Abstract

Binary Self-Dual and Formally Self-Dual Codes

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In the 70's there was much work on the classification of self-dual (s.d.) codes of modest length which culminated in 1980 in the classification of s.d. codes of length 32. Bounds are known for the largest minimum weight of Type I or Type II s.d. codes as their weight distributions satisfy the Gleason polynomials. The codes of largest minimum weight are called extremal codes and their weight distributions are uniquely determined. The Golay code is the unique extremal [24,12,8] code and there are five extremal [32,16,8] codes. There is a unique extremal [48,24,12] code.

A binary formally self-dual (f.s.d.) code is a code which has the same weight distribution as its dual code. They also satisfy the Gleason polynomials and hence the minimum weights of extremal codes are known as are their uniquely determined weight distributions. The extremal f.s.d. codes of lengths 10, 18 and 28 are unique. It is not known whether there is an extremal f.s.d. (or any) [40,20,10] code.

A f.s.d. even code with $d = 2\lfloor \frac{n}{8} \rfloor$ is called near-extremal. If C is a near-extremal f.s.d. even code of length n with 8 dividing n, then its weight enumerator can be expressed in terms of one parameter which can only take on a finite number of values. For lengths 16, 24 and 32 some of these codes have been constructed. A few of the near-extremal f.s.d. codes are extremal s.d. codes.