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## EXP 4: Informed Search Strategy

**Problem:** Apply IDA\* on the given graph.

Show updated fnew and flimit in every iteration

Final solution path with cost

**Program:**

#include<bits/stdc++.h>

using namespace std;

typedef pair<float,pair<int,int>> pi;

void ida(vector<vector<int>>& graph,vector<float>& h,priority\_queue<pi, vector<pi>, greater<pi>>& open){

float f\_bound = h[0];

float f\_new = INT\_MAX;

INIT: open.push(make\_pair(h[0],make\_pair(0,0)));

while(!open.empty()){

pair<float, pair<int,int>> curr\_state = open.top();

open.pop();

float cost = curr\_state.first;

int index = curr\_state.second.second;

float path\_cost = cost - h[index];

cout<<"f-bound: "<<f\_bound<<endl;

if(cost <= f\_bound){

cout<<"On index: "<<index<<" Cost: "<<cost<<endl;

if(index == 7) {

cout<<"Goal reached";

return;

}

for(int i=0; i<8; i++){

if(graph[index][i]!=0){

open.push(make\_pair(path\_cost+h[i]+graph[index][i],make\_pair(index,i)));

if(path\_cost+h[i]+graph[index][i]<=f\_bound) cout<<"Explored index: "<<i<<" from "<<index<<" with cost: "<<path\_cost+h[i]+graph[index][i]<<endl;

else cout<<"Explored index: "<<i<<" from "<<index<<" with cost: "<<path\_cost+h[i]+graph[index][i]<<" above limit"<<endl;

}

}

} else {

f\_new = cost;

cout<<"Cannot Explore Further At Index: "<<index<<" has Cost: "<<cost<<endl;

int index1 = -1;

while(!open.empty()){

pair<float, pair<int,int>> curr\_state = open.top();

if(f\_new>curr\_state.first){

f\_new = min(f\_new,curr\_state.first);

index1 = curr\_state.second.second;

}

open.pop();

}

cout<<"Update f\_bound from "<<f\_bound;

f\_bound = f\_new;

cout<<" to "<<f\_bound<<endl;

goto INIT;

}

}

}

int main(){

#ifndef ONLINE\_JUDGE

freopen("input.txt","r",stdin);

freopen("output.txt","w",stdout);

#endif

vector<vector<int>> graph = {{0,2,3,0,0,0,0,0},

{0,0,0,3,0,0,0,0},

{0,0,0,1,3,0,0,0},

{0,0,0,0,1,3,0,0},

{0,0,0,0,0,0,2,0},

{0,0,0,0,0,0,0,2},

{0,0,0,0,0,0,0,1},

{0,0,0,0,0,0,0,0}};

vector<float> h = {6,4,4,4,3.5,1,1,0};

priority\_queue<pi, vector<pi>, greater<pi>> open;

ida(graph,h,open);

}

**Output:**

f-bound: 6

On index: 0 Cost: 6

Explored index: 1 from 0 with cost: 6

Explored index: 2 from 0 with cost: 7 above limit

f-bound: 6

On index: 1 Cost: 6

Explored index: 3 from 1 with cost: 9 above limit

f-bound: 6

Cannot Explore Further At Index: 2 has Cost: 7

Update f\_bound from 6 to 7

f-bound: 7

On index: 0 Cost: 6

Explored index: 1 from 0 with cost: 6

Explored index: 2 from 0 with cost: 7

f-bound: 7

On index: 1 Cost: 6

Explored index: 3 from 1 with cost: 9 above limit

f-bound: 7

On index: 2 Cost: 7

Explored index: 3 from 2 with cost: 8 above limit

Explored index: 4 from 2 with cost: 9.5 above limit

f-bound: 7

Cannot Explore Further At Index: 3 has Cost: 8

Update f\_bound from 7 to 8

f-bound: 8

On index: 0 Cost: 6

Explored index: 1 from 0 with cost: 6

Explored index: 2 from 0 with cost: 7

f-bound: 8

On index: 1 Cost: 6

Explored index: 3 from 1 with cost: 9 above limit

f-bound: 8

On index: 2 Cost: 7

Explored index: 3 from 2 with cost: 8

Explored index: 4 from 2 with cost: 9.5 above limit

f-bound: 8

On index: 3 Cost: 8

Explored index: 4 from 3 with cost: 8.5 above limit

Explored index: 5 from 3 with cost: 8

f-bound: 8

On index: 5 Cost: 8

Explored index: 7 from 5 with cost: 9 above limit

f-bound: 8

Cannot Explore Further At Index: 4 has Cost: 8.5

Update f\_bound from 8 to 8.5

f-bound: 8.5

On index: 0 Cost: 6

Explored index: 1 from 0 with cost: 6

Explored index: 2 from 0 with cost: 7

f-bound: 8.5

On index: 1 Cost: 6

Explored index: 3 from 1 with cost: 9 above limit

f-bound: 8.5

On index: 2 Cost: 7

Explored index: 3 from 2 with cost: 8

Explored index: 4 from 2 with cost: 9.5 above limit

f-bound: 8.5

On index: 3 Cost: 8

Explored index: 4 from 3 with cost: 8.5

Explored index: 5 from 3 with cost: 8

f-bound: 8.5

On index: 5 Cost: 8

Explored index: 7 from 5 with cost: 9 above limit

f-bound: 8.5

On index: 4 Cost: 8.5

Explored index: 6 from 4 with cost: 8

f-bound: 8.5

On index: 6 Cost: 8

Explored index: 7 from 6 with cost: 8

f-bound: 8.5

On index: 7 Cost: 8

Goal reached