New bounds for spherical two-distance sets and equiangular lines.

Wei-Hsuan Yu, Brown University, Institute for Computational and Experimental Research in Mathematics

The set of points in a metric space is called an s-distance set if pairwise distances between these points admit only s distinct values. Two-distance spherical sets with the set of scalar products a and -a, are called equiangular. The problem of determining the maximal size of s-distance sets in various spaces has a long history in mathematics. We determine a new method of bounding the size of an s-distance set in two-point homogeneous spaces via zonal spherical functions. This method allows us to prove that the maximum size of a spherical two-distance set in n dimension Euclidean space is n(n+1)/2 with possible exceptions for some n=(2k+1)^2-3, where k is an positive integer. We also prove the universal upper bound 2/3 n a^2 for equiangular sets with angle 1/a and, employing this bound, prove a new upper bound on the size of equiangular sets in an arbitrary dimension.