Table of spherical codes

Title: Table of spherical codes

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List of files, types, and sizes:

File name	Type	Size
`table.txt`	plain text	121 KB
`data.txt`	plain text	207 MB

Notes:

This data set archives the data from the web site `https://spherical-codes.org` as of April 29, 2024 (and will be updated periodically). Please see that database for the most up to date records, but it would be better to cite this data set instead of the web site, since the web site will disappear if not actively maintained in the future.

A spherical code is a configuration of points on the surface of a sphere, with the goal of maximizing the minimal angle between the points given the dimension and number of points. The data set describes the best spherical codes that are known, to the best of my knowledge. It is limited to 32 dimensions and 1024 points, with a few exceptions. It omits cases that have been systematically solved, namely dimensions below three and n-dimensional codes with at most $2n$ points (see R. A. Rankin, *The closest packing of spherical caps in n dimensions*, Proc. Glasgow Math. Assoc. **2** (1955), 139–144, doi:10.1017/S2040618500033219).

There are two records listed in T. Ericson and V. Zinoviev's book (*Codes on Euclidean spheres*, North-Holland Mathematical Library **63**, North-Holland Publishing Co., Amsterdam, 2001) that I have not included: for 80 points in 7 dimensions, their construction describes only 78 points, and for 1024 points in 16 dimensions, I am unable to get their construction to work.

Files:

`table.txt`
Each line in this file corresponds to a spherical code and is either of the form n, N, t or n, N, t, p, where n is the dimension, N is the number of points, t is the cosine of the minimal angle (rounded up), and p is the minimal polynomial of t (if available).

`data.txt`
For each code in the data set, this file lists the dimension, number of points, cosine of the minimal angle (rounded up), minimal polynomial of the cosine (if available), whether the code is known to be optimal, references and notes, and coordinates for the points. Note that these codes are not always unique, but only one is listed.