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Title: Study of Neutral Atom Traps and Bose- Hubbard Model

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Abstract: In this work, I briefly describe the theory of magnetic trapping of neutral atoms and Bose-Hubbard model. In addition to that I append my calculations for different type of magnetic traps and their trapping potentials. This report is divided into 2 parts: the first half explains the magnetic trapping of neutral atoms, how a series of potential wells generated using three dimensional traps is useful to create a quantum register is described. The second half briefly describes the Bose-Hubbard model for a bosonic lattice. It explains two phases in a bosonic lattice which have contrasting properties, i.e. superfluid phase and Mott insulator phase. Furthermore, I calculate the wave functions and energies for a double well potential. The overlap of wave functions renders a finite tunneling probability from one site to the other.

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