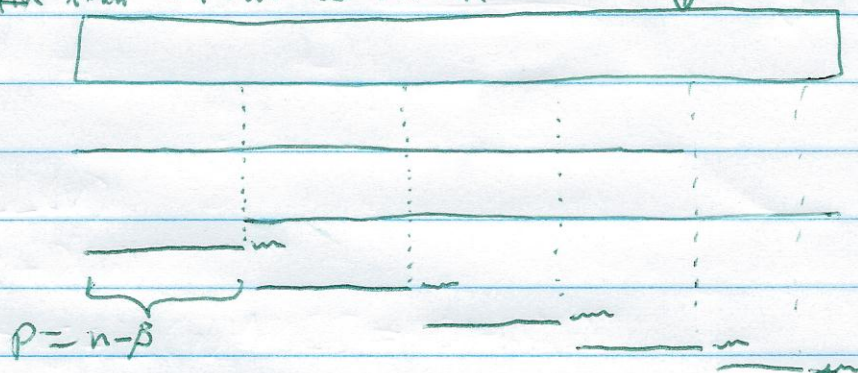


4 Periods and Borders

Borders

Proper ~~suffix~~ ^{prefix} that equals a suffix

$S =$



Periods

Overlapping borders imply the string is periodic

Normal form $S = (\text{---})_m^p$ (p is minimum period)

Longest border gives normal form.

Longest border

Naive (check all indexes) $O(n^2)$

We can do better

BA



\uparrow
LB $X[1..i]$

$$BA[1] = 0$$

$$BA[i+1] = ?$$

$BA[BA[i]]$



$$BA[i+1] = BA[BA[i]] + 1$$

$BA[i]$



$X[1..i]$



$X[1..i+1]$



$BA[i+1]$



$$BA[i+1] = BA[i] + 1$$

$B[1] = 0$

for $i = 1 \dots n-1$

$b = B[i]$

while $b > 0$ and $X[b+1] \neq X[i+1]$

$b = B[i]$

if $X[b+1] = X[i+1]$

$B[i+1] = b+1$

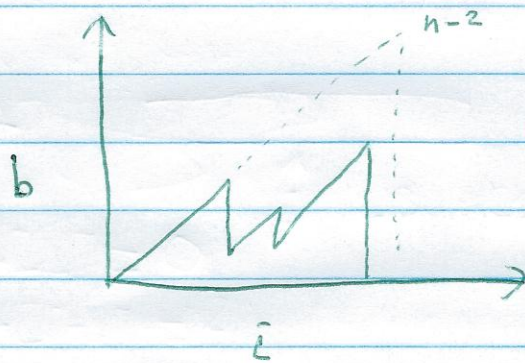
else

$B[i+1] = 0$

Time analysis

n iterations in for loop

$O(n + \text{"total time in while loop"})$



makes $n-2$ runs in while loop

time

$O(n)$