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Spin Matrix theory limit of the AdS/CFT correspondence

Abstract

One of the challenges in using the AdS/CFT correspondence to study quantitatively how space, time and gravity emerges from a quantum theory is that one does not know in general how to interpolate between the two sides of the duality. In the planar limit with infinite N , an integrable spin chain has been found that can provide a quantitative unifying framework enabling an interpolation between planar gauge theory and tree-level string theory. Can one do something like this also for finite N where gravity and black holes are part of the game? We propose another kind of limit of the AdS/CFT correspondence in which one gets a type of quantum mechanical theory called Spin Matrix theory that generalizes spin chains to finite N . We review that in the limit giving $SU(2)$ Spin Matrix theory, one can use it to interpolate between the gauge theory and string theory sides both for tree-level string theory and for interacting D-branes (Giant Gravitons). Moreover, we show that the Spin Matrix theory limits of string theory on $AdS_5 \times S^5$ result in non-relativistic strings moving in a certain type of non-relativistic geometry.