On $t$-Clique in $k$-Walk-Regular Graphs

C. Dalfó, M.A. Fiol, E. Garriga $^{1,2}$

Departament de Matemàtica Aplicada IV
Universitat Politècnica de Catalunya
Barcelona, Catalonia

Abstract

A graph is walk-regular if the number of cycles of length $\ell$ rooted at a given vertex is a constant through all the vertices. For a walk-regular graph $G$ with $d + 1$ different eigenvalues and spectrally maximum diameter $D = d$, we study the geometry of its $d$-cliques, that is, the sets of vertices which are mutually at distance $d$. When these vertices are projected onto an eigenspace of its adjacency matrix, we show that they form a regular tetrahedron and we compute its parameters. Moreover, the results are generalized to the case of $k$-walk-regular graphs, a family which includes both walk-regular and distance-regular graphs, and their $t$-cliques or vertices at distance $t$ from each other.

Keywords: Distance-regular graphs, $k$-Walk-regular graphs, Spectrum, Clique.

$^1$ Research supported by the Ministerio de Educación y Ciencia, Spain, and the European Regional Development Fund under projects MTM2008-06620-C03-01, and by the Catalan Research Council under project 2005SGR00256.

$^2$ Emails: cdalfo@ma4.upc.edu, fiol@ma4.upc.edu, egarriga@ma4.upc.edu