Assignment #8: 图论：概念、遍历，及树算

Updated 1919 GMT+8 Apr 8, 2024

2024 spring, Complied by 刘子暄 环境科学与工程学院

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：Windows 11

Python编程环境: PyCharm Community Edition 2023.3

1. 题目

19943: 图的拉普拉斯矩阵

matrices, http://cs101.openjudge.cn/practice/19943/

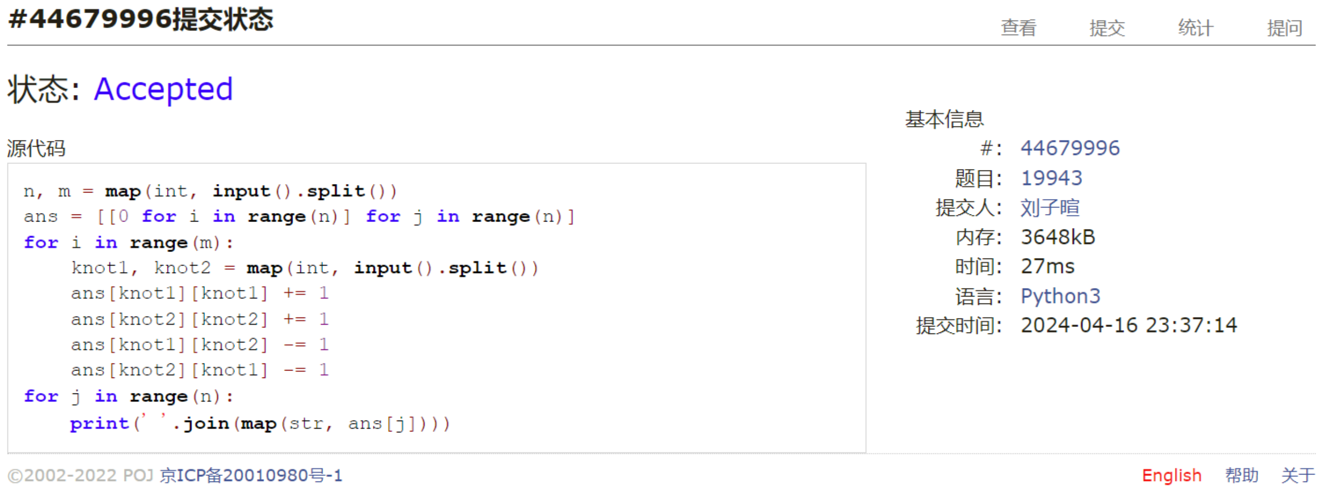
请定义Vertex类，Graph类，然后实现

思路：

代码

```
n, m = map(int, input().split())
ans = [[0 for i in range(n)] for j in range(n)]
for i in range(m):
    knot1, knot2 = map(int, input().split())
    ans[knot1][knot1] += 1
    ans[knot2][knot2] += 1
    ans[knot1][knot2] -= 1
    ans[knot2][knot1] -= 1
for j in range(n):
    print(' '.join(map(str, ans[j])))
```

代码运行截图 （至少包含有"Accepted"）



#44679996提交状态

状态: Accepted

源代码

```
n, m = map(int, input().split())
ans = [[0 for i in range(n)] for j in range(n)]
for i in range(m):
    knot1, knot2 = map(int, input().split())
    ans[knot1][knot1] += 1
    ans[knot2][knot2] += 1
    ans[knot1][knot2] -= 1
    ans[knot2][knot1] -= 1
for j in range(n):
    print(' '.join(map(str, ans[j])))
```

基本信息

#:	44679996
题目:	19943
提交人:	刘子暄
内存:	3648kB
时间:	27ms
语言:	Python3
提交时间:	2024-04-16 23:37:14

©2002-2022 POJ 京ICP备20010980号-1

18160: 最大连通域面积

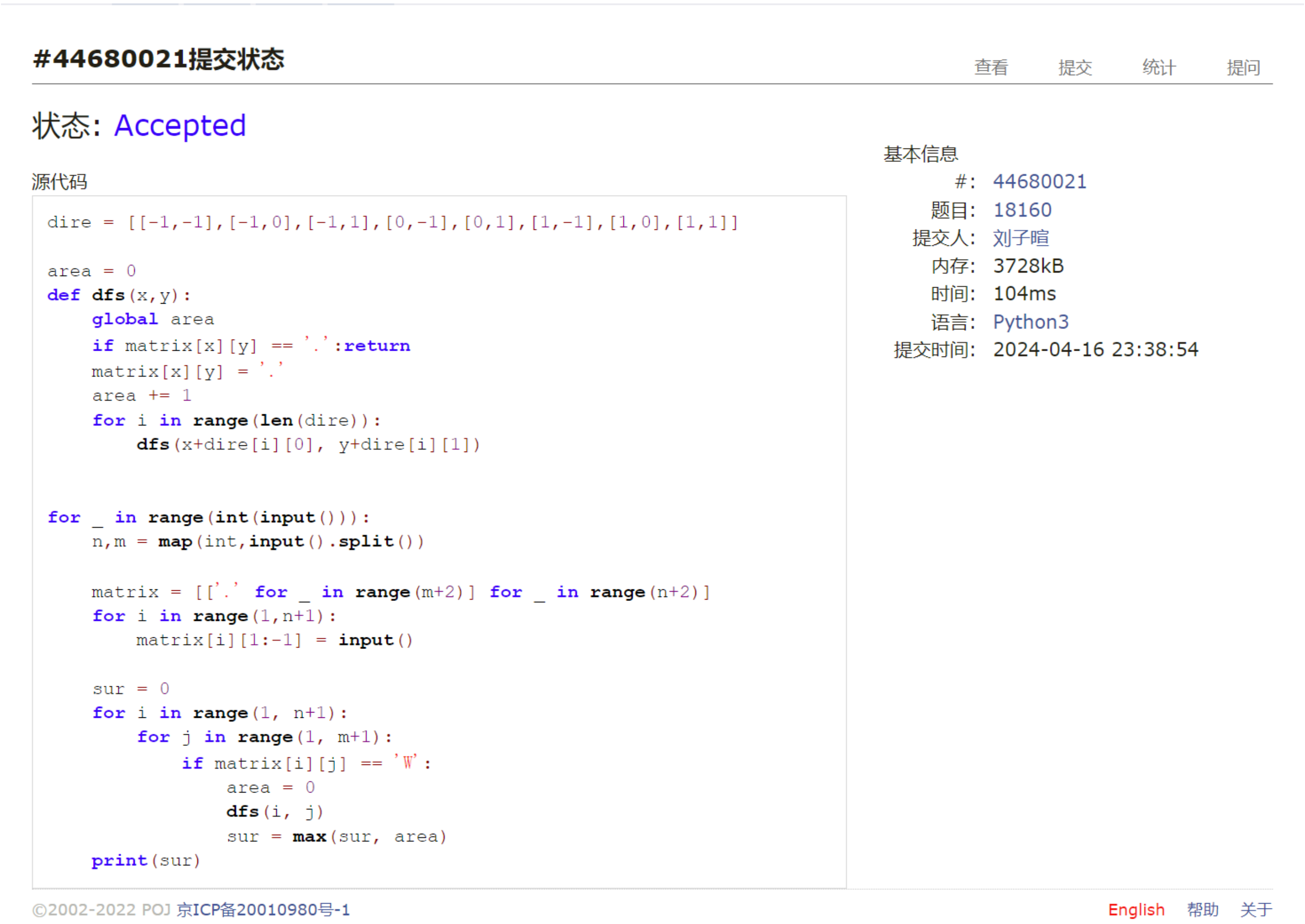
matrix/dfs similar, http://cs101.openjudge.cn/practice/18160

思路：

代码

```
dire = [[-1,-1],[-1,0],[-1,1],[0,-1],[0,1],[1,-1],[1,0],[1,1]]

area = 0
def dfs(x,y):
    global area
    if matrix[x][y] == '.':return
    matrix[x][y] = '.'
    area += 1
    for i in range(len(dire)):
        dfs(x+dire[i][0], y+dire[i][1])


for _ in range(int(input())):
    n,m = map(int,input().split())

    matrix = [['.' for _ in range(m+2)] for _ in range(n+2)]
    for i in range(1,n+1):
        matrix[i][1:-1] = input()

    sur = 0
    for i in range(1, n+1):
        for j in range(1, m+1):
            if matrix[i][j] == 'W':
                area = 0
                dfs(i, j)
                sur = max(sur, area)
    print(sur)
```

代码运行截图 （至少包含有"Accepted"）



状态: Accepted

源代码

```
dire = [[-1,-1],[-1,0],[-1,1],[0,-1],[0,1],[1,-1],[1,0],[1,1]]

area = 0
def dfs(x,y):
    global area
    if matrix[x][y] == '.':return
    matrix[x][y] = '.'
    area += 1
    for i in range(len(dire)):
        dfs(x+dire[i][0], y+dire[i][1])


for _ in range(int(input())):
    n,m = map(int,input().split())

    matrix = [['.' for _ in range(m+2)] for _ in range(n+2)]
    for i in range(1,n+1):
        matrix[i][1:-1] = input()

    sur = 0
    for i in range(1, n+1):
        for j in range(1, m+1):
            if matrix[i][j] == 'W':
                area = 0
                dfs(i, j)
                sur = max(sur, area)
    print(sur)
```

基本信息

#:	44680021
题目:	18160
提交人:	刘子暄
内存:	3728kB
时间:	104ms
语言:	Python3
提交时间:	2024-04-16 23:38:54

sy383: 最大权值连通块

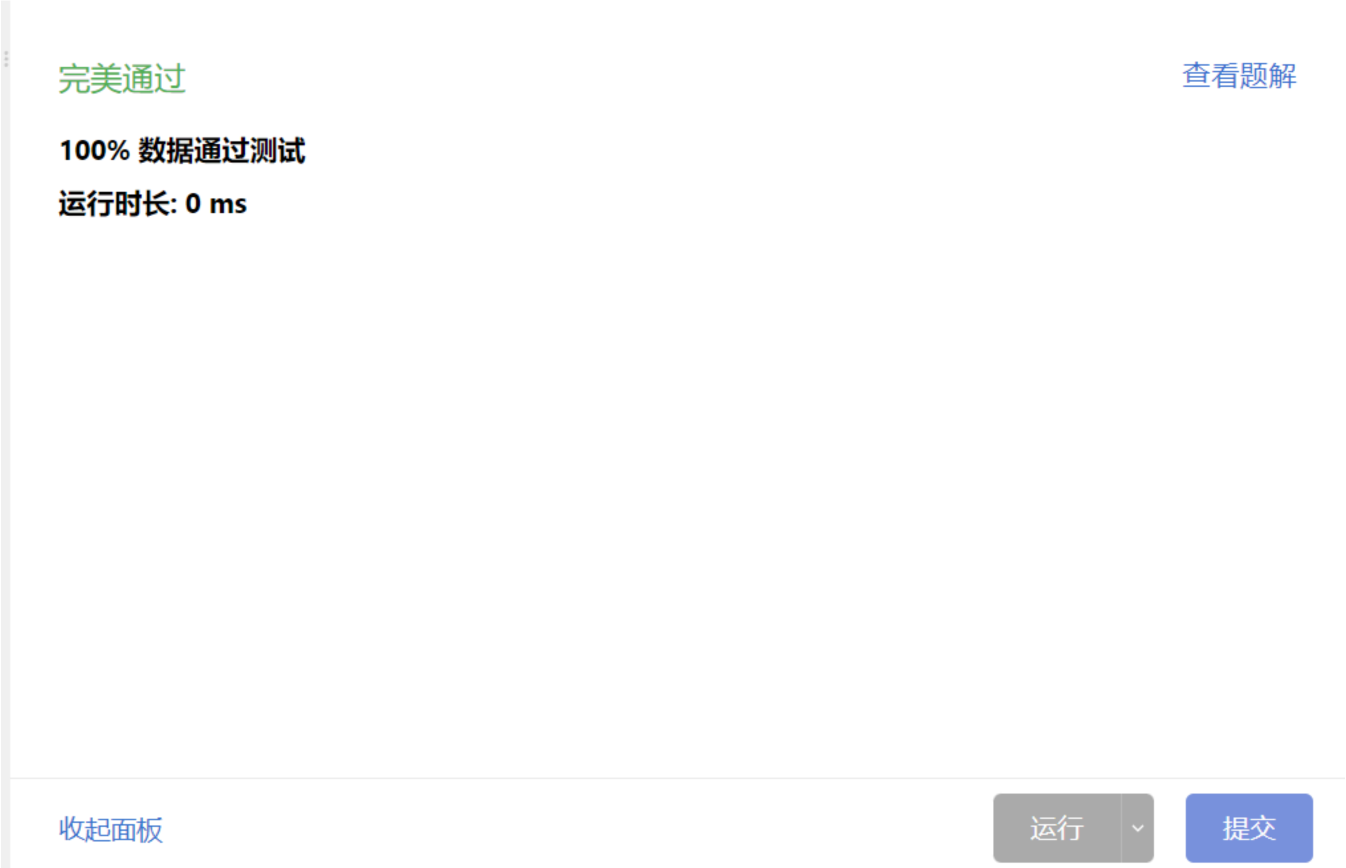
https://sunnywhy.com/sfbj/10/3/383

思路：

代码

```python
def max_weight(n, m, weights, edges):
    graph = [[] for _ in range(n)]
    for u, v in edges:
        graph[u].append(v)
        graph[v].append(u)

    visited = [False] * n
    max_weight = 0

    def dfs(node):
        visited[node] = True
        total_weight = weights[node]
        for neighbor in graph[node]:
            if not visited[neighbor]:
                total_weight += dfs(neighbor)
        return total_weight

    for i in range(n):
        if not visited[i]:
            max_weight = max(max_weight, dfs(i))

    return max_weight

n, m = map(int, input().split())
weights = list(map(int, input().split()))
edges = []
for _ in range(m):
    u, v = map(int, input().split())
    edges.append((u, v))

print(max_weight(n, m, weights, edges))
```

代码运行截图 （AC代码截图，至少包含有"Accepted"）


完美通过

100% 数据通过测试

运行时长: 0 ms

03441: 4 Values whose Sum is 0

data structure/binary search, http://cs101.openjudge.cn/practice/03441

思路：

代码

```
#
```

代码运行截图 （AC代码截图，至少包含有"Accepted"）

04089: 电话号码

trie, http://cs101.openjudge.cn/practice/04089/

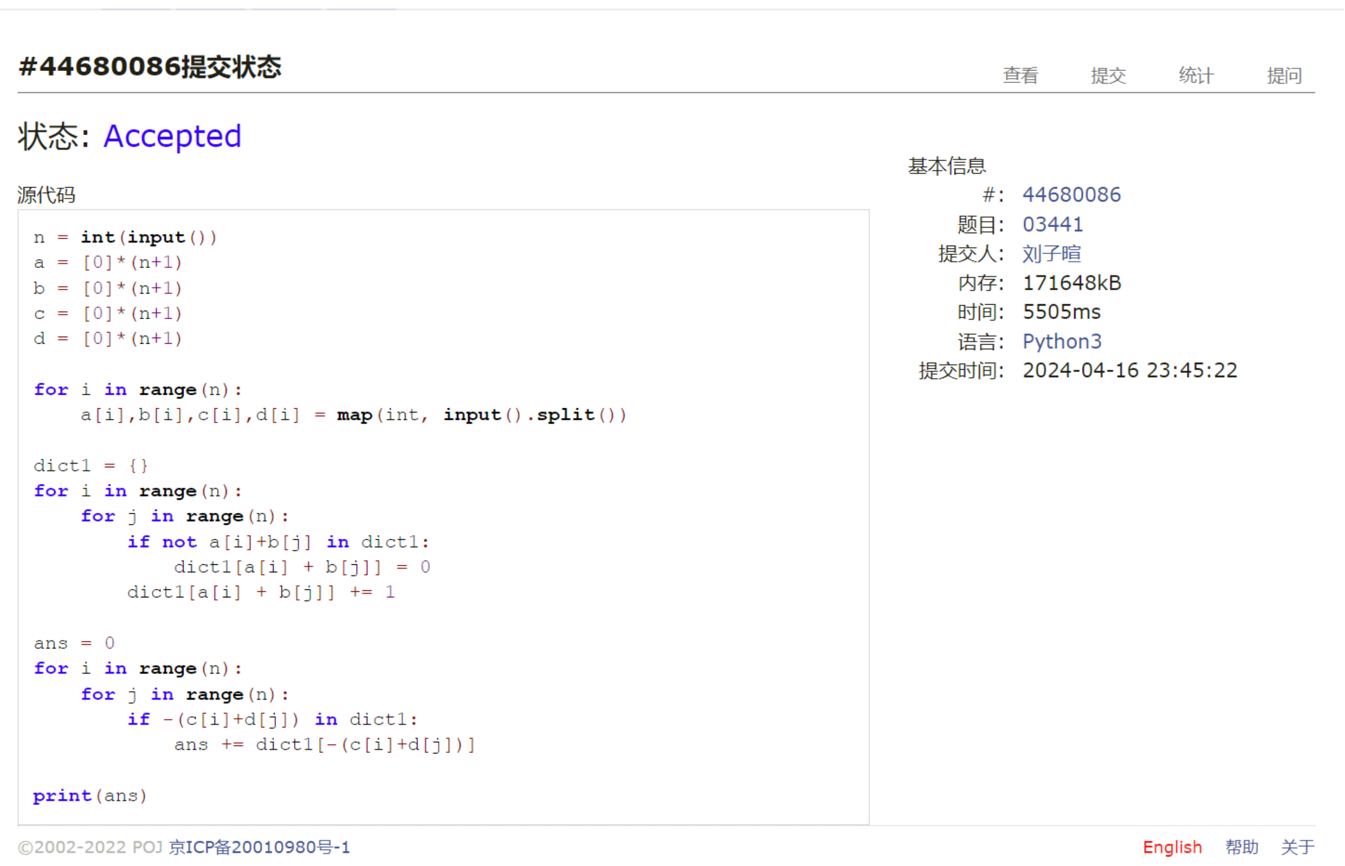
Trie 数据结构可能需要自学下。

思路：

代码

```
n = int(input())
a = [0]*(n+1)
b = [0]*(n+1)
c = [0]*(n+1)
d = [0]*(n+1)

for i in range(n):
    a[i],b[i],c[i],d[i] = map(int, input().split())

dict1 = {}
for i in range(n):
    for j in range(n):
        if not a[i]+b[j] in dict1:
            dict1[a[i] + b[j]] = 0
        dict1[a[i] + b[j]] += 1

ans = 0
for i in range(n):
    for j in range(n):
        if -(c[i]+d[j]) in dict1:
            ans += dict1[-(c[i]+d[j])]

print(ans)
```

代码运行截图 （AC代码截图，至少包含有"Accepted"）



#44680086提交状态

状态: Accepted

源代码

```python
n = int(input())
a = [0]*(n+1)
b = [0]*(n+1)
c = [0]*(n+1)
d = [0]*(n+1)

for i in range(n):
    a[i],b[i],c[i],d[i] = map(int, input().split())

dict1 = {}
for i in range(n):
    for j in range(n):
        if not a[i]+b[j] in dict1:
            dict1[a[i] + b[j]] = 0
        dict1[a[i] + b[j]] += 1

ans = 0
for i in range(n):
    for j in range(n):
        if -(c[i]+d[j]) in dict1:
            ans += dict1[-(c[i]+d[j])]

print(ans)
```

基本信息

#:	44680086
题目:	03441
提交人:	刘子暄
内存:	171648kB
时间:	5505ms
语言:	Python3
提交时间:	2024-04-16 23:45:22

©2002-2022 POJ 京ICP备20010980号-1

04082: 树的镜面映射

http://cs101.openjudge.cn/practice/04082/

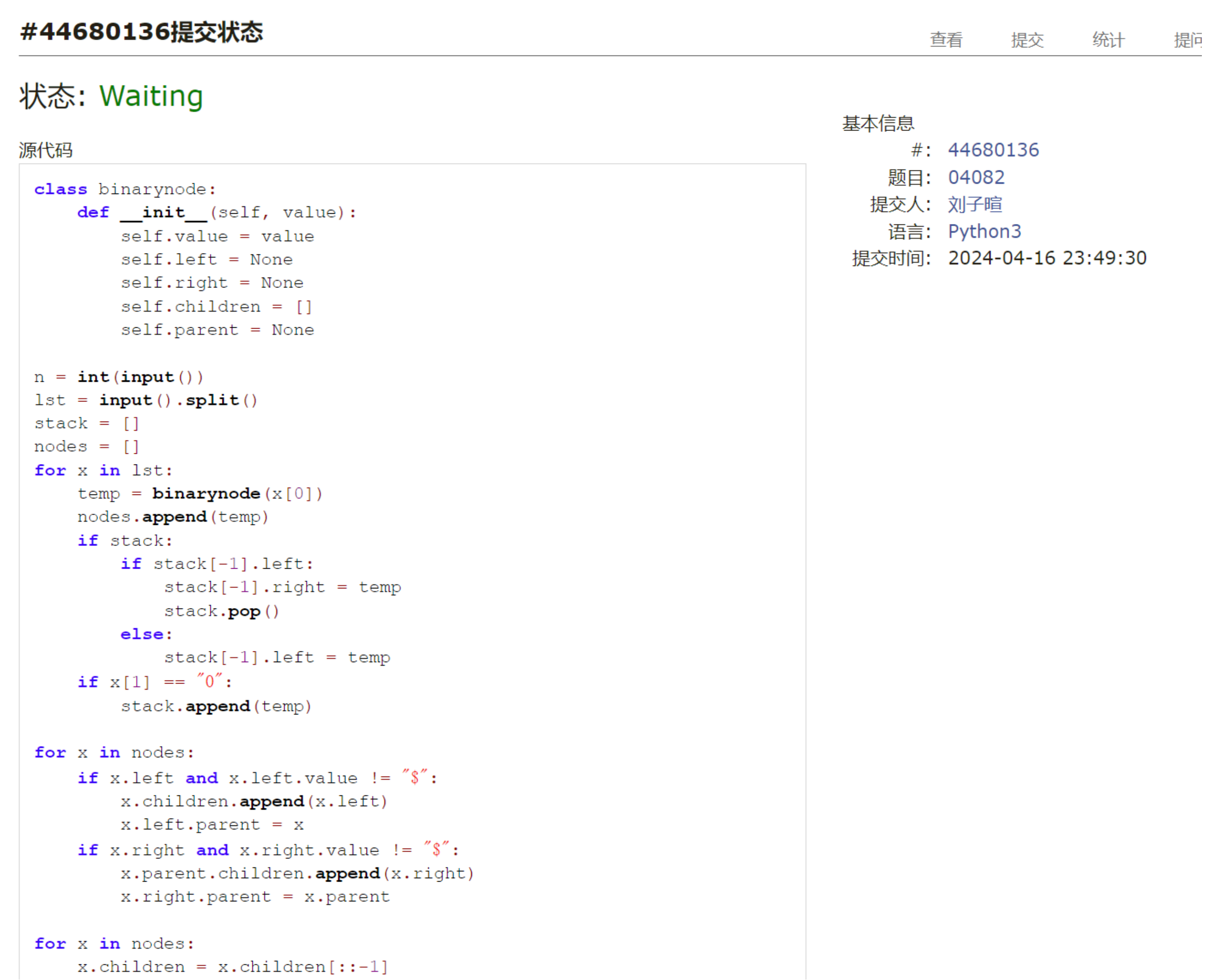
思路：

代码

```
class binarynode:
    def __init__(self, value):
        self.value = value
        self.left = None
        self.right = None
        self.children = []
        self.parent = None

n = int(input())
lst = input().split()
stack = []
nodes = []
for x in lst:
    temp = binarynode(x[0])
    nodes.append(temp)
    if stack:
        if stack[-1].left:
            stack[-1].right = temp
            stack.pop()
        else:
            stack[-1].left = temp
    if x[1] == "0":
        stack.append(temp)

for x in nodes:
    if x.left and x.left.value != "$":
        x.children.append(x.left)
        x.left.parent = x
    if x.right and x.right.value != "$":
        x.parent.children.append(x.right)
        x.right.parent = x.parent

for x in nodes:
    x.children = x.children[::-1]

lst1 = [nodes[0]]
for x in lst1:
    if x.children:
        lst1 += x.children
```

```
print(" ".join([x.value for x in lst1]))
```

代码运行截图 （AC代码截图，至少包含有"Accepted"）



#44680136提交状态

状态：Waiting

源代码

```
class binarynode:
    def __init__(self, value):
        self.value = value
        self.left = None
        self.right = None
        self.children = []
        self.parent = None

n = int(input())
lst = input().split()
stack = []
nodes = []
for x in lst:
    temp = binarynode(x[0])
    nodes.append(temp)
    if stack:
        if stack[-1].left:
            stack[-1].right = temp
            stack.pop()
        else:
            stack[-1].left = temp
    if x[1] == "0":
        stack.append(temp)

for x in nodes:
    if x.left and x.left.value != "$":
        x.children.append(x.left)
        x.left.parent = x
    if x.right and x.right.value != "$":
        x.parent.children.append(x.right)
        x.right.parent = x.parent

for x in nodes:
    x.children = x.children[::-1]
```

基本信息

#：	44680136
题目：	04082
提交人：	刘子暄
语言：	Python3
提交时间：	2024-04-16 23:49:30

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。

最后一题突然很难，还得多看