Edit Distance

A = Anshuman
B = Antihuman

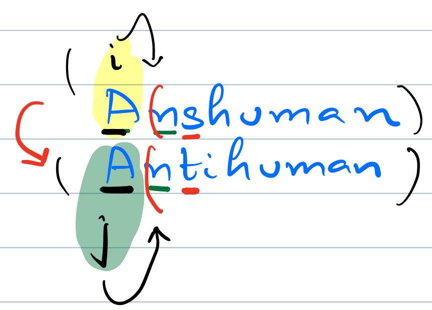
Convert the string A → B

3 operations allowed
1) Insert a char
2) Delete a char
3) Replace a char

Find min no. of operations required to convert A → B

Target ⇒ Antihuman

Anshuman (2) — Anstihuman: delete (1) — An t ihuman



1) Element of Choice
- Match
- Not Match
  - Add
  - Delete
  - Replace

2) What will your state calculate

EditDistance (i, j) ⇒ Min no. of operations required to convert $A[i, N-1] \rightarrow B[j, M-1]$

3) Recurrence Relationship

$ED(i, j)$

- $A[i] == B[j]$ → (zero) $0 + ED(i+1, j+1)$ — $DP[i+1, j+1]$
- $A[i] \,!= B[j]$ → Min of:
  - Insert → $1 + ED(i, j+1)$
  - Delete → $1 + ED(i+1, j)$
  - Replace → $1 + ED(i+1, j+1)$

Anshuman
Antihuman

(i moves along "Anshuman", j moves along "Antihuman")

Base Case

$i \rightarrow i+1$

$j \rightarrow j+1$

$(i == N) \;||\; (j == M)$

$M-j$ (for $i == N$) $\quad$ $N-i$ (for $j == M$)

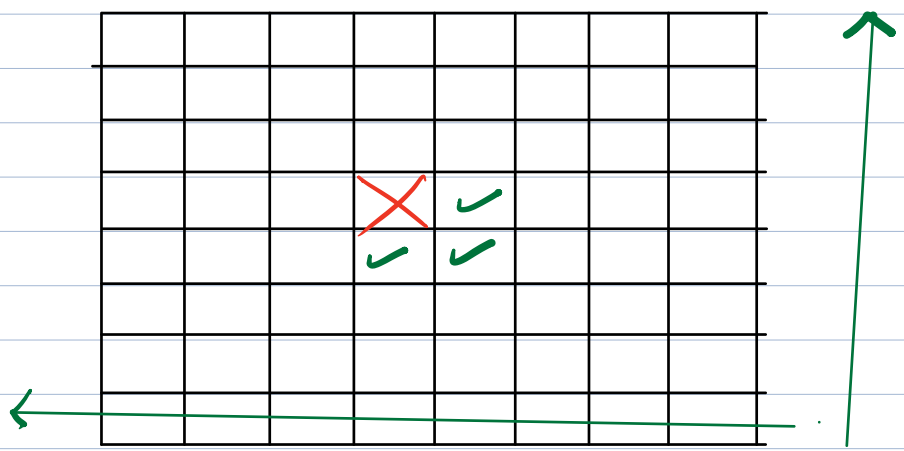
A (ayush) i Add

B ayushman

[j, M-1] # = (M-1) - j + 1 = (M-j)

A: ayush man i Delete [i, N-1]

B: ayush j = (N-i)



Code

$$DP[i][j] = \begin{cases} DP[i+1][j+1] \\ \min\left(DP[i+1][j], DP[i][j+1], DP[i+1][j+1]\right) + 1 \end{cases}$$

String ⇒ a b b a ? ⇒ one char

Patten ⇒ a ? b a * ⇒ any sequence of char

↓ special

cwr

(), (ab), (aaa)

Is it possible to convert the pattern to the string.

Sol^n

S ⇒ (i) ⇒ s[0, i]

P ⇒ (j) ⇒ P[0, j]

1) if (s[i] == P[j])

DP[i][j] = DP[i-1][j-1]

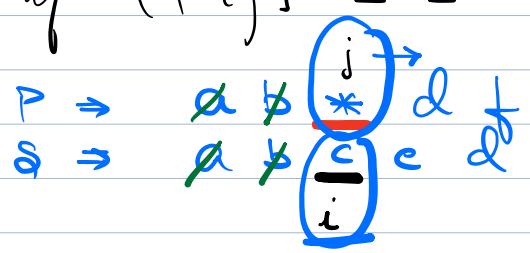
}

2) if (P[j] == '?')

DP[i][j] = DP[i-1][j-1]

}

3) if (P[j] == '*')



* → empty DP[i][j-1]

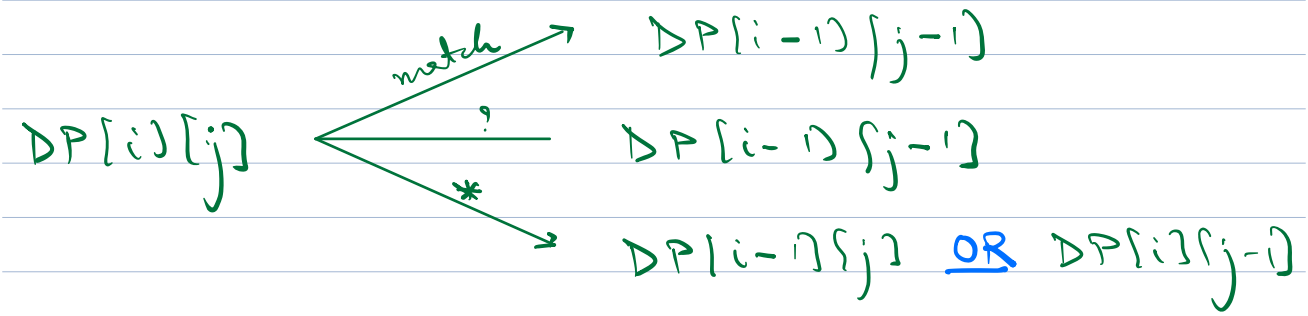
→ c * DP[i-1][j]

}

4) else { // Mismatch

DP[i][j] = false;

}



T → B {

L → R {

}

}

P: a ? b * c (j)

S: a a b c (i)

		0	1	2	3	4	5
		#	a	?	b	*	c
0	#	T	F	F	F	F	F
1	a	F	T	F	F	F	F
2	a	F	F	T	F	F	F
3	b	F	F	F	T	T	F
4	c	F	F	F	F	T	T

a ?
a a

a ?
a
i
j

a ? b *

a a b

T.C. = O(N×M)

S.C. = O(N×M)
↓ ??
O(2M)

LPS (Length of Longest Pallindromic Subsequence)

Eg: a b c d g g b d c z b a

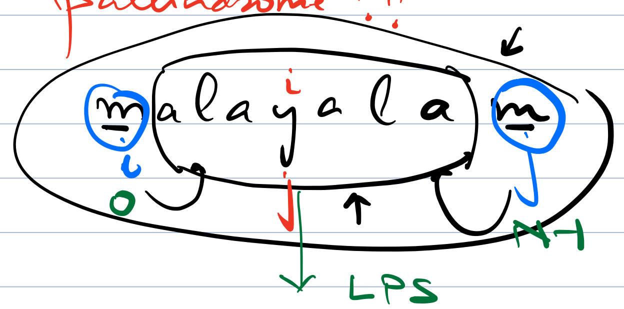
→ a b c d g g d c b a (10)

a b b a g g d g g d

a b c d b d c b e

Sol^n 1) (i) Str1 OR 2 (ii) Reverse of str1 > LCS

2) Q How to check if given string is palindrome ??



$i > j$ (0)

$i = j$ (1)

m m

1) Equality → $2 + LPS(i+1, j-1)$

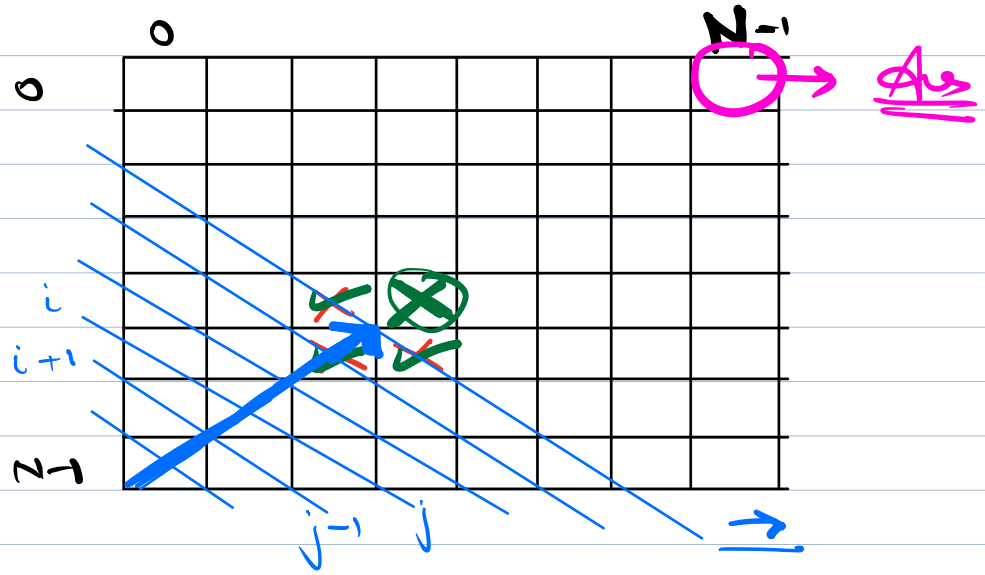
2) Inequality ⇒ 1) namana
2) anaman
→ choice

$0 + \max(LPS(i+1, j), LPS(i, j-1))$

Base Cases

Ans

0 Based ⇒ [0, N-1]



B → T |
L → R |
}
}

Next classes

- Diagonal
- MCM type of problems
- LPS ↓
  Matrix chain multiplication