Difficulties in analytic computation for relative entropy of entanglement

Hungsoo Kim[1], Mi-Ra Hwang[2], Eylee Jung[2], DaeKil Park[2,3]

[1] *The Institute of Basic Science, Kyungnam University, Masan, 631-701, Korea*

[2] *Department of Physics, Kyungnam University, Masan, 631-701, Korea*

[3] *Department of Electronic Engineering, Kyungnam University, Masan, 631-701, Korea*

Abstract

It is known that relative entropy of entanglement for an entangled state ρ is defined via its closest separable (or positive partial transpose) state σ. Recently, it has been shown how to find ρ provided that σ is given in two-qubit system. In this paper we study on the reverse process-i.e., how to find σ provided that ρ is given. It is shown that if ρ is one of Bell-diagonal, generalized Vedral-Plenio, and generalized Horodecki states, one can find σ from a geometrical point of view. This is possible due to the following two facts: (i) The Bloch vectors of ρ and σ are identical with each other (ii) The correlation vector of σ can be computed from a crossing point between a minimal geometrical object, in which all separable states reside in the presence of Bloch vectors, and a straight line, which connects the point corresponding to the correlation vector of ρ and the nearest vertex of the maximal tetrahedron, where all two-qubit states reside. It is shown, however, that these nice properties are not maintained for the arbitrary two-qubit states.