Bosonization in Electronic Systems

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This article discusses some details in bosonization, summarizing some details in famous textbooks and papers. Bosonization can be viewed as one way to exactly solve a system, which we will see in Luttinger liquid and bosonization of spin systems. A more "physical" motivation is to capture the bosonic modes in the system, i.e. density and current fluctuations, or since we usually only deal with low-energy perturbations in condensed matter systems, to capture *sound waves* [1, 2]. This is why the fields after bosonization are all density modes: We really do not know what to do other than this. Sometimes, bosonization are known as the *hydrodynamical approach* (for example in Wen's famous textbook), which reveals its physical nature.

Philip Phillips Chapter 10

1 Luttinger liquid from a Hubbard model

Philip Phillips Section 10.1

References

[1] Sin itiro Tomonaga. Remarks on bloch's method of sound waves applied to many-fermion problems. *Progress of Theoretical Physics*, 5:544–569, 1950.

[2] Norio Kawakami. Tomonaga's Theory for Collective Motion of Fermions: Basic Concept of One-Dimensional Correlated Electrons. *Progress of Theoretical Physics Supplement*, 170:185–197, 05 2007.