, our numerical results is similar to C. Best and A. Schafer's work, which have shown that the wavelets can use rather small number of variational parameters to describe fluctuations in a statistical field theory. The main problem in this part is that we must wrap around (periodic extension) our wavelets before to do any calculation, and the algorithm for generating scaling function and wavelet by iterative method is difficult to converge for high number of points. The eigenvalue matrix and diadic interpolation method is recommended

In Landau-Ginzburg, the analytically approximate solution of the partition function is obtained by scaling properties of wavelet and shown that reproduce the phase transitions. Especially, the expression for the wavelet correlation is derived and the correlation length becomes infinite at critical point. Then the Renormalization Group Transformation in wavelet space is implemented by the variational approximation and formulated the flow of the coupling constants. The result have corresponded to the Renormalization Group Transformation in Fourier Transform Space. Both the Gaussian fixed point, stable at $D > 4$, and the Wilson-Fisher fixed point below four dimensions can be reproduced in wavelet formulation. However, the approximations seem to be too coarse to allow a reliable calculation of critical exponents of the Wilson-Fisher fixed point. Due to The Renormalization Group can be formulated in wavelet space, the next work will be the verification of

the approximation by numerical means and the calculation of the critical exponents. If the numerical results have corresponded to analytically approximate results, then I hope that wavelet transformation may decrease the complexity (computer running time), like the wavelet in other applications.



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