# On Minimal Cuts in Ladder Graphs

**M. Korenblit ***
Ph. D., Senior Lecturer, School of Computer Science, Faculty of Sciences, Holon Institute of Technology, Holon, Israel

**V. E. Levit**
Ariel University, Ariel, Israel

## Abstract

In this paper, we consider a *ladder graph*, denoted by $L_n$, which represents a planar graph with $2n$ vertices and $3n - 2$ edges. It can be visualized as a "ladder" with $n$ rungs, formed by connecting two parallel paths of length $n$ with $n$ additional edges (the rungs). We study *minimal cuts (min-cuts)*, defined as minimal sets of edges whose removal disconnects the target from the source, in ladder graphs. The deletion of any edge from a min-cut turns it into a non-cut. We explore the structure of min-cuts in both directed and undirected versions of a ladder graph and estimate their number and sizes. We show that $L_n$ has $n^2$ min-cuts of sizes from *2* to $n$ and demonstrate the distribution of the min-cuts by their sizes. In addition, using the above results, we estimate the time complexity of the algorithm that computes *st-connectedness* for a probabilistic directed ladder graph (the probability that there exists a path of operating edges between the source and the target in the graph). The running time of this algorithm for a directed $L_n$ *is* $O(n^5)$.

## Keywords

Ladder graph, min-cut, probabilistic graph, st-connectedness.