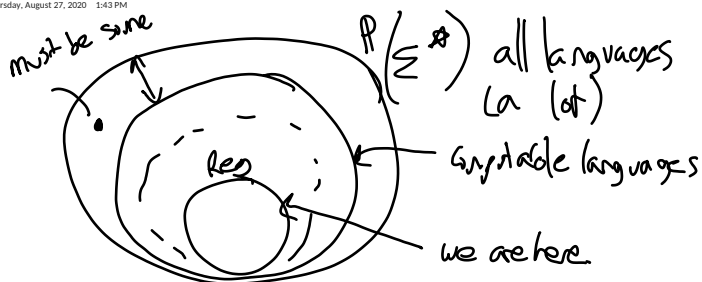


Regular Languages

Thursday, August 27, 2020 1:43 PM



Inductive def'n:

- $\emptyset$  is regular language
- $\{a\}$  is regular
- $\{\epsilon\}$  is regular
- $L_1 \cup L_2$  is regular (if  $L_1$  and  $L_2$  are regular)
- $L_1 L_2$  is regular
- $L^*$  is regular

Lemma: Let  $w \in \Sigma^*$  be a string.  
 $\{w\}$  is regular.

ex.  $\{aba\}$   $w = aba$   
 $L_1 = \{a\}$   $L_2 = \{b\}$   
 $L = L_1 \cdot L_2 \cdot L_1$

Lemma: Any finite language is regular.  
 by  $\cdot$  and  $\cup$ .

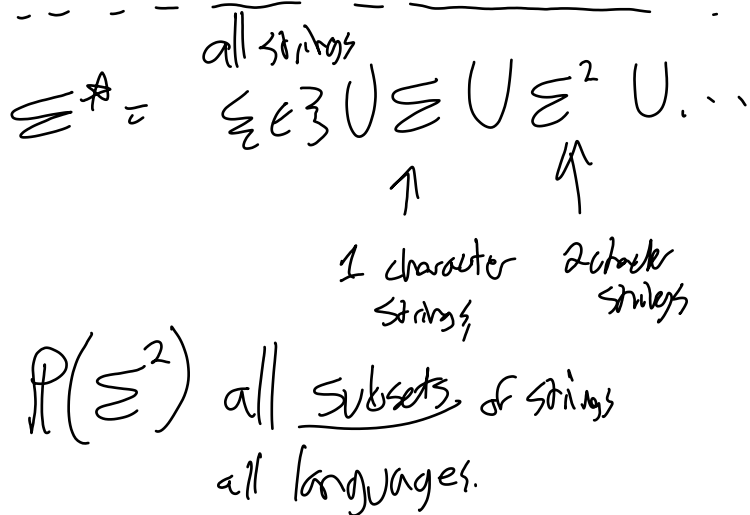
Reg Ex	$r$	Reg Lang	$L(r)$
$\emptyset$		$\emptyset$	
$\epsilon$		$\{\epsilon\}$	
$a$		$\{a\}$	
$(r_1 + r_2)$		$L(r_1) \cup L(r_2)$	
$(r_1 r_2)$		$L(r_1) \cdot L(r_2)$	
$r_1^*$		$L(r_1)^*$	

ex  $(c+ece)374(a+b) ?$

$\{cs374a, cs374b, ece374a, ece374b\}$

Skills: (1) given a description of language,  
give a regex that denotes.

(2) given a regex,  
describe the language it denotes.



Ex. Strings containing  
at least two 1's or  
two 0's.

$$\left( (0+1)^* 1 (0+1)^* 1 (0+1)^* \right) \cup \left( (0+1)^* 0 (0+1)^* 0 (0+1)^* \right)$$

at least two 1's                      at least two 0's

$$(0+1)^* (1(0+1)^* 1) + (0+1)^* 0(0+1)^* 0$$

Ex 2:  $L =$  No two consecutive 1's.

$$r = 0^*(100^*)^*(1+\epsilon)$$

01 in the language, but not in  $L(r)$