

Abstract

Siamese association schemes and Siamese Steiner designs

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We introduce a new notion of Siamese association scheme (the term “Siamese” can be traced to H.Kharaghani), and we investigate such objects. These are imprimitive schemes on $v = (s^2 + 1)(s + 1)$ points having a unique closed subset of size $s + 1$ such that each connected basis graph is antipodal, distance-regular of valency s^2 and diameter 3, and is an $(s + 1)$ -fold covering of the complete graph K_{s^2+1} . Adding the edges of the spread $(s^2 + 1) \circ K_{s+1}$ to such a graph yields a pseudo-geometric strongly regular graph corresponding to a generalized quadrangle $GQ(s, s)$.

We also introduce Siamese color graphs as a generalization of Siamese association schemes, and prove that each geometrical Siamese color graph leads to a Steiner design $S(2, s + 1, (s^2 + 1)(s + 1))$. Moreover in such way we are getting a specific partition of the block set of $S(2, s + 1, (s^2 + 1)(s + 1))$, which we call a Siamese partition.

We will discuss all Siamese objects on 15 points, and will outline a number of interesting objects on 40 points. We also will consider an infinite series of Siamese association schemes related to the classical generalized quadrangles $W(s)$.

This is a joint project with Sven Reichard and Andrew Woldar.