Fenchel's Problems for a de Sitter n-Simplex

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ABSTRACT

W. Fenchel raised two questions regarding two sets of $(n(n + 1))/2$ positive real numbers in his book, Elementary Geometry in Hyperbolic Space, (De Gruyter, Berlin, 1989, p. 174). What are the necessary and sufficient conditions for each set to be the dihedral angles and edge lengths of a hyperbolic n-simplex? These problems were solved by Feng Luo (Geom. Dedicata 64 (1997), 277-282) and Karliga (Geom. Dedicata 109 (2004), 1-6) by using Gram matrix and Edge matrix of a hyperbolic n-simplex, respectively. It is natural to pose the above Fenchel's problems and give Gram and Edge matrices of a de Sitter n-simplex. In this talk, we give the necessary and sufficient conditions for a given symmetric matrix to be the edge or Gram matrix of a de Sitter n-simplex.