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LOCAL ANTIMAGIC LABELING OF CYCLE-RELATED GRAPHS FOR COMMUNICATION CHANNEL OPTIMIZATION IN WIRELESS SENSOR NETWORKS

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Abstract. This paper presents a pioneering application of local antimagic labeling to cycle-related graphs, introducing an innovative strategy for optimizing communication channels in wireless sensor networks. The methodology involves assigning unique labels to edges to ensure neighboring vertices exhibit distinct label sums. Applied to wireless sensors in an agricultural setting, this approach minimizes interference between communication links, enhancing data transmission reliability. The resulting unique label sums facilitate dynamic channel switching based on the local antimagic chromatic number, enabling adaptive responses to changing environmental conditions. By reducing interference and promoting energy-efficient communication, this labeling technique serves as a practical solution for improving the overall efficiency and reliability of wireless sensor networks with cycle-related graph structures.

Keywords. Antimagic labeling, Local antimagic labeling, Cycle Graph, Rose Graph.

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1 INTRODUCTION

In this paper, we exclusively deal with finite, simple, and undirected graphs. When we mention a graph $G = (V, E)$, we are referring to a finite, simple, undirected graph that does not contain any isolated edges (K_2 components). To describe graph-related concepts and terminology, we rely on established references such as [6] for general graph terminology and [2, 19] for further insights into graph theory. The concept of antimagic graph labeling was first introduced by Hartsfield and Ringel in the year 1990, as documented in their work cited as [3]. Consider a graph denoted as $G = (V, E)$, and let there be a bijection $\phi(i) : E \to 1, 2, ..., |E|$. For each vertex $u \in V(G)$, we define the weight $w(u) = \sum_{e \in E(G)} \phi(e)$, where $E(u)$ represents the set of edges incident to vertex u. An important property of this labeling is that,