Graph

[def]

It consists of vertices and edges.

[type]

Categorized by direction.

1. directed graph (digraph):

Has directed edge

, that is,

1. undirected graph:

No directed edge

,that is ,

[term]

1. indegree: number of edges enters to the vertex v.
2. outdegree: number of edges leaves from the vertex v.
3. degree = indegree + outdegree
4. isolate : a vertex v is isolated when it has no adjacent vertex, that is, degree of v is zero.
5. Strongly connected: For directed graph,

the graph is strongly connected iff every two vertices are reachable to each other. That is, no vertices are isolated.

1. Connected : For undirected graph,

the graph is connected iff every two vertices are reachable to each other. That is, no vertices are isolated.

1. Cyclic: the graph is cyclic or is a graph with cycle iff there exist at least 1 path from vertex v to v.

That is, it is possible that start with vertex v then go to other vertex then go to v with different path.

In other words, there exist at least 2 pathes from vertex v and v.

1. acyclic: it is opposite of the word cyclic.
2. Connected component: it is a set of vertices whose vertices are connected each other.
3. Subgraph:
4. Isomorphic: Given two graphs,

That is to say,

we can relabel vertices of G or move its vertices to get a new graph with same vertices and edges.

In analogy, image that a rectangle r then rotate it 90 degrees left to get a new image R. Although it looks a slightly different, you can rotate it to compare them.

1. Adjacent: vertex u and v are adjacent iff there is an edge from u to v.
2. Adjacency matrix: a matrix to represent every two vertices are adjacent or not.

NOTE that for directed graph, adjacency matrix is NOT necessary symmetric. For undirected graph, adjacency matrix is always symmetric.

1. Self-loop: For directed graph,

A loop from the vertex to itself.

Such as

1. Simple: For directed graph,

The graph is simple iff there exists no self-loop.

[advance type]

1. complete graph: an undirected graph which every two vertices are adjacent.

[identity]

A complete graph must be connected or strongly connected.

1. Bipartite graph: an undirected graph which has two connected component.
2. Dag: abbreviation of directed acyclic graph.
3. Multigraph: Especially for directed graph.

a graph which has two paths from vertex u and vertex v where u and v ,or v and u are adjacent.

Shown as following figure.

[extension]

1. forest: an acyclic, undirected graph.

You can think that a forest consists many trees.

1. Tree (free tree): a connected, acyclic, undirected graph.