

Space complexity and complexity classes

Let $s : \mathbb{N} \rightarrow \mathbb{N}$.

Definition

A language $L \subseteq \Sigma^*$ is said to be in class $\text{NSPACE}(s(n))$ if there exists a non-deterministic Turing machine M such that $\forall x \in \Sigma^*$,

M halts on x using at most space $O(s(|x|))$ on any run of the machine,

where $|x|$ indicates the length of x .

if $x \in L$ then there exists an accepting run of M on x .

if $x \notin L$ then M rejects x on all the runs.

$$\text{NL} = \text{NSPACE}(\log n)$$

$$\text{NPSPACE} = \bigcup_k \text{NSPACE}(n^k)$$