HKOI2010 Senior

OI Football Team Solution

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whh

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Stat:

#Attempts	37
Maximum	100
#Maximum	2
Mean (Attempted)	32.4
Minimum	0
Std Dev (Attempted)	35.7

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Problem Statement : Given the positions of the N football players , K and the following process.

1) The process starts at player A.
Player A kicks the ball to player B (B!=A) with the **greatest** distance to player A.
2) Output A and A will leave
3) Player B kicks the ball to player C (C!=B) with the **least** distance to player B.
4) Repeat (1) and (3). There are K kicks in total.

Repeat the process until there is no player left.

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Constraints

For all test data,

$2<=N<=200$

$1<=K<=50000$

$0<=X_i, Y_i<=10000$

For 50% test data,

$2<=N<=50$

$1<=K<=1000$

$0<=X_i, Y_i<=1000$

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50% Solution

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Simulation

Complexity : O(KN^2)

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100% Solution

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Simulation Again !

We need to speed up the procedure of finding the nearest / the most distant player !

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For each player i,

1) Create a sorted array a[i][N-1] storing the distance of this player and all of the other players.

2) Use 2 integers NN[i] and DD[i] to store the indices of the nearest and the most distant players in the array respectively.

(NN[i] = 1 and DD[i] = N-1)

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When a player i gets the ball, maintain NN[i] and DD[i].

1) while a[i][NN] is left

    NN[i] = NN[i]+1

2) while a[i][DD] is left

    DD[i] = DD[i]-1

Find the next player immediately after this process.

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What are the complexities of the two solutions?

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O(KN^2)
vs
O(N^3 + KN + N^2)

Thank you!