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The Provost metric as a systematic means to construct geometric and gravitational duals

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Abstract content
   (Max 300 words)
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The AdS/CFT correspondence is a mathematical tool that has been used to study (especially strongly coupled) field theoretic problems. The correspondence conjectures a duality (a one to one mapping) between a theory of gravity in the bulk and a conformal field theory on the boundary of anti-de Sitter space-time. Examples of this correspondence are known, but a full AdS/CFT dictionary is still lacking i.e. which systems constitute duals and how the quantities in either theory are related to each other.

A key element of the above correspondence is that the symmetries of the field theory appear as isometries of the metric of the theory of gravity. Within quantum mechanics there is a way to achieve the same goal using a construction first proposed by Provost. This construction provides a procedure to construct metric tensors from a given family of quantum states that encode the dynamical symmetries of the quantum states as isometries of the resulting metric and thus offers an appealing method for the construction of dualities.

This talk focuses on constructing duals for tractable, simple 0-D quantum mechanical systems (only time translation) using the Provost metric. We show that this construction forces one to include an additional dimension (with the interpretation of an energy scale) on the Riemannian manifold and that quantum correlation functions can be recovered on the boundary of this manifold. This geometric "dual" is however not one-to-one and information beyond just the geometry is required. It is from this perspective that a precise duality between the large N Lipkin model (with the free particle and harmonic oscillator as specific limits) and the so-called vacuum Jackiw-Teitelboim dilaton gravity is constructed. The non-vacuum case is also discussed briefly.

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