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Geometry, Topology, and Physics Seminar

Topology of quantum states with short-range entanglement

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Friday, November 15, 2013, 4:00 p.m.
Room 6635 South Hall

Abstract: Many quantum systems can be described by the tensor product of small (e.g. two-dimensional) Hilbert spaces associated with atoms positioned in $\mathbb{R}^n$, usually called "sites." I will define a class of quantum states that can be reconstructed from local data corresponding to balls of radius r. Such states form a topological space, denoted by $\mathcal{B}_n$ for Bose systems and $\mathcal{F}_n$ for Fermi systems. (In the latter case, the Hilbert spaces are $\mathbb{Z}_2$-graded.) Only partial information is known about $\mathcal{B}_n$ and $\mathcal{F}_n$, in particular, that they form Ω-spectra. An analogous problem for so-called "free-fermion systems" is completely solved, and the corresponding spaces $\mathcal{F}_n^{(free)}$ are given by the KO spectrum. Interestingly, if we impose some symmetry described by an action of a compact group G on each site, then finding the fixed points in $\mathcal{B}_n$ and $\mathcal{F}_n$ is equivalent to finding the homotopy fixed points. That is not true in the free case.

This seminar is part of the NSF/UCSB 'Research Training Group' in Topology and Geometry. Information about future meetings can be found at http://www.math.ucsb.edu/~drm/GTPseminar/