Assignment #A: 图论：算法，树算及栈

Updated 2018 GMT+8 Apr 21, 2024

2024 spring, Complied by ==同学的姓名、院系==

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说明：

1）请把每个题目解题思路（可选），源码Python, 或者C++（已经在Codeforces/Openjudge上AC），截图（包含Accepted），填写到下面作业模版中（推荐使用 typora https://typoraio.cn，或者用word）。AC 或者没有AC，都请标上每个题目大致花费时间。

2）提交时候先提交pdf文件，再把md或者doc文件上传到右侧“作业评论”。Canvas需要有同学清晰头像、提交文件有pdf、"作业评论"区有上传的md或者doc附件。

3）如果不能在截止前提交作业，请写明原因。

编程环境

==（请改为同学的操作系统、编程环境等）==

操作系统：win10

Python编程环境：Spyder IDE 5.2.2

C/C++编程环境：

1. 题目

20743: 整人的提词本

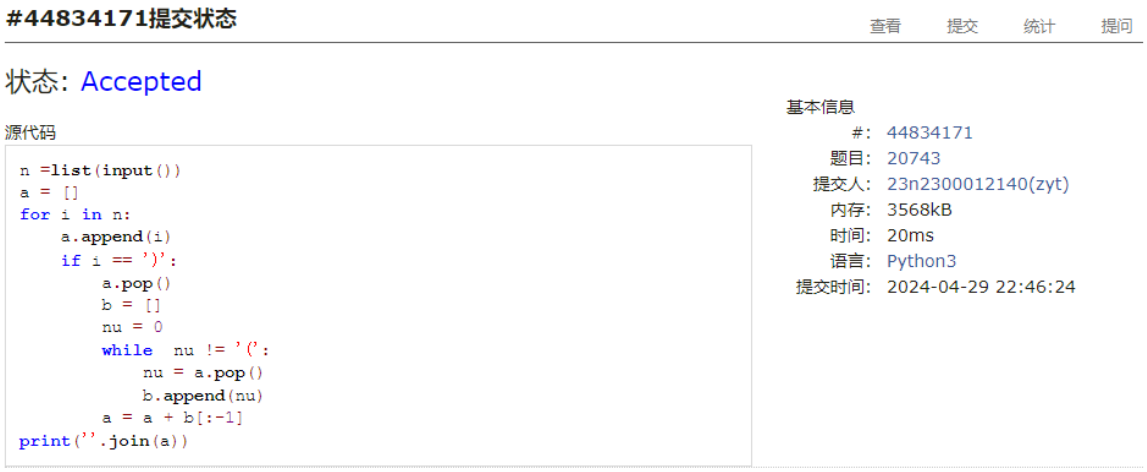
http://cs101.openjudge.cn/practice/20743/

思路：用两个列表就可以解决

代码

```
n =list(input())
a = []
for i in n:
    a.append(i)
    if i == ')':
        a.pop()
        b = []
        nu = 0
        while  nu != '(':
            nu = a.pop()
            b.append(nu)
        a = a + b[:-1]
print(''.join(a))
```

代码运行截图 ==（至少包含有"Accepted"）==



02255: 重建二叉树

http://cs101.openjudge.cn/practice/02255/

思路：和之前布置的作业一样的题型

代码

```
def tree(pre,ino):
    if not pre:
        return ''
    root = pre[0]
    ind = ino.index(root)
    preleft = pre[1:ind+1]
    preright = pre[ind+1:]
    inoleft = ino[:ind]
    inoright = ino[ind+1:]
    treeleft = tree(preleft,inoleft)
    treeright = tree(preright,inoright)
    return treeleft + treeright +root

while True:
    try:
        pre,ino = input().split()
        post = tree(pre,ino)
        print(post)
    except EOFError:
        break
```

代码运行截图 ==（至少包含有"Accepted"）==

01426: Find The Multiple

http://cs101.openjudge.cn/practice/01426/

要求用bfs实现

思路：在正常方法上加了一点数论

代码

```
from collections import deque
def ans(n):
    ban = deque([10,11])
    st = []
    while ban:
        bt = ban.popleft()
        if bt % n == 0:
            return str(bt)
        else:
            if bt % n not in st:
                st.append(bt % n)
                ban.append(bt*10)
                ban.append(bt*10+1)
while True:
    n = int(input())
    if n == 0:
        break
    print(ans(n))
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==

#44836652提交状态

查看 提交 统计 提问

状态: Accepted

源代码

```
from collections import deque
def ans(n):
    ban = deque([10,11])
    st = []
    while ban:
        bt = ban.popleft()
        if bt % n == 0:
            return str(bt)
        else:
            if bt % n not in st:
                st.append(bt % n)
                ban.append(bt*10)
                ban.append(bt*10+1)
while True:
    n = int(input())
    if n == 0:
        break
    print(ans(n))
```

基本信息

#: 44836652
题目: 01426
提交人: 23n2300012140(zyt)
内存: 3596kB
时间: 56ms
语言: Python3
提交时间: 2024-04-30 17:03:43

English 帮助 关于

04115: 鸣人和佐助

bfs, http://cs101.openjudge.cn/practice/04115/

思路：最初没有用set，超时后改用set就ac了。

代码

```
from collections import deque
def bfs(x,y,t):
    v = set()
    dir = [(-1, 0), (0, -1), (1, 0), (0, 1)]
    s = deque()
    s.append((x,y,t,0))
    while s:
        nx,ny,nt,ns = s.popleft()
        for a,b in dir:
            newx = nx + a
            newy = ny + b
            if 0 <= newx < m and 0 <= newy <n:
                if maze[newx][newy] == '#':
                    newt = nt - 1
                else:
                    newt = nt
                if newt >= 0 and (newx,newy,newt) not in v:
                    news = ns + 1
                    if maze[newx][newy] == '+':
                        return news
                    s.append((newx,newy,newt,news))
                    v.add((newx,newy,newt))
    return -1

m,n,t = map(int,input().split())
```

```
maze = []
for _ in range(m):
    maze.append(list(input()))
for i in range(m):
    for j in range(n):
        if maze[i][j] == '@':
            x = i
            y = j
print(bfs(x,y,t))
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==

#44838227提交状态

查看 提交 统计 提问

状态: Accepted

源代码

```
from collections import deque
def bfs(x,y,t):
    v = set()
    dir = [(-1, 0), (0, -1), (1, 0), (0, 1)]
    s = deque()
    s.append((x,y,t,0))
    while s:
        nx,ny,nt,ns = s.popleft()
        for a,b in dir:
            newx = nx + a
            newy = ny + b
            if 0 <= newx < m and 0 <= newy <n:
                if maze[newx][newy] == '#':
                    newt = nt - 1
                else:
                    newt = nt
                if newt >= 0 and (newx,newy,newt) not in v:
                    news = ns + 1
                    if maze[newx][newy] == '+':
                        return news
                    s.append((newx,newy,newt,news))
                    v.add((newx,newy,newt))
    return -1
```

基本信息

#: 44838227
题目: 04115
提交人: 23n2300012140(zyt)
内存: 7584kB
时间: 73ms
语言: Python3
提交时间: 2024-04-30 21:51:21

20106: 走山路

Dijkstra, http://cs101.openjudge.cn/practice/20106/

思路：类似的bfs

代码

```
def bfs(x,y):
    dire = [[0,1],[0,-1],[1,0],[-1,0]]
    que = [(x,y)]
    dis = {(x,y):0}
    while que:
        newx,newy = que.pop(0)
        if 0<=newx<m and 0<=newy<n and mapa[newx][newy] != "#":
            for i in range(4):
                yanx,yany = newx + dire[i][0],newy + dire[i][1]
```

```
                if  0<=yanx<m and 0<=yany<n and mapa[yanx][yany] != "#":
                    juli = dis[(newx,newy)] + abs(int(mapa[yanx][yany])-
int(mapa[newx][newy]))
                    if (yanx,yany) not in dis or juli < dis[(yanx,yany)]:
                        dis[(yanx,yany)] = juli
                        que.append((yanx,yany))
    return dis

m,n,p = map(int,input().split())
mapa = []
for _ in range(m):
    mapa.append(list(input().split()))
for _ in range(p):
    x1,y1,x2,y2 = map(int,input().split())
    a = bfs(x1,y1)
    if mapa[x1][y1] == '#' or mapa[x2][y2] == '#':
        print('NO')
    else:
        if (x2,y2) in a:
            print(a[(x2,y2)])
        else:
            print('NO')
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==

状态：Accepted

源代码

```
def bfs(x,y):
    dire = [[0,1],[0,-1],[1,0],[-1,0]]
    que = [(x,y)]
    dis = {(x,y):0}
    while que:
        newx,newy = que.pop(0)
        if 0<=newx<m and 0<=newy<n and mapa[newx][newy] != "#":
            for i in range(4):
                yanx,yany = newx + dire[i][0],newy + dire[i][1]
                if  0<=yanx<m and 0<=yany<n and mapa[yanx][yany] != "#":
                    juli = dis[(newx,newy)] + abs(int(mapa[yanx][yany])
                    if (yanx,yany) not in dis or juli < dis[(yanx,yany)]
                        dis[(yanx,yany)] = juli
                        que.append((yanx,yany))
    return dis

m,n,p = map(int,input().split())
mapa = []
for _ in range(m):
    mapa.append(list(input().split()))
for _ in range(p):
    x1,y1,x2,y2 = map(int,input().split())
```

基本信息

#:	44838638
题目:	20106
提交人:	23n2300012140(zyt)
内存:	4100kB
时间:	1354ms
语言:	Python3
提交时间:	2024-04-30 23:20:16

05442: 兔子与星空

Prim, http://cs101.openjudge.cn/practice/05442/

思路：比前几个要难，自己没有什么好的思路

代码

```
class DisjSet:
    def __init__(self, n):
        self.parent = [i for i in range(n)]
        self.rank = [0]*n

    def find(self, x):
        if self.parent[x] != x:
            self.parent[x] = self.find(self.parent[x])
        return self.parent[x]

    def union(self, x, y):
        xset, yset = self.find(x), self.find(y)
        if self.rank[xset] > self.rank[yset]:
            self.parent[yset] = xset
        else:
            self.parent[xset] = yset
            if self.rank[xset] == self.rank[yset]:
                self.rank[yset] += 1

def kruskal(n, edges):
    dset = DisjSet(n)
    edges.sort(key = lambda x:x[2])
    sol = 0
    for u, v, w in edges:
        u, v = ord(u)-65, ord(v)-65
        if dset.find(u) != dset.find(v):
            dset.union(u, v)
            sol += w
    if len(set(dset.find(i) for i in range(n))) > 1:
        return -1
    return sol

n = int(input())
edges = []
for _ in range(n-1):
    arr = input().split()
    root, m = arr[0], int(arr[1])
    for i in range(m):
        edges.append((root, arr[2+2*i], int(arr[3+2*i])))
print(kruskal(n, edges))
```

代码运行截图 ==（AC代码截图，至少包含有"Accepted"）==

#44838648提交状态

查看 提交 统计 提问

状态: Accepted

源代码

```
class DisjSet:
    def __init__(self, n):
        self.parent = [i for i in range(n)]
        self.rank = [0]*n

    def find(self, x):
        if self.parent[x] != x:
            self.parent[x] = self.find(self.parent[x])
        return self.parent[x]

    def union(self, x, y):
        xset, yset = self.find(x), self.find(y)
        if self.rank[xset] > self.rank[yset]:
            self.parent[yset] = xset
        else:
            self.parent[xset] = yset
            if self.rank[xset] == self.rank[yset]:
                self.rank[yset] += 1

def kruskal(n, edges):
    dset = DisjSet(n)
    edges.sort(key = lambda x:x[2])
```

基本信息

#: 44838648
题目: 05442
提交人: 23n2300012140(zyt)
内存: 3696kB
时间: 19ms
语言: Python3
提交时间: 2024-04-30 23:23:30

2. 学习总结和收获

==如果作业题目简单，有否额外练习题目，比如：OJ“2024spring每日选做”、CF、LeetCode、洛谷等网站题目。==

本周作业涉及较多之前的内容，因此大部分题写起来还是较为轻松的