Karl-Franzens-Universität Graz

Master Thesis

Numerical Study of astrophysical solutions in modified theory of gravity in the Palatini formalism

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Abstract

$$\Psi = e^{i\vec{k}\vec{r}}u(\vec{r})$$

$$T_{\vec{R}}f(\vec{r}) = f(\vec{r} + \vec{R}$$

$$H|\Psi >= E|\Psi >$$

$$T_{\vec{R}}[H(\vec{r})\Psi(\vec{r})] = H(\vec{r} + \vec{R})\Psi(\vec{r} + \vec{R})$$

$$H(\vec{r} + \vec{R}) = H(\vec{r})$$

$$= H(\vec{r})T_{\vec{R}}\Psi(\vec{r}) = ET_{\vec{R}}\Psi(\vec{r})$$

$$[H, T] = 0$$

$$T_{\vec{R}}\Psi(\vec{r}) = \Psi(\vec{r} + \vec{R}) \stackrel{!}{=} c(\vec{R})\Psi(\vec{r})$$

Vom endlichen ins unendliche: $\sum_{k=1}^{k=N}(1) = N$

$$\sum_k \longrightarrow c\int_{-\pi/a}^{\pi/a} dk = \frac{2\pi}{a}c \stackrel{!}{=} N$$

$$\Rightarrow c = \frac{Na}{2\pi} = \frac{L}{2\pi}$$

$$\Rightarrow \sum_k \longrightarrow \frac{L}{2\pi}\int_{-\pi/a}^{\pi/a} dk$$

$$\Rightarrow \sum_k \longrightarrow \frac{V}{(2\pi)^3}\int_{-\pi/a}^{\pi/a} d^3k$$

1 Ising Model

References

[1] Claude Itzykson and Jean-Michael Drouffe. *Statistical Field Theory*, Volume 1. Cambridge University Press, 1989.

[2] Fugao Wang and David P. Landau. Efficient, multiple-range random walk algorithm to calculate the density of states. *Physical Review Letters*, 86(10):2050–2053, March 2001.

[3] Luke Bornn, Pierre E. Jacob, Pierre Del Moral, and Arnaud Doucet. An adaptive interacting Wang-Landau algorithm for automatic density exploration. *arXiv*, 1109(3829v3), June 2012.

[4] David P. Landau, Shan-Ho Tsai, and M. Exler. A new approach to Monte Carlo simulations in statistical physics: Wang-landau sampling. *American Physics Journal*, 72(10):1294–1302, October 2004.