Summary: Lecture 8

Summary for the chapters *9.3* and *9.4*. [2, 1]

Undirected graph

An undirected graph G is a pair of sets (V, E) where V is the finite set of nodes and E is a set of unordered pairs in V that are symmetric:

$$\forall i, j \in E, i \neq j : \ (i,j) \in E \Rightarrow (j,i) \in E$$

IndependentSet

IndependentSet

INDEPENDENTSET
Input: An undirected Graph $G = (V, E)$ and a number k.
Question: Is there a set $I \subseteq V$ of $k = |I|$ nodes with no edges in between? (INDEPENDENTSET)

INDEPENDENTSET is NP-complete.

Proof idea:

- triangle construction

TODO
Questions:

HamiltonPath is NP-complete

HAMILTONPATH is NP-complete.

Proof idea:

- Another reduction from 3SAT

TODO
Questions:

TSP(D)

TSP(D)

TSP(D) is a decision version of TSP.
Input: A $n \times n$ distance matrix and a bound $B \in \mathbb{N}$
Question: Is there a round tour of length $\leq B$ that visits all *cities*?

TSP(D) is NP-complete.

Proof idea:

- budget of nodes is $B = |V| + 1$

TODO
Questions:

Knapsack

KNAPSACK is NP-complete.

- filled in in one dimensional array onthe board

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TODO
Questions:

References

[1] Martin Berglund. *Lecture notes in Computational Complexity.*

[2] Christos H. Papadimitriou. *Computational Complexity.* Addison-Wesley Publishing Company, 1994.