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RECOVERING THE HIDDEN AXIS OF A ONE DIMENSIONAL QUANTUM REFLECTION OPERATOR

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Abstract of Report Talk: Reflections are unitary linear transformations which fix some subspace, and multiply its orthogonal complement by a factor of -1 . They play an important role in Quantum Computing; for example, one of the most important applications, the Grover searching algorithm, can be described as the repeated application of two one-dimensional reflections (reflections whose fixed subspace is linear). In this talk we consider the following problem: given a black box (that is, we know what it does but not how it works) implementation of a one dimensional reflection operator, how might we recover the axis which it fixes? Since reflections are determined completely by the subspace they fix, accomplishing this gives us all the information about our black box. We will discuss a quantum algorithm that accomplishes this, as well as derive a lower bound on the running time which shows that this algorithm is optimal.

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