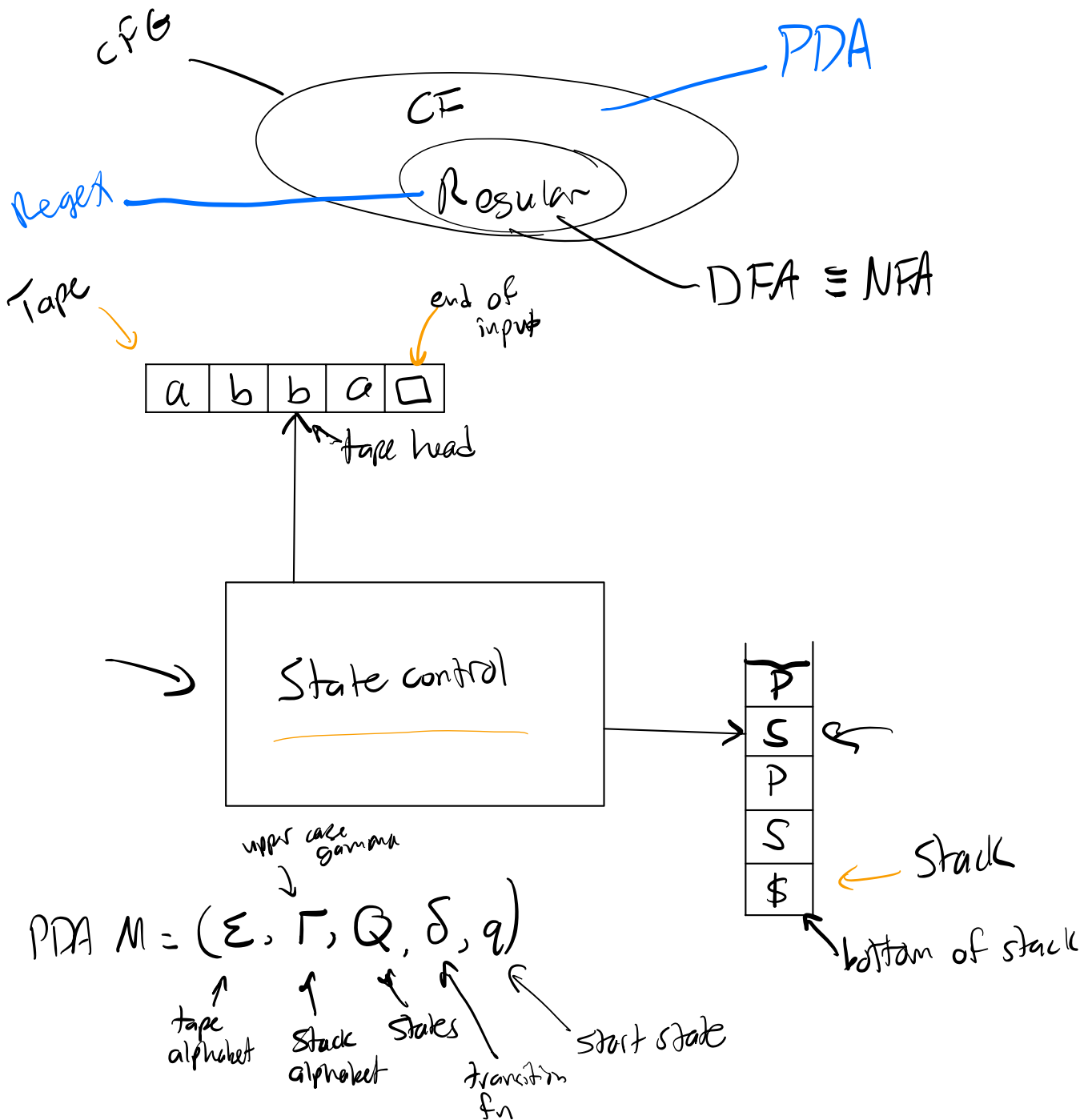


CSCI 301 - Lecture 31: Pushdown Automata



Initialization:

- Tape head is at the start of input
- Stack contains only $\$$
- current state is q

Computation step:

move tape head right
↓
don't move tape head

$$\delta : \underline{Q} \times \underline{(\Sigma \cup \square)} \times \underline{\Gamma} \rightarrow \underline{Q} \times \underline{\{R, N\}} \times \underline{\Gamma^*}$$

q' M γ

- move to state q'
- move tape head right 1 symbol if $M = R$
- pop top stack symbol and push symbols in γ (a string)

Termination: M terminates when the stack is empty.

Acceptance: Accept if the machine terminates with tape head on \square

Reject: If M terminates and tape head is not on \square
or doesn't terminate.

Nested Pairs

Accept: ab $aabb$ $ababbb$
 $()$ $(())$ $((())())$

Reject: $($ $()()$ $)$
 a aba bb

- $\Sigma = \{a, b\}$
- $\Gamma = \{\$, S\}$
- $Q = \{q\}$
- $q = q$

	δ inputs		outputs	
	Tape in	Stack in	Move?	Stack out
empty string	\square	$\$$	N	ϵ
$(_0$	a	$\$$	R	$\$S$
$(_k$	a	S	R	SS
$)_0$	b	$\$$	N	$\$$
$)_k$	b	S	R	ϵ
$(()$	\square	S	N	S

Non-deterministic PDA

$$\delta : \underline{Q} \times \underline{(\Sigma \cup \square)} \times \underline{\Gamma} \rightarrow \mathcal{P}_f \left(\underbrace{Q}_{q'} \times \underbrace{\{R, N\}}_M \times \underbrace{\Gamma^*}_\gamma \right)$$

Finite Subset

Strings w/ b in the middle

$$\Sigma = \{a, b\}$$

$$\Gamma = \{\$, \square\}$$

$$Q = \{q_a, q_b\}$$

$$q = q_a$$

ab aabb

aa b ba aab baa ϵ

q_{in}	Σ_{in}	Γ_{in}	q_{out}	Move?	Γ_{out}^*

