Simplified A\* Algorithm

Program:

def aStarAlgo(start\_node, stop\_node):

open\_set = set([start\_node])

closed\_set = set()

g = {} # store distance from starting node

parents = {} # parents contain an adjacency map of all nodes

# distance of starting node from itself is zero

g[start\_node] = 0

# start\_node is the root node, so it has no parent nodes

# so start\_node is set to its own parent node

parents[start\_node] = start\_node

while len(open\_set) > 0:

n = None

# node with the lowest f() is found

for v in open\_set:

if n is None or g[v] + heuristic(v) < g[n] + heuristic(n):

n = v

if n == stop\_node or n is None or n not in Graph\_nodes:

break

else:

for m, weight in get\_neighbors(n):

# nodes 'm' not in open\_set and closed\_set are added to open\_set

# n is set as its parent

if m not in open\_set and m not in closed\_set:

open\_set.add(m)

parents[m] = n

g[m] = g[n] + weight

# for each node m, compare its distance from start i.e g(m)

# to the from start through n node

else:

if g[m] > g[n] + weight:

# update g(m)

g[m] = g[n] + weight

# change parent of m to n

parents[m] = n

# if m is in closed\_set, remove and add to open\_set

if m in closed\_set:

closed\_set.remove(m)

open\_set.add(m)

# remove n from the open\_set and add it to closed\_set

# because all of its neighbors were inspected

open\_set.remove(n)

closed\_set.add(n)

if n is None:

print('Path does not exist!')

return None

# if the current node is the stop\_node,

# then we begin reconstructing the path from it to the start\_node

if n == stop\_node:

path = []

while parents[n] != n:

path.append(n)

n = parents[n]

path.append(start\_node)

path.reverse()

print('Path found:', path)

return path

print('Path does not exist!')

return None

# define function to return neighbors and their distances from the passed node

def get\_neighbors(v):

if v in Graph\_nodes:

return Graph\_nodes[v]

else:

return None

# for simplicity, we'll consider heuristic distances given

# and this function returns heuristic distance for all nodes

def heuristic(n):

h\_dist = {

'A': 11,

'B': 6,

'C': 99,

'D': 1,

'E': 7,

'G': 0

}

return h\_dist[n]

# Describe your graph here

Graph\_nodes = {

'A': [('B', 2), ('E', 3)],

'B': [('A', 2), ('C', 1), ('G', 9)],

'C': [('B', 1)],

'D': [('E', 6), ('G', 1)],

'E': [('A', 3), ('D', 6)],

'G': [('B', 9), ('D', 1)]

}

print("Following is the A\* Algorithm:")

aStarAlgo('A', 'G')

Output:

Path found: [‘A’, ‘E’, ‘D’, ‘G’]