William J. Martin* (martin@wpi. edu), Dept. of Mathematical Sciences, 100 Institute Road, Worcester Polytechnic Institute, Worcester, MA 01609, and Jason S. Williford (jwillif1@uwyo.edu), Department of Mathematics and Statistics, Dept. 3036, 1000 E. University Ave., Laramie, WY 82071. Some remarks on the nearest neighbor graph in a $Q$-polynomial (cometric) association scheme. Preliminary report.
Let $(X, \mathcal{R})$ be a symmetric $d$-class association scheme which is $Q$-polynomial (cometric) with respect to the ordering $E_{0}, E_{1}, \ldots, E_{d}$ of its primitive idempotents. Order the entries of $|X| E_{1}$ in decreasing order as $Q_{01}>Q_{11}>\cdots>Q_{d 1}$ and consider the graph $\Gamma=\left(X, R_{1}\right)$ determined by the basis relation with adjacency matrix $A_{1}$ (so that $A_{1} \circ E_{1}=\frac{Q_{11}}{|X|} A_{1}$ ). We study the combinatorics of $\Gamma$.

We prove that $\Gamma$ has $d+1$ distinct eigenvalues and provide bounds on both its diameter and its valency. In particular, we apply Terwilliger's balanced set condition, together with a result of Kodalen and Martin, to prove that the rank of $E_{1}$ is bounded above by the sum of valencies $v_{1}+v_{i}$ for any $i>1$ with intersection number $p_{11}^{i}>0$ where $A_{i}$ has constant row sum $v_{i}$. We then explore extremal cases for some of the inequalities derived. (Received July 31, 2018)

