On the walks and CDC of graphs with the same main eigenspace

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Two connected labelled graphs H_1 and H_2, with a common simple eigenvalue μ of their 0-1 adjacency matrix, having a corresponding μ–eigenspace generated by the same vector $\mathbf{y}$, such that the one-vertex deleted subgraphs $H_1 - z_1$ and $H_2 - z_2$ are identical to a graph G, are called root graphs. Their connected sum Z is obtained by gluing the two root graphs along the common subgraph G. Adding the edge $\{z_1, z_2\}$ to Z produces the edged connected sum $Z + e$. The μ–multiplicity of G, Z and $Z + e$ is shown to depend on the μ–type of z_1 and z_2 in the root graphs. A sufficient condition for the uniqueness of $H_1 (\simeq H_2)$, for a given $\mathbf{y}$, when constructed from G, is also established.

Keywords: common eigenvector, μ–core vertices, μ–core forbidden vertices, root–graphs, connected sum.