Assignment #B: 图为主

Updated 2223 GMT+8 Apr 29, 2025

2025 spring, Complied by 任宇桐 物理学院

> **说明：**
>
> 1. **解题与记录：**
>
> 对于每一个题目，请提供其解题思路（可选），并附上使用Python或C++编写的源代码（确保已在OpenJudge， Codeforces，LeetCode等平台上获得Accepted）。请将这些信息连同显示“Accepted”的截图一起填写到下方的作业模板中。（推荐使用Typora https://typoraio.cn 进行编辑，当然你也可以选择Word。）无论题目是否已通过，请标明每个题目大致花费的时间。
>
> 2. **提交安排：**提交时，请首先上传PDF格式的文件，并将.md或.doc格式的文件作为附件上传至右侧的“作业评论”区。确保你的Canvas账户有一个清晰可见的头像，提交的文件为PDF格式，并且“作业评论”区包含上传的.md或.doc附件。
> 3. **延迟提交：**如果你预计无法在截止日期前提交作业，请提前告知具体原因。这有助于我们了解情况并可能为你提供适当的延期或其他帮助。
>
> 请按照上述指导认真准备和提交作业，以保证顺利完成课程要求。

1. 题目

E07218:献给阿尔吉侬的花束

bfs, http://cs101.openjudge.cn/practice/07218/

思路：

看起来是简单的bfs，但是感觉时间卡的有点紧。。。如果出队列的时候再加入visited就不能通过了，必须在加入队列的同时加入visited。但是这两种做法用时竟然相差十倍以上，还是让我有点惊讶的。

代码：

```
from collections import deque

def scope(x, y):
    return 0 <= x <r and 0<= y <c

def bfs(x, y):
    q = deque([(x, y)])
    visited = {(x, y)} # 就是这里
    step = 0
    while q:
        s = len(q)
        for _ in range(s):
            x, y = q.popleft()
            for dx, dy in [(0, 1), (0, -1), (1, 0), (-1, 0)]:
                nx = x+dx
```

```
                ny = y+dy
                if scope(nx, ny) and maze[nx][ny] != '#' and (nx, ny) not in
visited:
                    if maze[nx][ny] == 'E':
                        return step+1
                    q.append((nx, ny))
                    visited.add((nx, ny))
        step += 1
    return  'oop!'
t = int(input())
for _ in range(t):
    r,c = map(int, input().split())
    maze = [input() for _ in range(r)]
    for i in range(r):
        for j in range(c):
            if maze[i][j] == 'S':
                print(bfs(i, j))
```

代码运行截图（至少包含有"Accepted"）

M3532.针对图的路径存在性查询I

disjoint set, https://leetcode.cn/problems/path-existence-queries-in-a-graph-i/

思路：

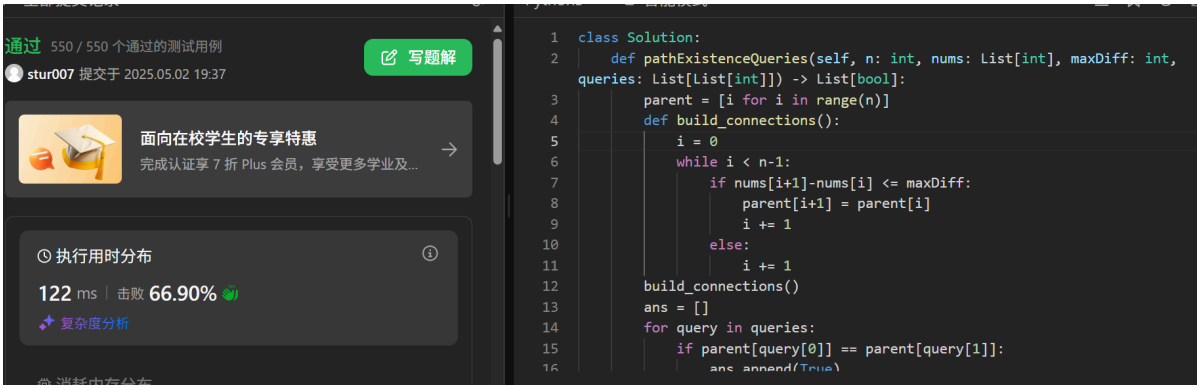
其实感觉比一般的并查集要简单，但是一开始一直沉浸在普通并查集的思路中无法逃脱，代码写的也不漂亮，最后受到ai的提示才写出简单的代码。

代码：

```
class Solution:
```

```
    def pathExistenceQueries(self, n: int, nums: List[int], maxDiff: int,
queries: List[List[int]]) -> List[bool]:
        parent = [i for i in range(n)]
        def build_connections():
            i = 0
            while i < n-1:
                if nums[i+1]-nums[i] <= maxDiff:
                    parent[i+1] = parent[i]
                    i += 1
                else:
                    i += 1
        build_connections()
        ans = []
        for query in queries:
            if parent[query[0]] == parent[query[1]]:
                ans.append(True)
            else:
                ans.append(False)
        return ans
```

代码运行截图 （至少包含有"Accepted"）



M22528:厚道的调分方法

binary search, http://cs101.openjudge.cn/practice/22528/

思路:

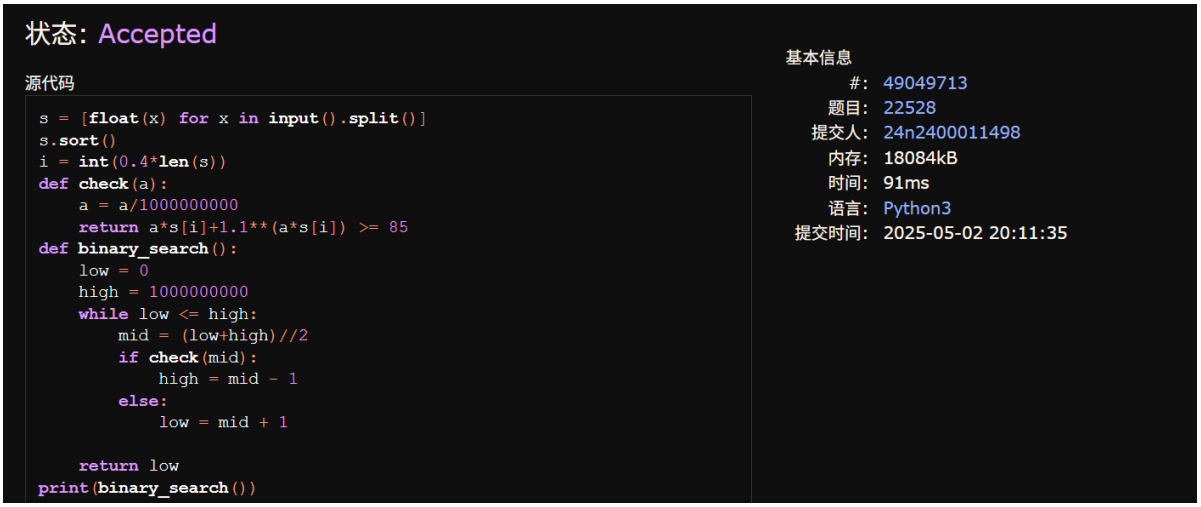
二分查找最小

代码:

```
s = [float(x) for x in input().split()]
s.sort()
i = int(0.4*len(s))
def check(a):
    a = a/1000000000
    return a*s[i]+1.1**(a*s[i]) >= 85
def binary_search():
    low = 0
    high = 1000000000
    while low <= high:
```

```
        mid = (low+high)//2
        if check(mid):
            high = mid - 1
        else:
            low = mid + 1

    return low
print(binary_search())
```

代码运行截图（至少包含有"Accepted"）



Msy382: 有向图判环

dfs, https://sunnywhy.com/sfbj/10/3/382

思路:

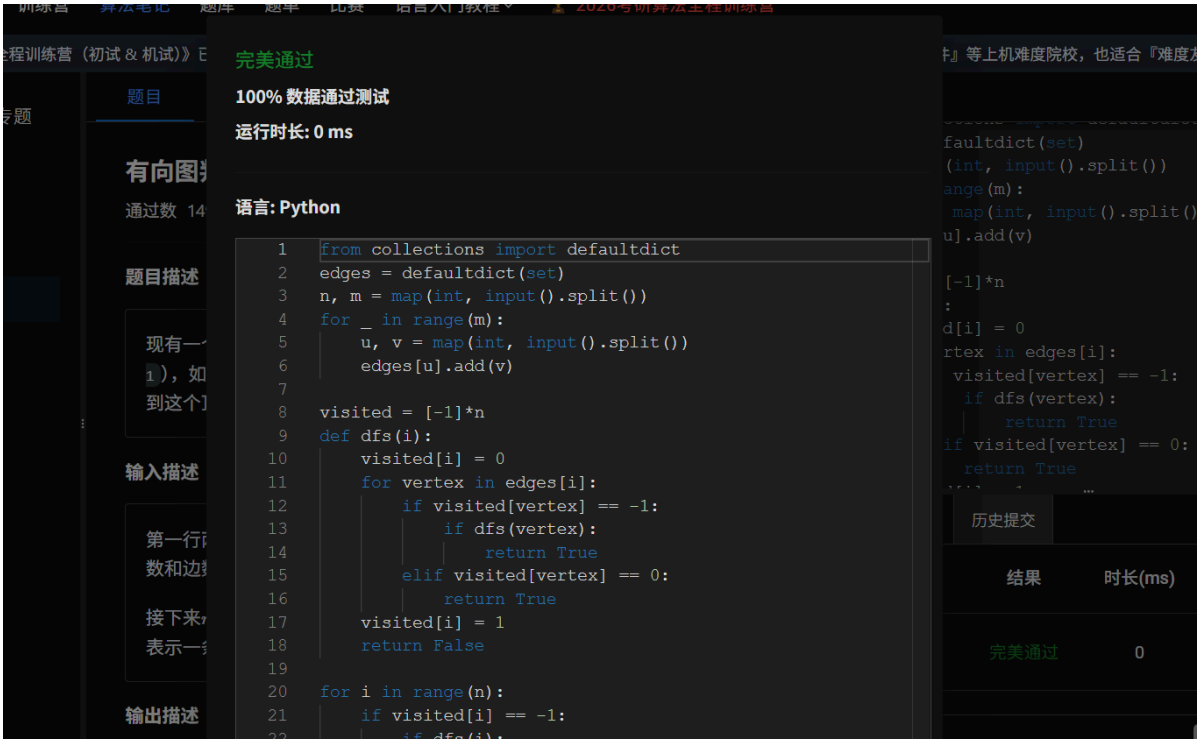
基本和直接dfs差不多，但是要分black，gray，white节点。

代码:

```
from collections import defaultdict
edges = defaultdict(set)
n, m = map(int, input().split())
for _ in range(m):
    u, v = map(int, input().split())
    edges[u].add(v)

visited = [-1]*n
def dfs(i):
    visited[i] = 0
    for vertex in edges[i]:
        if visited[vertex] == -1:
            if dfs(vertex):
                return True
        elif visited[vertex] == 0:
            return True
    visited[i] = 1
    return False
```

```
for i in range(n):
    if visited[i] == -1:
        if dfs(i):
            print('Yes')
            break
else:
    print('No')
```

代码运行截图（至少包含有"Accepted"）



M05443:兔子与樱花

Dijkstra, http://cs101.openjudge.cn/practice/05443/

思路:

直接套用dijkstra的模板即可。

代码:

```
import heapq

p = int(input())
paths = dict()
for _ in range(p):
    paths[input()] = dict()
q = int(input())
for _ in range(q):
    u, v, c = input().split()
    c = int(c)
    paths[u][v] = c
    paths[v][u] = c
```

```python
r = int(input())
for _ in range(r):
    a, b = input().split()
    visited = {a: 'end'}
    def dijkstra():
        q = [(0, a)]
        distance = dict()
        for place in paths:
            distance[place] = float('inf')
        distance[a] = 0
        while q:
            c_distance, c_place = heapq.heappop(q)
            if c_place == b:
                return
            for neighbor in paths[c_place]:
                    if distance[neighbor]>c_distance+paths[c_place][neighbor]:
                        distance[neighbor] = c_distance+paths[c_place][neighbor]
                        heapq.heappush(q, (distance[neighbor], neighbor))
                        visited[neighbor] = c_place
    dijkstra()
    ans =[]
    while visited[b] != 'end':
        ans.append(b)
        ans.append('('+str(paths[b][visited[b]])+')')
        b = visited[b]
    ans.append(b)
    ans.reverse()
    print('->'.join(ans))
```

代码运行截图（至少包含有"Accepted"）

T28050: 骑士周游

dfs, http://cs101.openjudge.cn/practice/28050/

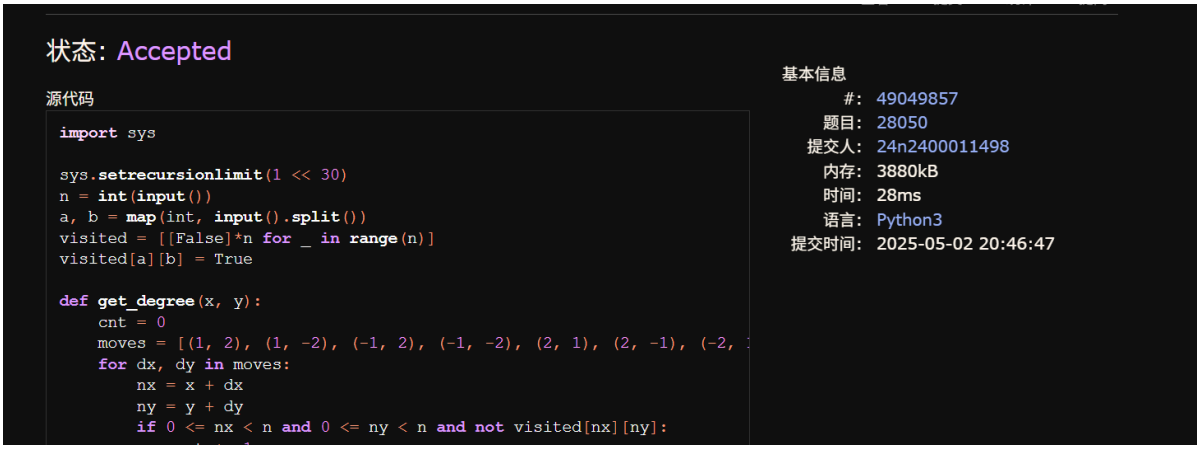
思路:

使用Warnsdorff's Rule会快不少，但是感觉也不是一下子就能想到。。。

代码:

```
import sys

sys.setrecursionlimit(1 << 30)
n = int(input())
a, b = map(int, input().split())
visited = [[False]*n for _ in range(n)]
visited[a][b] = True

def get_degree(x, y):
    cnt = 0
    moves = [(1, 2), (1, -2), (-1, 2), (-1, -2), (2, 1), (2, -1), (-2, 1), (-2,
-1)]
    for dx, dy in moves:
        nx = x + dx
        ny = y + dy
        if 0 <= nx < n and 0 <= ny < n and not visited[nx][ny]:
            cnt += 1
    return cnt

def dfs(x, y, temp):
    if temp == n*n:
        return True
    moves = [(1, 2), (1, -2), (-1, 2), (-1, -2),(2, 1), (2, -1), (-2, 1), (-2,
-1)]
    n_step = []
    for dx, dy in moves:
        nx = x + dx
        ny = y + dy
        if 0 <= nx < n and 0 <= ny < n and not visited[nx][ny]:
            n_step.append((get_degree(nx, ny), nx, ny))
    n_step.sort()
    for _,nx, ny in n_step:
        visited[nx][ny] = True
        temp += 1
        if dfs(nx, ny, temp):
            return True
        temp -= 1
        visited[nx][ny] = False

if dfs(a, b,1):
    print('success')
else:
    print('fail')
```

代码运行截图（至少包含有"Accepted"）



2. 学习总结和收获

如果发现作业题目相对简单，有否寻找额外的练习题目，如“数算2025spring每日选做”、LeetCode、Codeforces、洛谷等网站上的题目。

做题的感受都写在题目中了。

感觉小北探索的模型似乎不是很支持换行？（不知道是仅仅看不到还是不支持）利用了知识库中的检索，感觉确实一定程度上提高了研究题解的效率。