

Homework assignment 1 - Turing Machines

Deadline: do 21.10, 2024, 9:00 in Moodle.

Problem 1. Design a logical circuit that adds two (non-negative) integers, each of them represented using n bits. How many gates in total does the circuit use and what is its depth?

Problem 2. Design a Turing machine that moves its input one cell to the right: $u \rightarrow 0u$, where $u \in \Sigma^*$ and $\Sigma = \{0, 1\}$. Draw its transition graph. Can you construct such a machine so that it moves arbitrary input string $u \in (\Gamma \setminus \{\sqcup\})^*$?

Problem 3. Construct a Turing machine that copies its input: $u \rightarrow u\#u$, where $u \in \Sigma^*$ and $\Sigma = \{0, 1\}$. Draw its transition graph.

Problem 4. Describe an algorithm for a Turing machine, that gets as an input a description of a graph G given by the list of vertices and edges, and marks all vertices reachable from the first node.