```
class Graph:
    def __init__(self, graph, heuristicNodeList, startNode): #instantiate graph object with graph topology, heuristic values, start node
        self.graph = graph
        self.H=heuristicNodeList
        self.start=startNode
        self.parent={}
        self.status={}
        self.solutionGraph={}

    def applyAOStar(self): # starts a recursive AO* algorithm
        self.aoStar(self.start, False)

    def getNeighbors(self, v): # gets the Neighbors of a given node
        return self.graph.get(v,'')

    def getStatus(self,v): # return the status of a given node
        return self.status.get(v,0)

    def setStatus(self,v, val): # set the status of a given node
        self.status[v]=val

    def getHeuristicNodeValue(self, n):
        return self.H.get(n,0) # always return the heuristic value of a given node

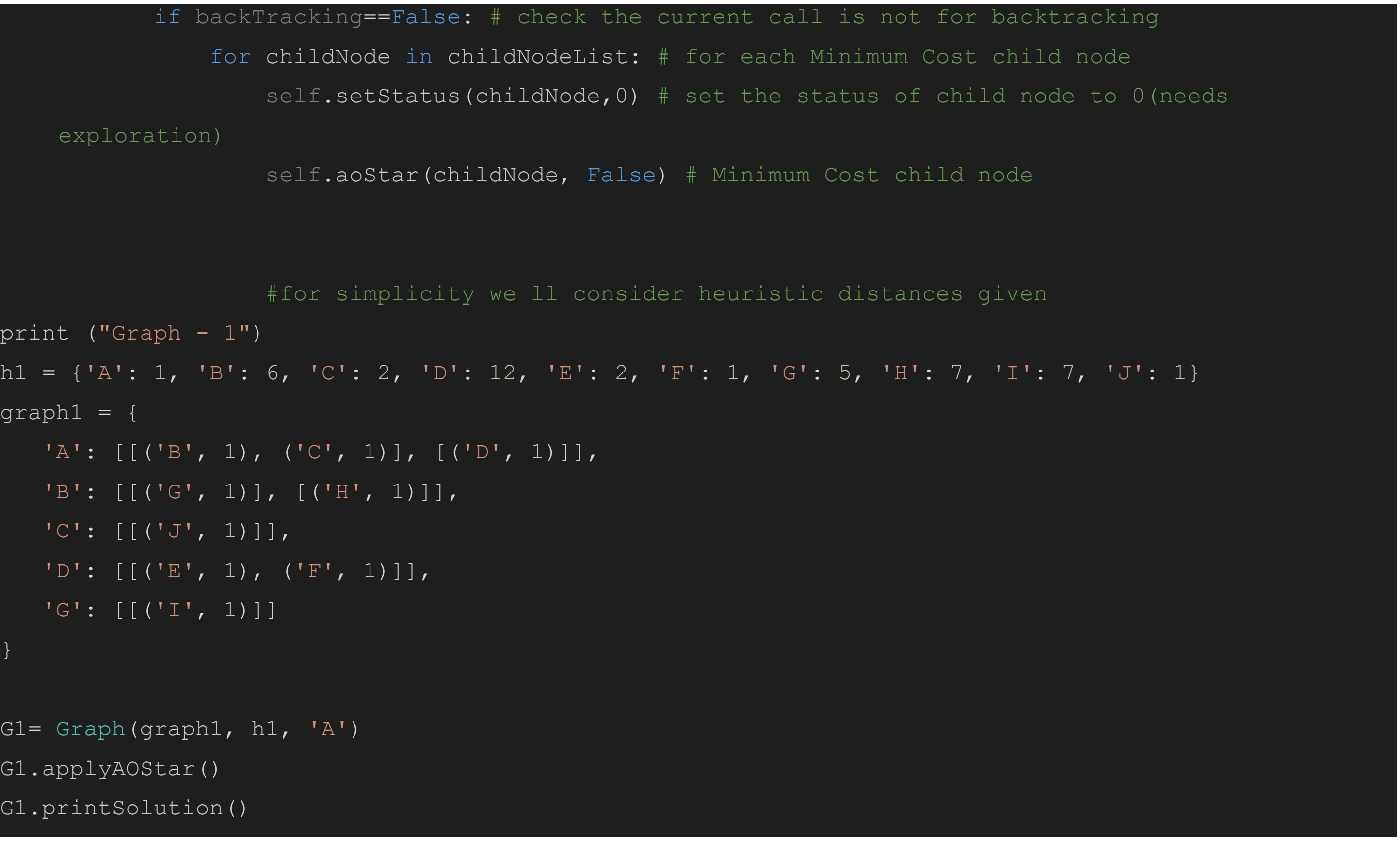
    def setHeuristicNodeValue(self, n, value):
        self.H[n]=value # set the revised heuristic value of a given node

    def printSolution(self):
        print("FOR GRAPH SOLUTION, TRAVERSE THE GRAPH FROM THE START NODE:",self.start)
        print("------------------------------------------------------------")
        print(self.solutionGraph)
        print("------------------------------------------------------------")

    def computeMinimumCostChildNodes(self, v): # Computes the Minimum Cost of child nodes of a given node v
        minimumCost=0
        costToChildNodeListDict={}
        costToChildNodeListDict[minimumCost]=[]
        flag=True
        for nodeInfoTupleList in self.getNeighbors(v): # iterate over all the set of child node/s
            cost=0
        nodeList=[]
        for c, weight in nodeInfoTupleList:
            cost=cost+self.getHeuristicNodeValue(c)+weight
            nodeList.append(c)
        if flag==True: # initialize Minimum Cost with the cost of first set of child node/s
            minimumCost=cost
            costToChildNodeListDict[minimumCost]=nodeList # set the Minimum Cost child node/s
            flag=False
        else: # checking the Minimum Cost nodes with the current Minimum Cost
            if minimumCost>cost:
                minimumCost=cost
                costToChildNodeListDict[minimumCost]=nodeList # set the Minimum Cost child
 node/s
    return minimumCost, costToChildNodeListDict[minimumCost] # return Minimum Cost and Minimum
 Cost child node/s

def aoStar(self, v, backTracking): # AO* algorithm for a start node and backTracking status flag
    print("HEURISTIC VALUES :", self.H)
    print("SOLUTION GRAPH :", self.solutionGraph)
    print("PROCESSING NODE :", v)

 print("-----------------------------------------------------------------------------------------
 -")
    if self.getStatus(v) >= 0: # if status node v >= 0, compute Minimum Cost nodes of v
        minimumCost, childNodeList = self.computeMinimumCostChildNodes(v)
        print(minimumCost, childNodeList)
        self.setHeuristicNodeValue(v, minimumCost)
        self.setStatus(v,len(childNodeList))
        solved=True # check the Minimum Cost nodes of v are solved
        for childNode in childNodeList:
            self.parent[childNode]=v
            if self.getStatus(childNode)!=-1:
                solved=solved & False
        if solved==True: # if the Minimum Cost nodes of v are solved, set the current node
 status as solved(-1)
            self.setStatus(v,-1)
            self.solutionGraph[v]=childNodeList # update the solution graph with the solved
 nodes which may be a part of solution
        if v!=self.start: # check the current node is the start node for backtracking the
 current node value
            self.aoStar(self.parent[v], True) # backtracking the current node value with
 backtracking status set to true
```



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           if backTracking==False: # check the current call is not for backtracking
               for childNode in childNodeList: # for each Minimum Cost child node
                   self.setStatus(childNode,0) # set the status of child node to 0(needs
    exploration)
                   self.aoStar(childNode, False) # Minimum Cost child node



                   #for simplicity we ll consider heuristic distances given
print ("Graph - 1")
h1 = {'A': 1, 'B': 6, 'C': 2, 'D': 12, 'E': 2, 'F': 1, 'G': 5, 'H': 7, 'I': 7, 'J': 1}
graph1 = {
   'A': [[('B', 1), ('C', 1)], [('D', 1)]],
   'B': [[('G', 1)], [('H', 1)]],
   'C': [[('J', 1)]],
   'D': [[('E', 1), ('F', 1)]],
   'G': [[('I', 1)]]
}

G1= Graph(graph1, h1, 'A')
G1.applyAOStar()
G1.printSolution()
```