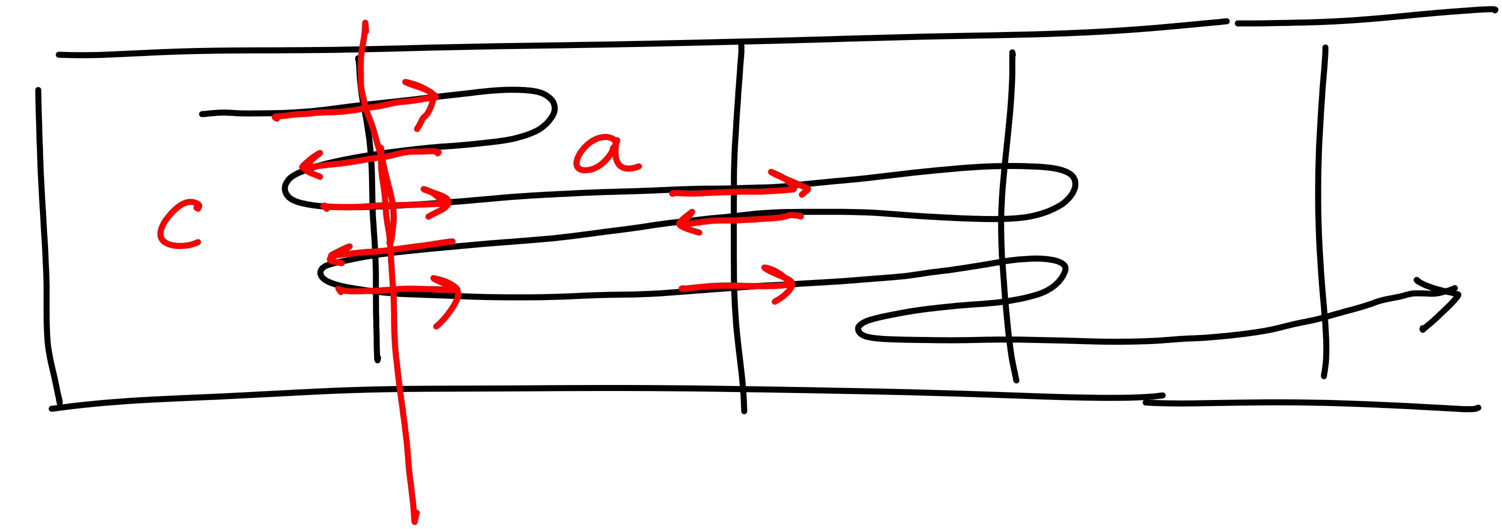
COL 352 Lecture 34 April 18



Post Correspondence Problem (PCP) is not recursive

$$L_u \leq_f L_{PCP}$$

$$f(\langle M, w \rangle) = (A, B)$$

s.t. $A, B \in L_{PCP}$ iff M accepts w

	A	B
1	s_1	w_1
2	s_2	w_2
⋮	⋮	
k	s_k	w_k

$$s_{i_1} \cdot s_{i_2} \cdot s_{i_3} \cdots s_{i_m} = w_{i_1} \cdot w_{i_2} \cdots w_{i_m}$$

$i_j \in \{1, \dots, k\}$

Time and Space Complexity

Time complexity $T(n)$ — n is the length of input string

k-tape TM $\quad k \geq 1$

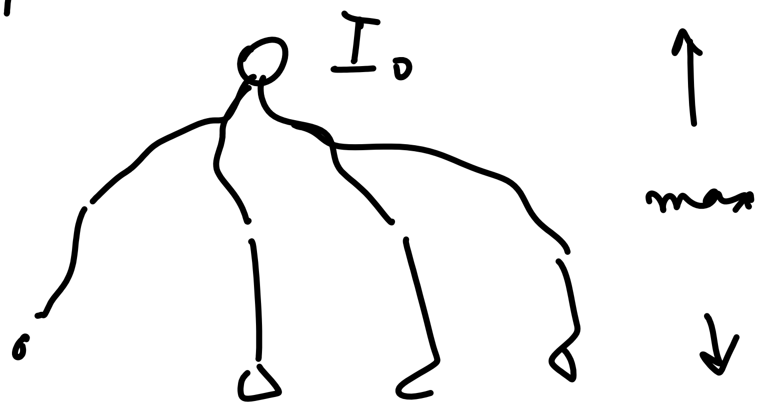
The TM always halt (recursive languages)

For a given TM M, the time complexity is $T(n)$ if the maximum no of steps taken by M on any input of size n is $T(n)$.
(for acceptance)

A language L is in the time complexity class $T(n)$ if there is a TM that accepts L has time complexity $T_k(n)$ (k-tapes)

$T(n)$ is at least n (by convention)
Unless the entire input is read, the language/problem is not considered interesting

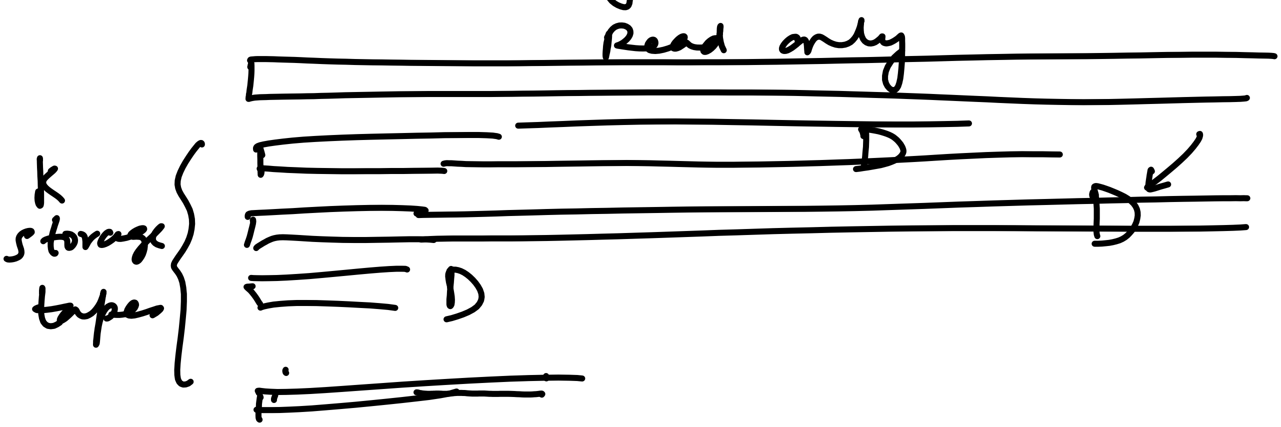
A similar definition also holds for non-deterministic TM.



$$T(n) = \max_{\substack{\text{all inputs}\\ \text{of length } n}} \ \max_{\substack{\text{all choices}\\ \text{for a}\\ \text{fixed input}}} T(n)$$

Space Complexity

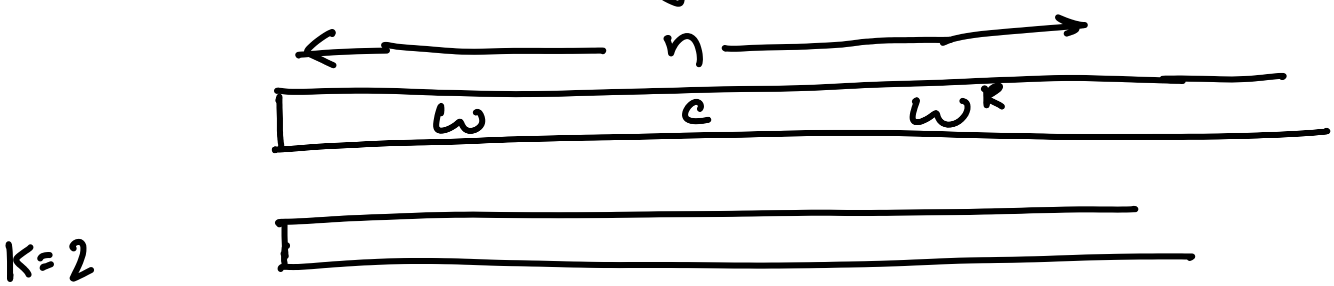
K-tape TM but we have a read-only input tape



Max{Rightmost head position in any of the K storage tapes} not including input tape

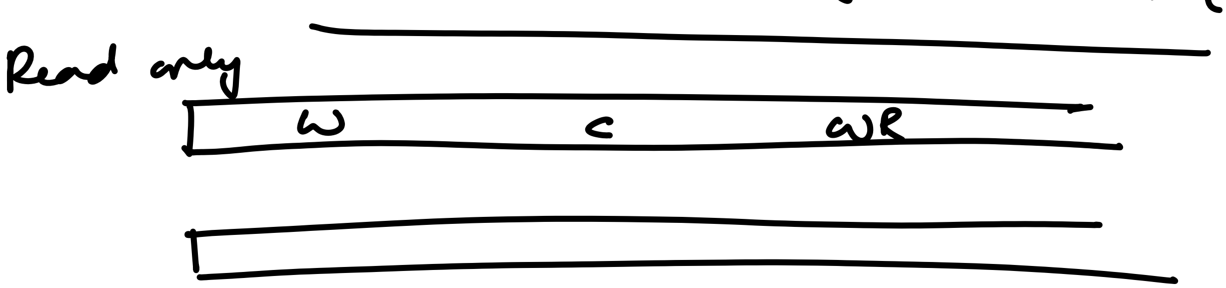
Consider $L_{pal} : \left\{ wcw^R \mid \begin{array}{l} w \in \Sigma^* \\ c \text{ is special char} \end{array} \right\}$

Time complexity L_{pal}



By copying w in tape 2 and then checking w and w^R by moving the heads in opposite direction $T(n) = n$ for L_{pal}

Space complexity of L_{pal}



Space complexity using the previous approach is $\frac{n}{2}$ (length of w)

By using counters we can compare the corresponding characters of w & w^R

A counter take log n space

So space complexity is $\boxed{3\log n}$