

Deterministic vs. Nondeterministic Computations

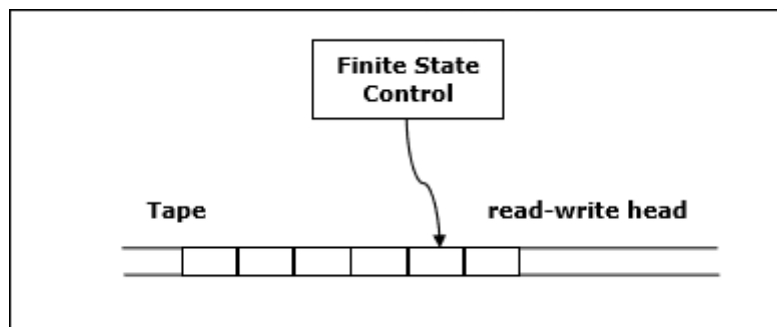
To understand class **P** and **NP**, first we should know the computational model. Hence, in this chapter we will discuss two important computational models.

Deterministic Computation and the Class P

Deterministic Turing Machine

One of these models is deterministic one-tape Turing machine. This machine consists of a finite state control, a read-write head and a two-way tape with infinite sequence.

Following is the schematic diagram of a deterministic one-tape Turing machine.



A program for a deterministic Turing machine specifies the following information –

- A finite set of tape symbols (input symbols and a blank symbol)
- A finite set of states
- A transition function

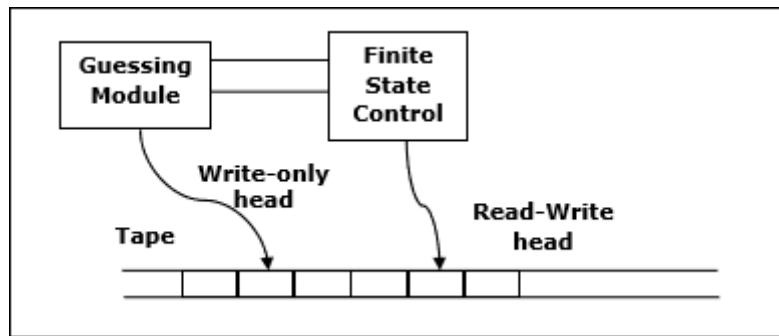
In algorithmic analysis, if a problem is solvable in polynomial time by a deterministic one tape Turing machine, the problem belongs to P class.

Nondeterministic Computation and the Class NP

Nondeterministic Turing Machine

To solve the computational problem, another model is the Non-deterministic Turing Machine (NDTM). The structure of NDTM is similar to DTM, however here we have one additional module known as the guessing module, which is associated with one write-only head.

Following is the schematic diagram.



If the problem is solvable in polynomial time by a non-deterministic Turing machine, the problem belongs to NP class.