# *k*-Graceful labeling of triangular type grid graphs

**W.K.M. Indunil [1],* and A.A.I. Perera [2]**

[1] Department of Physical Science, Rajarata University of Sri Lanka.
[2] Department of Mathematics, University of Peradeniya, Sri Lanka.
* Corresponding author email: asp1617030@as.rjt.ac.lk

**Abstract:** The study of graph labeling is currently one of the most ubiquitous graph theory research topics. There is a vast amount of literature available on graph labeling techniques. Prime labeling, antimagic labeling, radio labeling, graceful labeling, incidence labeling, and elegant labeling are some of the graph labeling techniques. Among them, graceful labeling is one of the most popular graph labeling techniques. A major conjecture available in this area is the graceful tree conjecture, which hypothesizes that all trees are graceful and remain unsolved yet. The term *k*–graceful labeling was introduced later as the natural generalization of graceful labeling. Over the past few decades, plenty of studies have been conducted on this area in various dimensions. Grid graphs are very much useful in applications of circuit theory, communication networks, and transportation networks. However, in the literature, there are not many research papers on the graceful labeling of grid graphs except a few on odd graceful labeling. As well as graceful labeling of disconnected graphs is also pretty much rare in the literature. In this research work, we introduce generalized *k*–graceful labeling for $m \times n$ triangular type grid graph, $L$–vertex union of triangular type grid graph, and $L$–disconnected triangular type grid graph $\forall$ $L$, $m_L$, and $n_L$. In future works, we hope to use these *k*–graceful labeling for $m \times n$ triangular type grid graph and its other two variations for encryption processes in cryptography and multi-protocol label switching networks in communications networks.

**Keywords:** Disconnected triangular type grid graph, *k*–graceful labeling