Aalto University
School of Science

Department of
Computer Science

Combinatorics of
Efficient
Computations

Approximation Algorithms

Glossary

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Walks, Eulerian Cycles, Hamiltonian Paths

- Given a (multi-)graph $G = (V, E)$, a **walk** is a sequence $(v_0, e_1, v_1, e_2, v_2, \ldots, e_\ell, v_\ell)$ of (not necessarily distinct) nodes v_i and edges e_i such that edge e_i connects v_{i-1} and v_i

- A walk is called **cycle** if its end nodes are the same, that is, $v_1 = v_\ell$

- A **Eulerian cycle** is a cycle that traverses each edge of the graph exactly once. A graph is called **Eulerian** if and only if it contains a Eulerian cycle.

- A walk is called **(simple) path** if and only if it traverses every node at most once.

- An **Hamiltonian path** is a path that visits every node **exactly** once

Theorem of Euler

A (multi-)graph is Eulerian if and only if it is connected and if every node has even degree, that is, every node has an even number of incident edges.