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CS 180

Dis 1B

Homework 2

1. A. Since the tournament graph is a complete directed graph, that means the independent set S of the underlying undirected graph is just one node (king). Any node in the graph can be reached by that node from S via a path of length <= 2 according to the theorem. So if we pick that one node in the tournament graph that is the node in S, it can reach any other node via a path <=2.

B. Given a tournament graph G with N nodes

For every node N1 in G

Counter = 1

For every node N2 in G

If distance between N1 and N2 <=2

Counter += 1

Else

Counter = 1

Break

Endif

If Counter == N

Return N1

Endif

C. Complexity is O()

1. A. Let’s suppose that the set of edges E of Kn can’t be partitioned into sets E1 … En/2 such that each graph Gi=(V,Ei) is a spanning tree of Kn. However, we can see that if we have a graph K with N vertices, there are at least (N-1)! spanning trees of K that are completely linear. Assuming N >=2, we see that there are always at least n/2 spanning trees of K. So by way of contradiction, Kn can be partitioned into sets E1 … En/2.

B.Create array Trees

Count = 1

F(n)

Create array

If Count <= n/2

[0] = select first vertice from n

K=1

While k < n-1

[k] = select any vertice not in E

K++

Trees[Count-1] =

Count ++

If Count = n/2

Return Trees

Else

F(n)

1. F(n)

k = n-2

i = n-1

If n > 3

F(1 through n/2)

F(n/2 through n)

Endif

If A[i] < A[n] and A[i] < A[k]

Return i

Endif

This algorithm has runtime O(logn) because it uses a divide and conquer algorithm which splits the array into half each time until 3 entries remain and tests if the middle entry is a local min.

1. HeapSort(A,N)

End = 1

While End < N

Heapify (A,0,End)

End ++

End = N-1

While End > 0

Swap(A[End], A[0])

End --

Heapify (A,0,End)

Heapify(A,0,End)

Child = End

While Child > 0

Parent =

If A[Parent] < A[Child]

Swap(A[Parent], A[Child])

Child = Parent

Else

Return

Endif

This algorithm is not greedy although it builds the final sorted array element by element. It doesn’t compare each element to every other element, but to logN elements.