

Computability

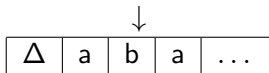
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January 2015

Turing Machines as language acceptors

Give a definition of a Turing Machine. Describe how a Turing Machine processes its input and define the language accepted by a Turing machine.

Turing Machine (informal)



Turing Machine (formal)

$$T = (Q, \Sigma, \Gamma, q_0, \delta)$$

Q , a finite set of states

Σ , the input alphabet ($\Sigma \subseteq \Gamma$)

Γ , the tape alphabet ($\Delta \notin \Gamma$)

q_0 , the initial state ($q_0 \in Q$)

δ , the transition function

$$\delta : Q \times (\Gamma \cup \{\Delta\}) \rightarrow (Q \cup \{h_a, h_r\}) \times (\Gamma \cup \{\Delta\} \times \{R, L, S\})$$

Language accepted by a TM

If $x \in \Sigma$ then x is accepted by T if

$$q_0 \Delta x \vdash_T^* wh_a y$$

$L \subseteq \Sigma^*$ is accepted by T if $L = L(T)$ where

$$L(T) = \{x \in \Sigma^* \mid x \text{ is accepted by } T\}$$

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