A decomposition structure of resonance graphs that are daisy cubes

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The resonance graph of a plane bipartite graph G, denoted by $R(G)$, is a graph whose vertex set is the set of perfect matchings of G and two perfect matchings are adjacent if their symmetric difference forms the periphery of exactly one finite face of G. Lam and Zhang [*Order* **20** (2003) 13–29] showed that any connected resonance graph can be oriented as the Hasse diagram of a finite distributive lattice. The concept of daisy cubes was introduced by Klavžar and Mollard [*European J. Combin.* **80** (2019) 214–223]. A daisy cube is an induced subgraph of a hypercube that is generated by a downward closed subset of poset $(\mathcal{B}^n, \leq)$. It has recently been shown in [*Discrete Appl. Math.* **366** (2025) 75–85] that the resonance graph of a plane elementary bipartite graph G with more than two vertices is a daisy cube if and only if G is peripherally 2-colorable. Let G be a peripherally 2-colorable graph. In this talk, we present a decomposition structure of $R(G)$ with respect to an arbitrary finite face of G, together with a proper labelling for the vertex set of $R(G)$. As an application, we obtain an algorithm to generate a binary coding for the vertex set of $R(G)$ as a daisy cube. Moreover, the binary coding can be easily transformed into one so that $R(G)$ can be oriented as the Hasse diagram of a finite distributive lattice.

Keywords: daisy cube, finite distributive lattice, peripherally 2-colorable graph, resonance graph