<Discrete Mathematics>

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Euler cycle problem, Hamiltonian cycle problem
-> Decision/Search problem versions

Traveling salesman problem -> an optimization problem이기도 하다.

Traveling salesman problem의 조건
1. every node must be visited once
2. a cycle
3. the sum of traveling cost should be minimized

Traveling salesman problem(TSP)의 조건 (new version) input: a graph, k
1. every node must be visited once
2. a cycle
3. the sum of traveling cost should be smaller than “k”

-reducibility-
a->Hamiltonian cycle problem
b->Traveling salesman problem(new version)
==> If TSP is solvable, then HAM is solvable.
==> HAM reduces to TSP
TSP에서 모든 weight가 1이고, k가 모든 노드의 개수이면 된다.

A reduces to B
== if B is solvable, then A is solvable
== if A is not solvable, then B is not solvable

problem x, y are solvable,
problem z, w are not solvable
a. x reduces to y (O)
b. x reduces to z (O)
c. z reduces to w (O)
d. w reduces to y (X)

-Dijkstra`s algorithm-

input:

1. a directed weighted graphy
2. a starting node

output:

all shortest paths from x to all other nodes

```
1   S = {1}
2   for i = 2 to n do
3       D[i] = C[1,i]       // initialization
4   for i= 1 to n-1
5       choose a vertex w in V - S such that
6           D[w] is a minimum
7       add w to S
8       for each vertex v in V - S
9           D[v] = min(D[v], D[w]+C[w,v])
```

Dijkstra(G, S)

1. initialization
2. iteration
   a. selection
   b. update
      -> $D[v] = \min(D[v], +(D[w], C[w, v]))$