

16-1/

$$L = \{ w \mid \#_0(w) \neq \#_1(w) \}$$

$$001 \in L \quad 0011 \notin L \quad 0101 \notin L \quad 0110 \notin L$$

$$L = L_{\{\text{move } 0s\}} \cup L_{\{\text{move } 1s\}}$$

$$S \rightarrow S_0 \mid S_1$$

$$L_{\{\text{move } x\}} = L = (x L)^+$$

$$S_x \rightarrow S = (x S)^+ \quad S_x \rightarrow S = S_{x+}$$

$$S_{x+} \Rightarrow x S = \mid x S = S_{x+}$$

$$S_0 \Rightarrow S = S_{0+}$$

$$S_{0+} \Rightarrow 0 S = \mid 0 S = S_{0+} \quad S = \rightarrow \epsilon \mid 0 S = 1 S =$$

$$S_1 \Rightarrow S = S_{1+} \mid 1 S = 0 S =$$

$$S_{1+} \Rightarrow 1 S = \mid 1 S = S_{1+}$$

$$\{ w \# t \mid t = x w y \} = \{ w \# x w y \mid x, y, w \in \{0,1\}^+$$

OK $s = 0^p \# 1^p 0^p 1^p \quad u = 0^p \# \quad vxy = 1^p \quad z = 0^p 1^p$

OK $s = 0^p \# 1^{p-2} 0^p 1^p \quad vxy = 1^{p-2}$

OK $s = 0^p 1 \# 0^p 1 1^p \quad u = 0^p 1 \# 0^p 1 \quad vxy = 1^p \quad z = \epsilon$

$$s = 0^p 1 \# 0^p 1$$

$\hookrightarrow vxy \rightarrow i > 1, \text{ ~~not~~ } w \& t \quad \hookrightarrow vxy \rightarrow i < 0 \rightarrow w \& t$

6-2/ CFL is not closed under intersect.

$\rightarrow (\forall A, B \in CFL, A \cap B \in CFL)$
 \parallel

$\exists A, B \in CFL, \underbrace{A \cap B} \notin CFL$
 $\neg CPP(A \cap B)$

$A =$ binary palindromes
 $(S \rightarrow 0S0 \mid 1S1 \mid \epsilon)$

$B =$ equal number of 0 and 1
 $(S \rightarrow 0S1S \mid 1S0S \mid \epsilon)$

$A \cap B =$ binary palindromes w/ equal 0s and 1s

00111100 011110 0110 10100101

$S \rightarrow 01S10 \mid 10S01 \mid \epsilon$

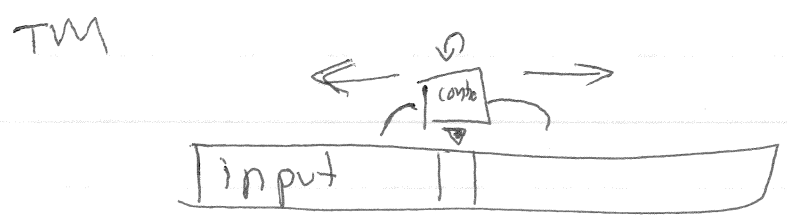
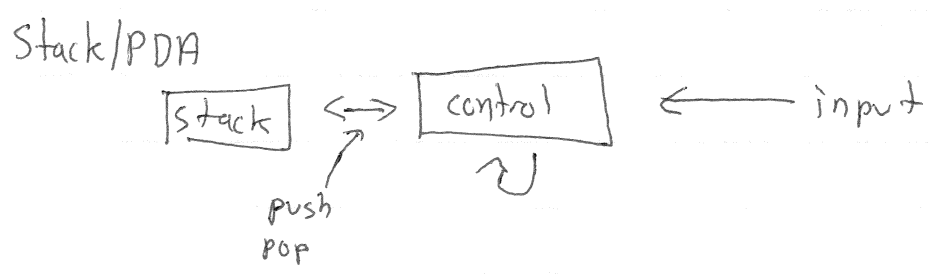
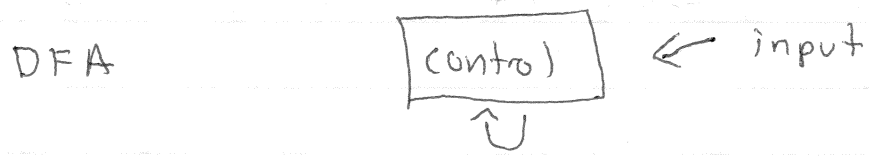
$S \rightarrow 0S_{(more\ 1s)}0 \mid 1S_{(more\ 0s)}1 \mid \epsilon$

$s = 0^p 1^p 1^p 0^p = 0^p 1^{2p} 0^p$

④	⑤		
↓	↓	↓	
①	②	③	

①, ③	✓
④, ⑤	✓
②	✓

Turing machine



16-3/

Input: 0s & 1s
Goal: check palindromeness + equality

→ Read a char (c) (change to \hat{c})
~~if done~~ Go to last char (l) if done
 Check if (l == c)
 If not, end
 Change l to be ~~l~~ \hat{c}
 Go back to left
 Return to start

~~read~~ read a char (\hat{c})
 change it to $_$
 go right looking for \hat{c}
 change it to X
 go left until we see a blank
 go right turning X into blank

