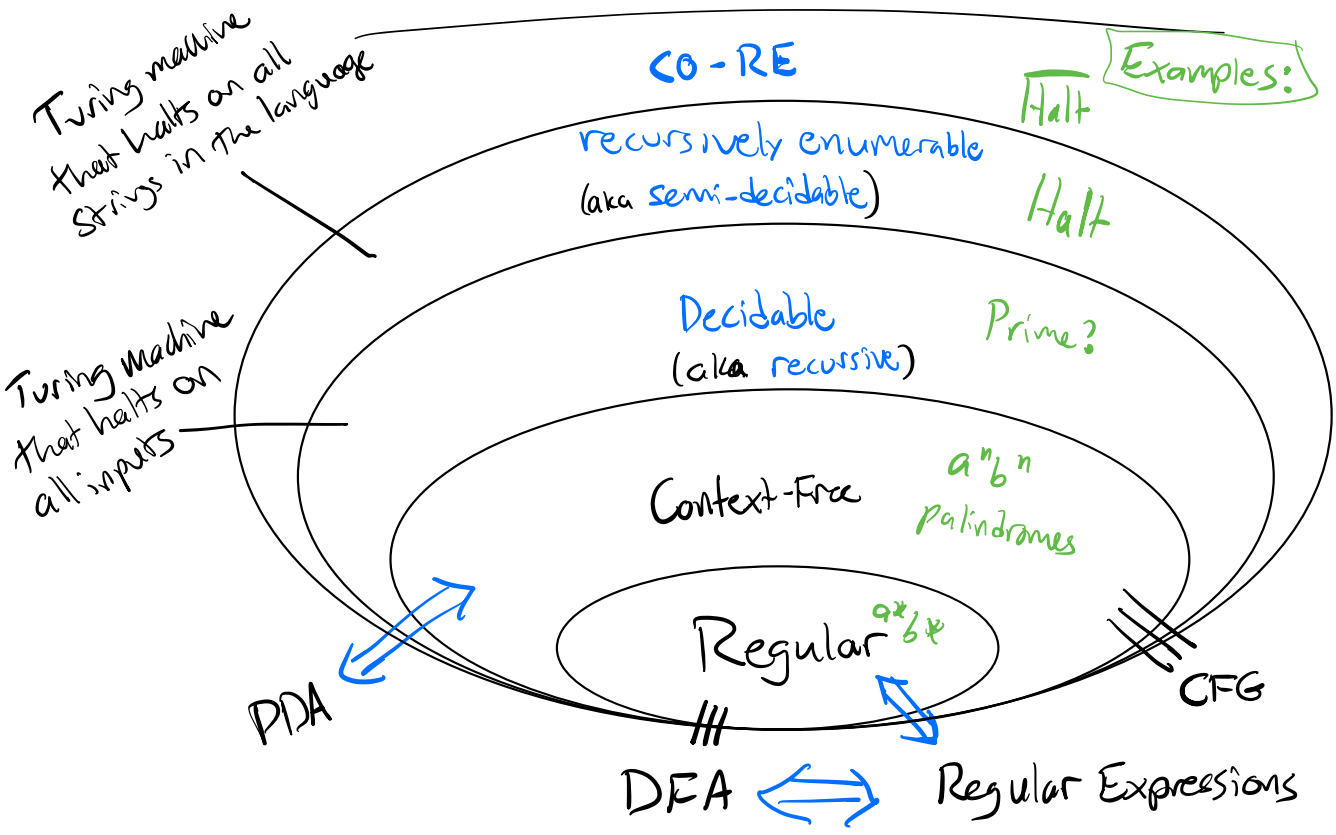
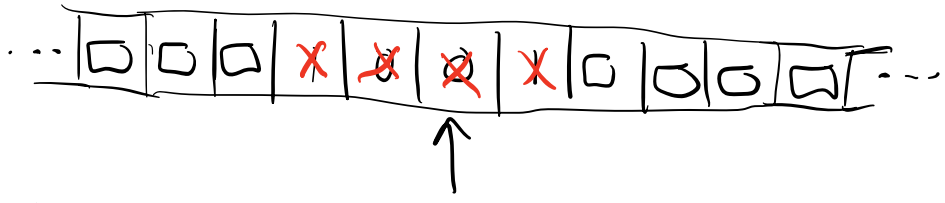
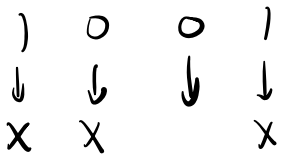
CSCI 301 - Lecture 30: Turing Machines



Informal Example: Palindromes over {0, 1}



States:



q

q_1

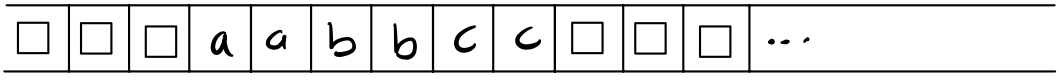
q_{1l}

q_L ←

q_0

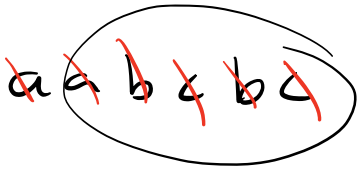
Not Context-Free Example (more formally)

$$L = \{a^n b^n c^n : n \geq 0\}$$



Idea:
- x out first a
- x out first b
- x out first c

accept if empty



New idea: 2 phases:

1. Verify $a^* b^* c^*$

2. Verify $a^n b^n c^n$

Formal Machine

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

$\Gamma = \{a, b, c, \square, \underset{\rightarrow}{\square}, \underset{\leftarrow}{x}\}$

Q:

Phase 1: $a^*b^*c^*$

- q_a start state, find an a, read a's
- q_b reading b's
- q_c reading c's
- q_L go to start

Phase 2: $a^n b^n c^n$

- q_A find leftmost a, x it; accept if all x's
- q_B find leftmost b, x it
- q_C find leftmost c, x it
- q_L goto start

δ: $q_a a \rightarrow q_a a R$

	a	b	c	□	x
q_a	$q_a a R$	$q_b b R$	$q_c c R$	q_L	q_{reject}
q_b	q_{reject}	$q_b b R$	$q_c c R$	q_L	q_{reject}
q_c	q_{rej}	q_{rej}	$q_c c R$	q_L	q_{reject}
q_L	$q_L a L$			$q_A \square R$	q_{reject}
q_A	$q_B x R$	q_{reject}	q_{rej}	q_{accept}	$q_A x R$
q_B					
q_C					
q_L					

↓ q_{reject}, q_{accept}

	a	b	c	□	x
→ q_a	$q_a a R$	$q_b b R$	$q_c c R$	$q_L \square L$	q_{reject}
q_b	q_{reject}	$q_b b R$	$q_c c R$	$q_L \square L$	q_{reject}
q_c	q_{reject}	q_{reject}	$q_c c R$	$q_L \square L$	q_{reject}
q_L	$q_L a L$	$q_L b L$	$q_L c L$	$q_a \square R$	q_{reject}
q_a'	$q_b' x R$	q_{reject}	q_{accept}		$q_a' x R$
q_b'	$q_b' a R$	$q_c' x R$	q_{reject}		$q_b' x R$