Multiplicative Harmonious Labeling

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Based on harmonious labelings, we introduce a new graph labeling: A multiplicative harmonious labeling is an injective function $f : V(G) \to U(n)$ that induces an injective function $f' : E(G) \to U(n)$ defined by $f'(uv) = f(u) * f(v)$, where $U(n)$ is the group under modular multiplication made of integers relatively prime to n and * is the group operation. We present results in this area, including a comparison to harmonious labelings, a description of the Java program we wrote to find multiplicative harmonious labelings for a given graph, and an investigation of graphs that fail to be multiplicative harmonious.

Keywords: labeling, computer-assisted algorithm, Java, group theory, group structure