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Steinhaus Graphs and Its Application in Cryptography

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Abstract

The concept of an adjacency matrix in graph theory stems from the inherent structure of a graph. Mullunzzo derived a graph from a Steinhaus matrix, characterized by being $(0, 1)$–symmetric with a zero diagonal, by extending a Steinhaus triangle into an adjacency matrix.

The Steinhaus graph, a representation of this process, behaves akin to an XOR logical gate, lending itself to applications in cryptography alongside graph theory. This paper delves into the notion of a Steinhaus complement within the realm of Steinhaus graphs, introducing the concept of Steinhaus self–complementary graphs.

Exploring vertex set partitions of Steinhaus graphs, particular focus is placed on identifying 2–partitions that yield the Steinhaus graph as their 2–complement. Utilizing the notion of a 2–self–complement of a graph, the characterization of Steinhaus self–complementary graphs is elucidated.

The paper also outlines insights from Steinhaus graphs that contribute to the advancement of symmetric cryptography.

Keywords: Steinhaus graph, Adjacency matrix, Self-complementary graph, XOR operation, Cryptography

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