

Permutation of Dynamically Sized Array

- Prafullkumar P. Tale
Integrated M.Sc. in
Applied Mathematics
IIT Roorkee

Simple things should be simple...

Simple things should be simple...

Input :

- $X1 = [11, 22, 33]$
- $X2 = [44, 55]$

Simple things should be simple...

Input :

- $X1 = [11, 22, 33]$
- $X2 = [44, 55]$

Output

- $(11, 44) ; (11, 55) ; (22, 44) ; (22, 55) ; (33, 44) ; (33, 55)$

What's Big deal??

- Use two 'for' loops

What's Big deal??

- Use two 'for' loops

Problem is -

The size of arrays is not fixed nor does the number of arrays

What's Big deal??

- Use two 'for' loops

Problem is -

The size of arrays is not fixed nor does the number of arrays

X1 = [11,22,33 ..]

X2 = [44,55, ..]

:

:

What's Big deal??

- Use two 'for' loops

Problem is -

The size of arrays is not fixed nor does the number of arrays

X1 = [11,22,33 ..]

X2 = [44,55, ..]

:

:

Not infinity just

unknown or dynamic

Little math..

Little math..

- $a \approx b \bmod (c)$
c divides (b-a)

Little math..

- $a \approx b \pmod{c}$
c divides (b-a)
- $f(x) \approx 0 \pmod{n}$
p1, p2, p3 prime factors of 'n'

Little math..

- $a \approx b \pmod{c}$
c divides (b-a)
- $f(x) \approx 0 \pmod{n}$
p1, p2, p3 prime factors of 'n'
- $f(x) \approx 0 \pmod{p1^{e1}}$
 $f(x) \approx 0 \pmod{p2^{e2}}$
:
:

Little math..

- $a \approx b \pmod{c}$
c divides (b-a)
- $f(x) \approx 0 \pmod{n}$
p1, p2, p3 prime factors of 'n'
- $f(x) \approx 0 \pmod{p1^{e1}} \rightarrow X1$
 $f(x) \approx 0 \pmod{p2^{e2}} \rightarrow X2$
:
:

The Clock...

The Clock...

- 10:58:59 am
10:59:00 am

The Clock...

- 10:58:59 am
10:59:00 am
- 10:59:59 am
11:00:00 am

The Clock...

- 10:58:59 am
10:59:00 am
- 10:59:59 am
11:00:00 am

We can use the same concept to make permutations

- $X = X_1 + X_2 + \dots$
- L = saving lower limits
- U = saving upper limits

Example

- $X1 = [10, 20, 30]$ $X2 = [40, 50]$
 $X3 = [60, 70, 80]$

Example

- $X1 = [10, 20, 30]$ $X2 = [40, 50]$
 $X3 = [60, 70, 80]$
- $X = X1 + X2 + X3$
 $X = [10, 20, 30, 40, 50, 60, 70, 80]$

Example

- $X1 = [10, 20, 30]$ $X2 = [40, 50]$
 $X3 = [60, 70, 80]$
- $X = X1 + X2 + X3$
 $X = [10, 20, 30, 40, 50, 60, 70, 80]$
- $L = [1, 4, 6]$
- $U = [3, 5, 8]$

Algorithm

$L = [1, 4, 6]$ $U = [3, 5, 8]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$ ---> Sec place is over

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$ ---> Sec place is over
 $[1,5,6]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$ ---> Sec place is over
 $[1,5,6]$
 $[1,5,7]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$ ---> Sec place is over
 $[1,5,6]$
 $[1,5,7]$
 $[1,5,8]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$ ---> Sec place is over
 $[1,5,6]$
 $[1,5,7]$
 $[1,5,8]$ --- > Min place is over

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$ ---> Sec place is over
 $[1,5,6]$
 $[1,5,7]$
 $[1,5,8]$ --- > Min place is over
 $[2,4,6]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$ ---> Sec place is over
 $[1,5,6]$
 $[1,5,7]$
 $[1,5,8]$ --- > Min place is over
 $[2,4,6]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$ ---> Sec place is over
 $[1,5,6]$
 $[1,5,7]$
 $[1,5,8]$ --- > Min place is over
 $[2,4,6]$
 $[2,4,7]$

Algorithm

$L = [1,4,6]$ $U = [3,5,8]$

- $I = L = [1,4,6]$
 $[1,4,7]$
 $[1,4,8]$ ---> Sec place is over
 $[1,5,6]$
 $[1,5,7]$
 $[1,5,8]$ --- > Min place is over
 $[2,4,6]$
 $[2,4,7]$
 :
 $I = U$