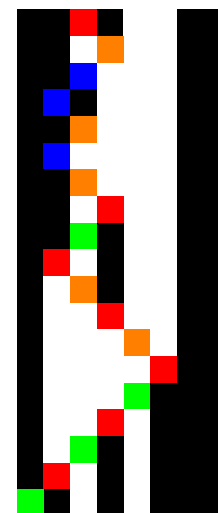


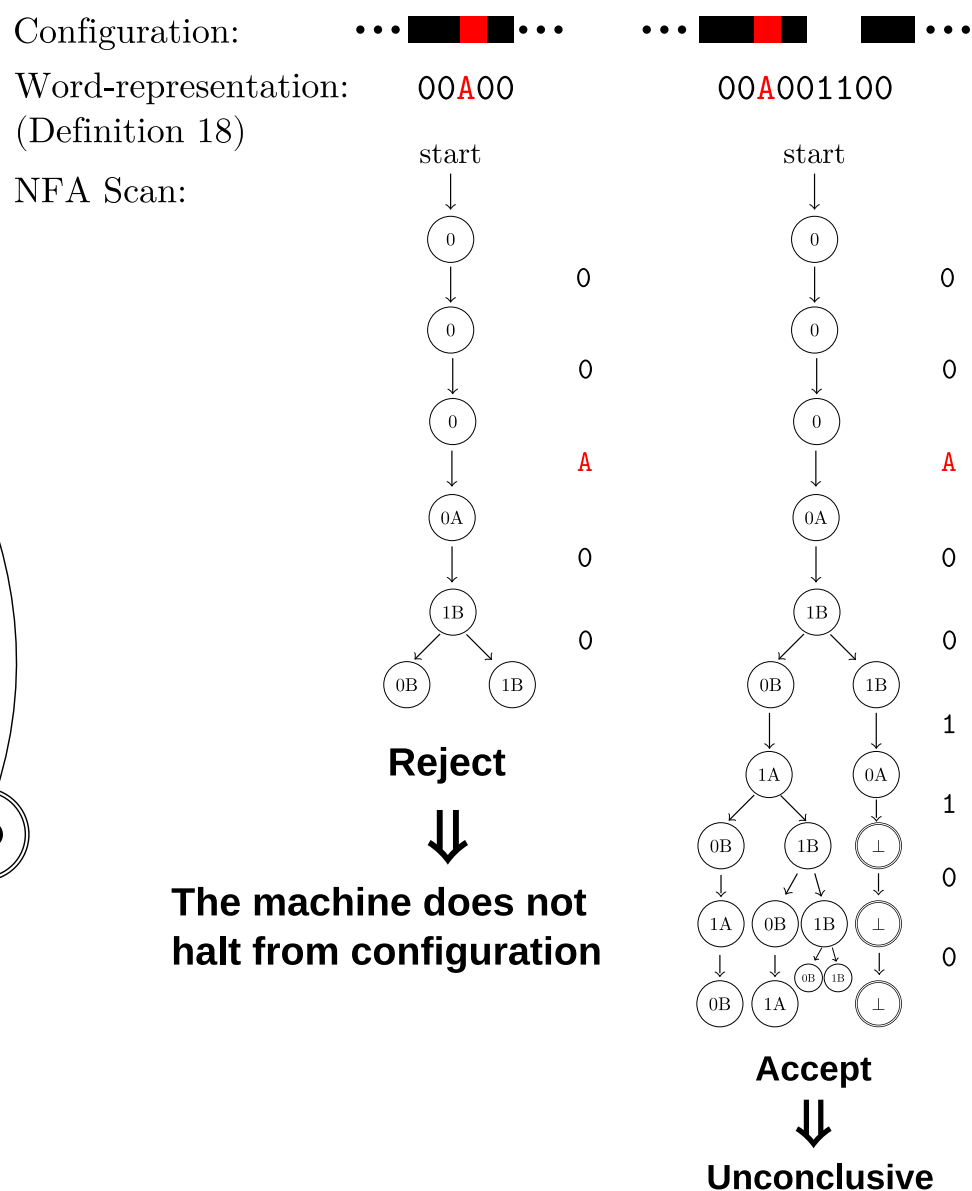
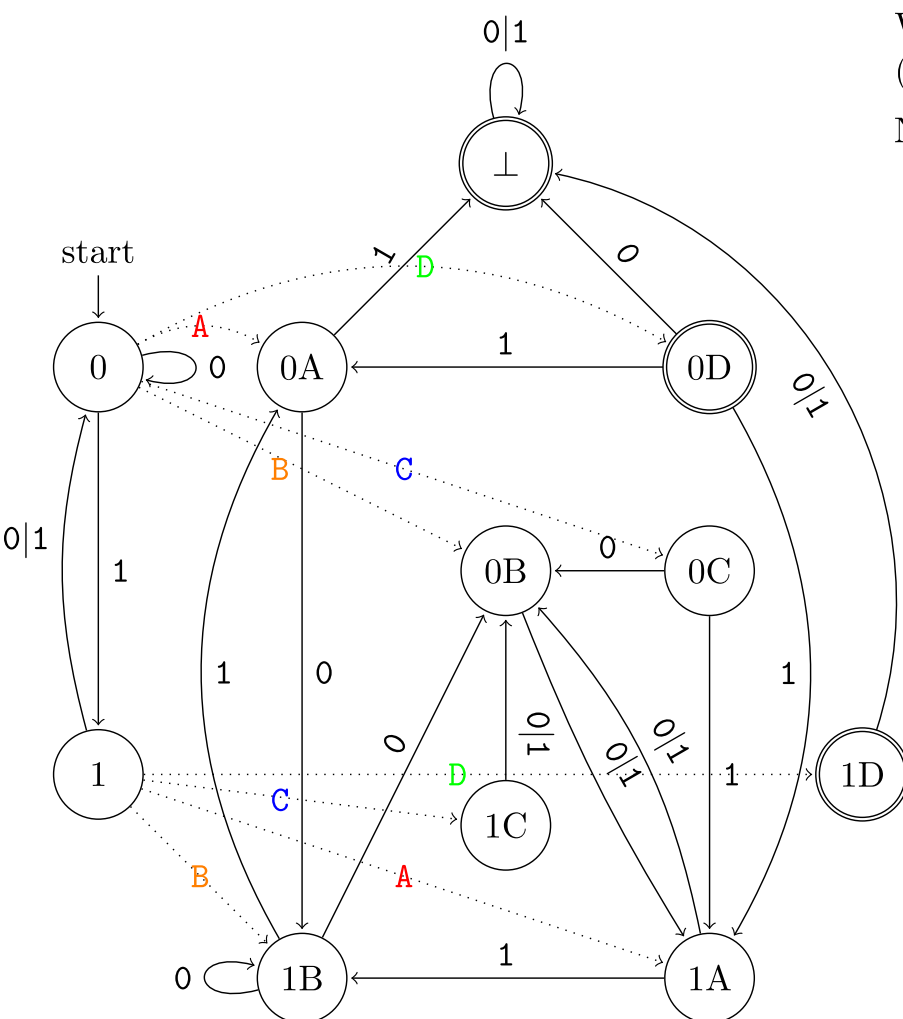
(a) 10,000-step space-time diagram of the 4-state Turing machine given in (b) from the all-0 initial configuration. The machine does not halt from the all-0 configuration.

| | 0 | 1 |
|---|-------------|-------------|
| A | 1R B | 0L D |
| B | 1L C | 1R A |
| C | 0R B | 0L C |
| D | --- | 1L A |

(b) Transition table.



(c) Detailed space-time diagram of the Turing machine given in (b) from an eventually-halting configuration: the machine halts after 18 steps by reading a 0 in state **D**.



(d) Left: Nondeterministic Finite Automaton for the Turing machine given in (b), constructed using FAR direct algorithm, see Section 6.3. By construction, if this NFA rejects a configuration, then we know that the configuration does not eventually halt, see Theorem 20. Right: The NFA rejects the all-0 configuration, the machine does not halt from it. The NFA accepts the starting (or any) configuration shown in (c) hence we cannot conclude that it is non-halting, which is consistent since it eventually halts.