

# Theory of Computation

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References: Lectures by Stephen Cranefield in COSC341 at the University of Otago, New Zealand;  
[tikz tutorial](#) by Satyaki Sikdar

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# 1 Deterministic Finite State Automaton (DFAs)

**DEF:** A *deterministic finite state automaton (DFA)*,  $\mathbf{A}$ , consists of the following:

- A finite set  $\Sigma$  called its alphabet,
- A finite set  $\mathcal{S}$  called its states,
- A function  $T : \mathcal{S} \times \Sigma \rightarrow \mathcal{S}$  called its transition function,
- A single element  $s \in \mathcal{S}$  called its start state,
- A subset  $A \subseteq \mathcal{S}$  called its final states or accepting states.

We begin with an example. Consider a light with two switches. Flipping either switch changes the state of the light.

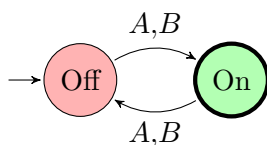


Figure 1: Two buttons, one light

another example:

