Equivalent Turing Machine Models

Many variations on TMs are equivalent.

1. Stay option. Read-write can stay at current square.
2. Semi-infinite tape. Tape is infinite to the right, but not the left.
3. Off-line TM. Two tapes, one for input, and the other for working storage.
4. Multitape TMs. TM has a finite number of tapes.
5. Multidimensional TMs. Tape is two-dimensional like a matrix.

Nondeterministic Turing Machines

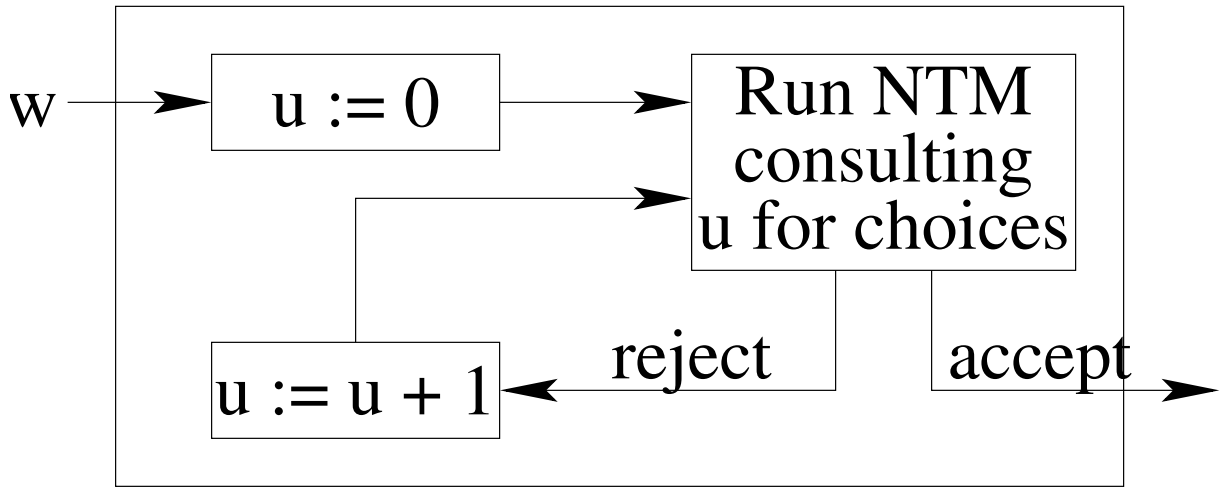
A nondeterministic TM can have a set of choices from a given state and tape symbol. A NTM has the same definition as a TM expect for δ:

$$\delta : Q \times \Gamma \rightarrow 2^{Q \times \Gamma \times \{L,R\}}$$

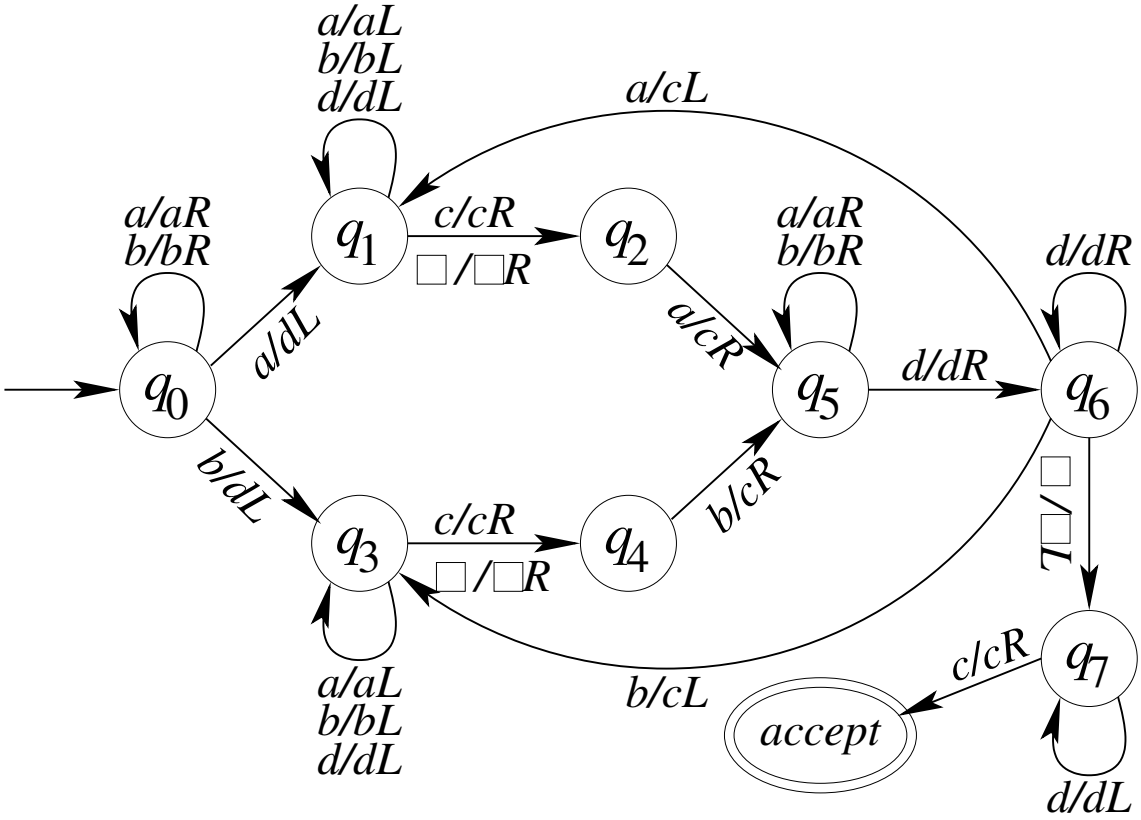
A NTM accepts w if there is any sequence of moves to a final state.

Simulating NTMs

One can examine every sequence of choices.



An NTM for ww



An NTM for $a^n : n > 2$ is not prime