

Calculating Fusions of Association Schemes

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Given two finite association schemes (X, T) and (X, S) of the same order, we say that T is a fusion of S if every relation in T is a union of relations in S . This talk will discuss two computer algorithms for detecting the fusions of a given association scheme. The first directly calculates fusions of (X, S) arising from partitions of S , which works reasonably well for partitions that are relatively small or large compared to the size of S . The second detects the possibility that T is a fusion of S by comparing automorphism groups, and verifies actual fusions using an explicit embedding of $Aut(S)$ into $Aut(T)$. This second method can effectively determine a fusion relationship between schemes of higher rank in situations where the first method would not be conclusive. In joint work with Sourav Sikdar, we have used our GAP implementation of these methods to produce an almost complete list of fusions among schemes of order up to 30 that appear in Hanaki and Miyamoto's classification of small association schemes.