

J. Theory of Automata → II. Theory of Formal Languages III. Theory of Turing Machines ...





Pushdown Automata : A new model for theoretical machines.















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A pushdown automaton (PDA) is:

- 1. an alphabet \sum of input letters
- 2. an input tape, finite on the left but infinite to the right and separated into cells. The input tape initially contains the sequence of input letters starting in the first cell. The rest of the tape contains only blanks Δ .
- 3. one start state with at least one outgoing edge and no incoming edges
- a set of halt states with incoming edges only
- a set of READ states. The outgoing arrows are labeled with letters from Σ or blanks.







A pushdown automaton (PDA) is:

- 6. an alphabet Γ for stack characters
- 7. a pushdown stack, infinite in one direction. The stack is initially empty.
- 8. a finite set of PUSH states that put characters onto the top of the stack
- 9. a finite set of POP states. Outgoing edges are labeled with letters of Γ and blanks.

(There can be none or many edges labeled with the same character. There can be many incoming edges: NonDetreministic).







- The language accepted or recognized by a pushdown automaton is the set of words whose paths end in an ACCEPT state.
- <u>Theorem.</u> For every regular language L, there is some PDA that accepts it.
 - <u>Proof:</u> There is an FA that accepts L because it is regular. We transform the FA into a PDA using the constructive algorithm already discussed.









PALINDROMEX = {X,aXa,bXb,aaXaa,abXba,baXab,...}









Chapter 14: Pushdown Automata Languages accepted by nondeterministic pushdown automata Languages accepted by deterministic pushdown automata Languages accepted by finite automata 1. nondeterministic finite automata 2. 3. transition graphs CSI3104-W11

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Theorem. Let L be a language accepted by a PDA. There is another PDA that accepts L such that whenever a path leads to ACCEPT, the stack and the input tape contain only blanks.





