Optimal Equi-Difference Conflict-Avoiding Codes について

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A *conflict-avoiding code* (CAC) is motivated to apply to transmit data packets successfully over a collision channel without feedback. A conflict-avoiding code of length n and weight k is defined as a family $\mathcal{C}$ of k-subsets (called codewords) of $\mathbb{Z}_n = \{0, 1, 2, \ldots, n-1\}$, the ring of residues modulo n, such that $\Delta(C) \cap \Delta(C') = \emptyset$ for any $C, C' \in \mathcal{C}$, where $\Delta(C) = \{j - i \pmod{n} : i, j \in C, i \neq j\}$. A code $\mathcal{C}$ in CACs of length n and weight k is called an *equi-difference* code if every codeword $C \in \mathcal{C}$ has the form $\{0, i, 2i, \ldots, (k-1)i\}$. The class of all the equi-difference CACs of length n and weight k is denoted by $\mathrm{CAC}^e(n, k)$. Let $M^e(n, k)$ be the maximum size of codes in $\mathrm{CAC}^e(n, k)$. A code $\mathcal{C}$ is said to be *optimal* if $\mathcal{C}$ has the maximum number of codewords among codes in CACs of length n and weight k.
In this talk, we focus on the case of equi-difference CACs of length $n = 2^a 3^b m$ and weight $k = 4$ for $\gcd(m, 6) = 1$. A directed graph is defined by the dominance relations between the possible codewords. We show upper bounds on the size of an optimal code in $\mathrm{CAC}^e(2^a 3^b m, 4)$ by examining the structure of the graph. Moreover, recurrence formulas for $M^e(2^a 3^b m, 4)$ are also given, which can be used to simplify the process of constructing optimal codes.