# The Index of Nearsightedness of Electronic Matter in Finite Model

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Electrons are nonlocal in nature in the context of quantum theory. However, it is generally accepted that electron density is not affected so much from a perturbation that is far enough from the site. W. Kohn et al. had introduced the concept of "nearsightedness of electronic matter (NEM)" and proved that NEM holds for several bulky systems (1). In our earlier study, we analyzed liner response function (LRF) $\delta\rho(r)/\delta v(r')$, showed that the behavior of responses obviously depends on the number of electrons (N) for several finite systems (2). In this study, we introduced a new quantitative measure of nearsightedness, termed the index of nearsightedness (Ns), and it was showed that the single-well potential systems approximate to NEM as N increases. In addition, we analyzed LRFs of harmonic oscillator potential systems. The results exhibit similar N-dependency for each systems.

N=2   N=10

N=40   N=100
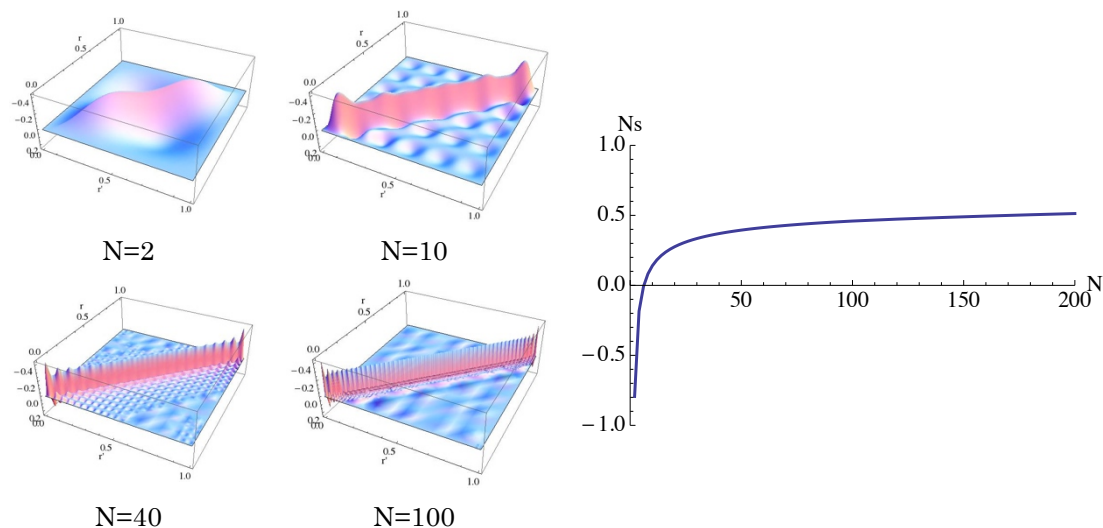
Fig. 1. LRFs of single-well potential systems for various numbers of electrons (N).

Fig. 2. Ns of single-well potential for various numbers of electrons (N).

(1) W. Kohn, Phys. Rev. Lett. 1996 76, 3168; E. Prodan, W. Kohn, 2005, 112, 11635

(2) Y. Mitsuta, S. Yamanaka, K. Yamaguchi, M. Okumura, H. Nakamura, Molecules, 2014, 19(9), 13358-73