SPECTRAL ANALYSIS OF t-PATH SIGNED GRAPHS

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ABSTRACT. Formally, a *signed graph* S is a pair (G, σ) that consists of a graph $G = (V, E)$ and a sign mapping called signature σ from E to the sign group $\{+, -\}$. Given a signed graph S and a positive integer t, the *t-path signed graph* $(S)_t$ of S is a signed graph whose vertex set is $V(S)$ and two vertices are adjacent if and only if there exists a path of length t between these vertices and then by defining its sign $s_t(e)$ to be '-' if and only if in every such path of length t in S all the edges are negative. The *negation* $\eta(S)$ of a signed graph S is a signed graph obtained from S by reversing the sign of every edge of S. Two signed graphs S_1 and S_2 on the same underlying graph are *switching equivalent* if it is possible to assign signs '+' ('plus') or '-' ('minus') to the vertices of S_1 such that by reversing the sign of each of its edges that have received opposite signs at its ends, one obtains S_2. In this paper, we characterize signed graphs whose negations are switching equivalent to their t-path signed graphs for $t = 2$ and also characterize signed graphs such that the spectrum of their t-path signed graphs, where $t = 1,$ *and* 2, is symmetric about the origin.

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