Assignment #C: 五味杂陈

Updated 1148 GMT+8 Dec 10, 2024

2024 fall, Complied by 颜鼎堃 工学院

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。

1. 题目

1115. 取石子游戏

dfs, https://www.acwing.com/problem/content/description/1117/

思路：

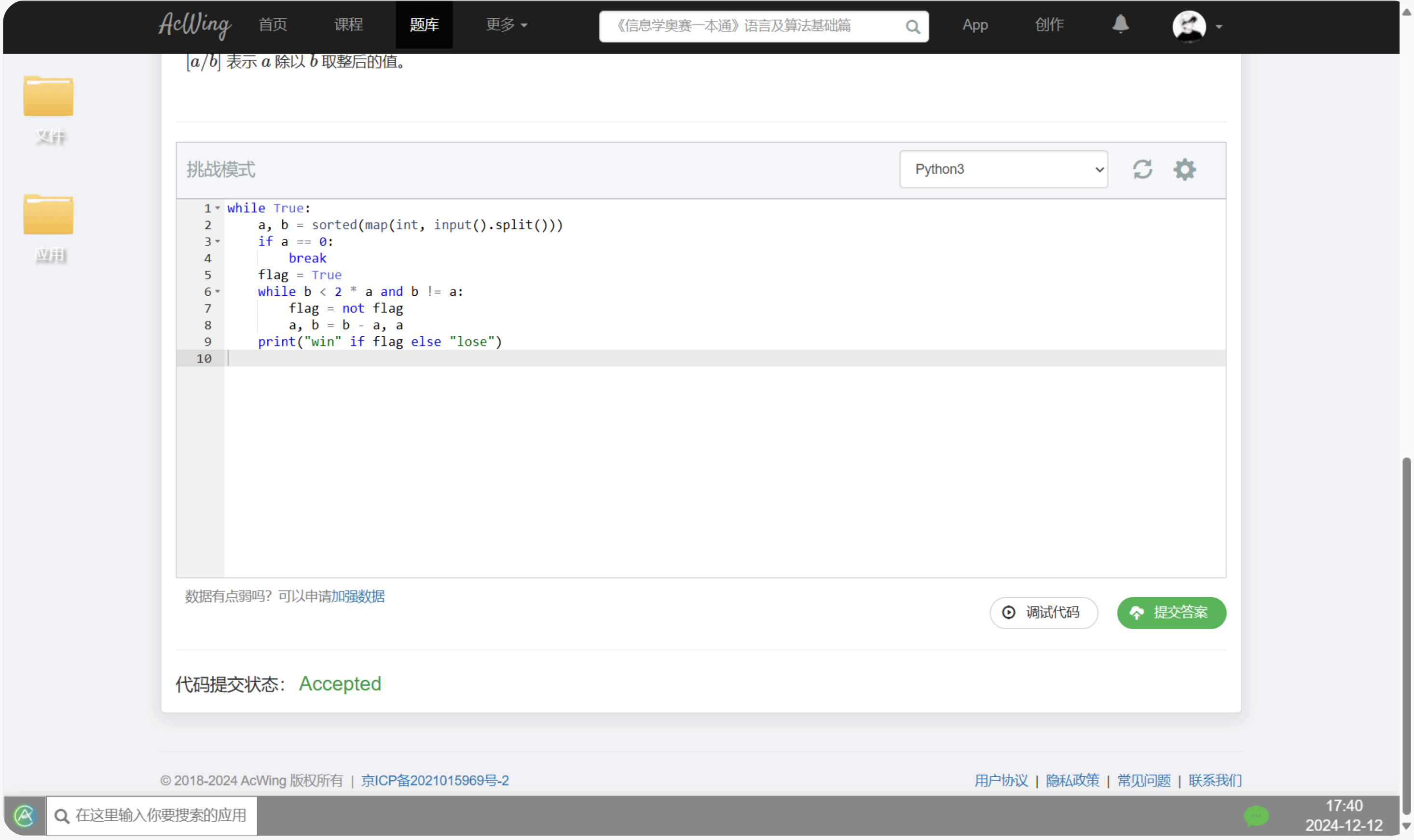
- 在每回合开始时如果两堆相等显然必胜，如果一堆中个数大于等于另一堆中的两倍也必胜，因为可以让下一轮行动的人只有唯一的选择

代码：

```Python
while True:
    a, b = sorted(map(int, input().split()))
    if a == 0:
        break
    flag = True
    while b < 2 * a and b != a:
        flag = not flag
        a, b = b - a, a
    print("win" if flag else "lose")

```

代码运行截图 （至少包含有"Accepted"）



$\lfloor a/b \rfloor$ 表示 a 除以 b 取整后的值。

```python
while True:
    a, b = sorted(map(int, input().split()))
    if a == 0:
        break
    flag = True
    while b < 2 * a and b != a:
        flag = not flag
        a, b = b - a, a
    print("win" if flag else "lose")
```

数据有点弱吗？可以申请加强数据

代码提交状态： Accepted

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17:40
2024-12-12

25570: 洋葱

Matrices, http://cs101.openjudge.cn/practice/25570

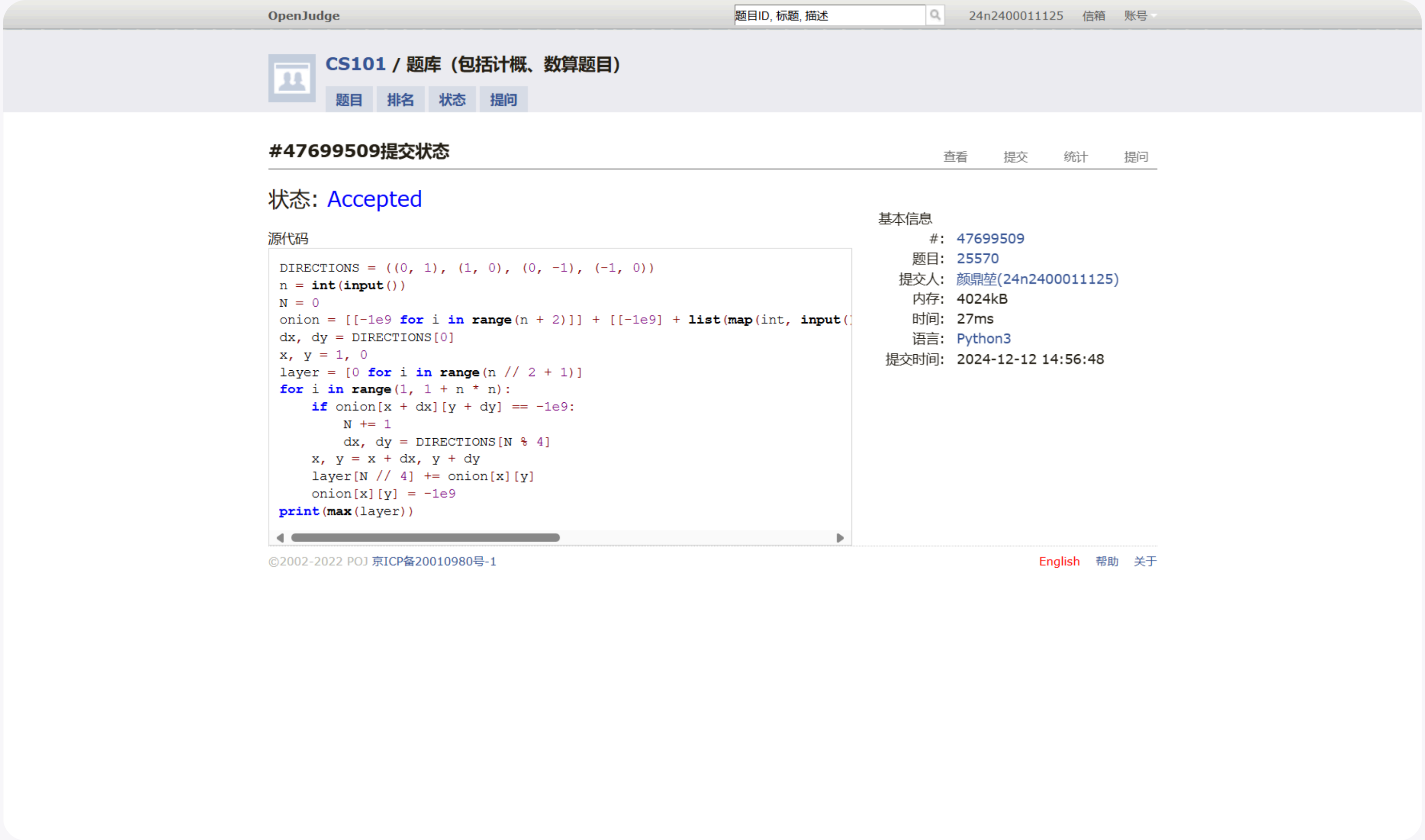
思路：

- 旋转矩阵的另一个版本罢了
- 通过 `N // 4` 紧凑地表示出所处层数

代码：

```python
DIRECTIONS = ((0, 1), (1, 0), (0, -1), (-1, 0))
n = int(input())
N = 0
onion = [[-1e9 for i in range(n + 2)]] + [[-1e9] + list(map(int, input().split())) + [-1e9] for i in range(n)] + [[-1e9 for i in range(n + 2)]]
dx, dy = DIRECTIONS[0]
x, y = 1, 0
layer = [0 for i in range(n // 2 + 1)]
for i in range(1, 1 + n * n):
    if onion[x + dx][y + dy] == -1e9:
        N += 1
        dx, dy = DIRECTIONS[N % 4]
    x, y = x + dx, y + dy
    layer[N // 4] += onion[x][y]
    onion[x][y] = -1e9
print(max(layer))
```

代码运行截图（至少包含有"Accepted"）



#47699509提交状态

状态: Accepted

源代码

```
DIRECTIONS = ((0, 1), (1, 0), (0, -1), (-1, 0))
n = int(input())
N = 0
onion = [[-1e9 for i in range(n + 2)]] + [[-1e9] + list(map(int, input(
dx, dy = DIRECTIONS[0]
x, y = 1, 0
layer = [0 for i in range(n // 2 + 1)]
for i in range(1, 1 + n * n):
    if onion[x + dx][y + dy] == -1e9:
        N += 1
        dx, dy = DIRECTIONS[N % 4]
    x, y = x + dx, y + dy
    layer[N // 4] += onion[x][y]
    onion[x][y] = -1e9
print(max(layer))
```

基本信息

#:	47699509
题目:	25570
提交人:	颜鼎堃(24n2400011125)
内存:	4024kB
时间:	27ms
语言:	Python3
提交时间:	2024-12-12 14:56:48

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1526C1. Potions(Easy Version)

greedy, dp, data structures, brute force, 1500,

https://codeforces.com/problemset/problem/1526/C1

思路：

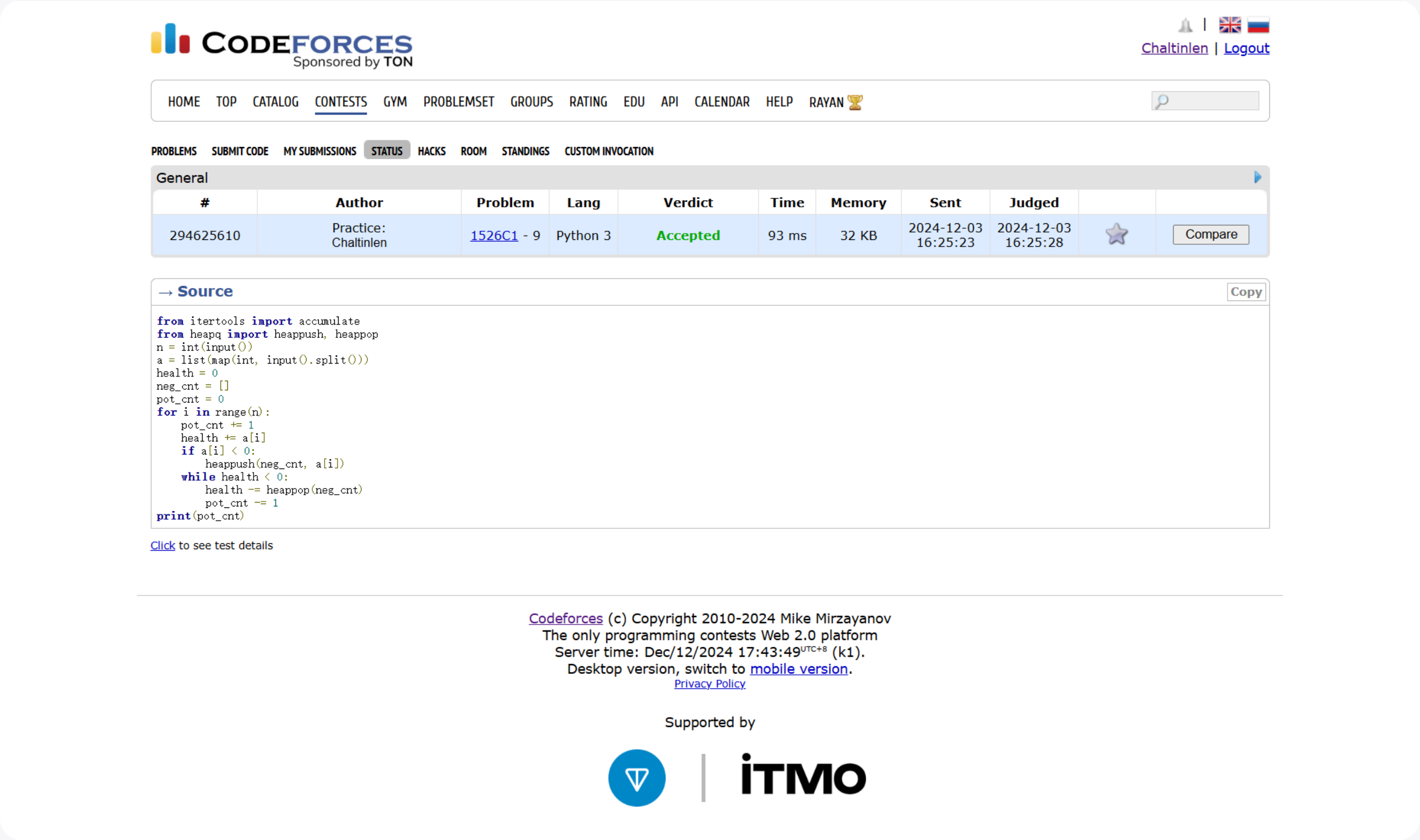
- 以下代码在Hard Version也能过
- 用堆不断获取与更新最小值

代码：

```Python
from heapq import heappush, heappop
n = int(input())
a = list(map(int, input().split()))
health = 0
neg_cnt = []
pot_cnt = 0
for i in range(n):
    pot_cnt += 1
    health += a[i]
    if a[i] < 0:
        heappush(neg_cnt, a[i])
    while health < 0:
        health -= heappop(neg_cnt)
        pot_cnt -= 1
print(pot_cnt)

```

代码运行截图 （至少包含有"Accepted"）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General

#	Author	Problem	Lang	Verdict	Time	Memory	Sent	Judged
294625610	Practice: Chaltinlen	1526C1 - 9	Python 3	Accepted	93 ms	32 KB	2024-12-03 16:25:23	2024-12-03 16:25:28

→ Source

```python
from itertools import accumulate
from heapq import heappush, heappop
n = int(input())
a = list(map(int, input().split()))
health = 0
neg_cnt = []
pot_cnt = 0
for i in range(n):
    pot_cnt += 1
    health += a[i]
    if a[i] < 0:
        heappush(neg_cnt, a[i])
    while health < 0:
        health -= heappop(neg_cnt)
        pot_cnt -= 1
print(pot_cnt)
```

Click to see test details

Codeforces (c) Copyright 2010-2024 Mike Mirzayanov
The only programming contests Web 2.0 platform
Server time: Dec/12/2024 17:43:49^{UTC+8} (k1).
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22067: 快速堆猪

辅助栈，http://cs101.openjudge.cn/practice/22067

思路：

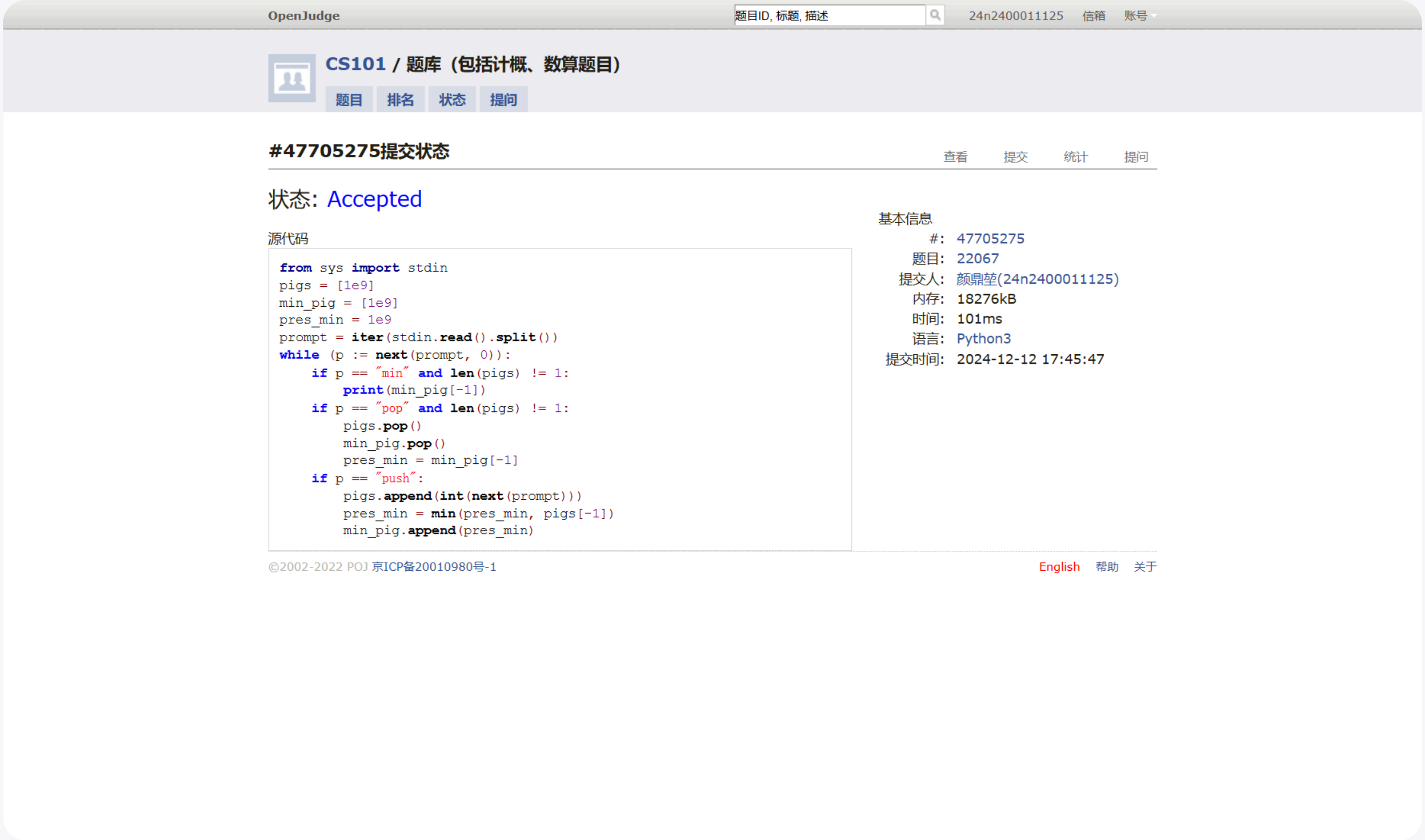
- 一开始想的用`heapq`，但发现会超时
- 后来一想，只要储存每头猪对应的最小值同步更新就好了

代码：

```python
from sys import stdin
pigs = [1e9]
min_pig = [1e9]
pres_min = 1e9
prompt = iter(stdin.read().split())
while (p := next(prompt, 0)):
    if p == "min" and len(pigs) != 1:
        print(min_pig[-1])
    if p == "pop" and len(pigs) != 1:
        pigs.pop()
        min_pig.pop()
        pres_min = min_pig[-1]
    if p == "push":
        pigs.append(int(next(prompt)))
        pres_min = min(pres_min, pigs[-1])
        min_pig.append(pres_min)

```

代码运行截图 （至少包含有"Accepted"）



#47705275提交状态

状态: Accepted

源代码

```
from sys import stdin
pigs = [1e9]
min_pig = [1e9]
pres_min = 1e9
prompt = iter(stdin.read().split())
while (p := next(prompt, 0)):
    if p == ″min″ and len(pigs) != 1:
        print(min_pig[-1])
    if p == ″pop″ and len(pigs) != 1:
        pigs.pop()
        min_pig.pop()
        pres_min = min_pig[-1]
    if p == ″push″:
        pigs.append(int(next(prompt)))
        pres_min = min(pres_min, pigs[-1])
        min_pig.append(pres_min)
```

基本信息

#: 47705275
题目: 22067
提交人: 颜鼎堃(24n2400011125)
内存: 18276kB
时间: 101ms
语言: Python3
提交时间: 2024-12-12 17:45:47

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20106: 走山路

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

思路：

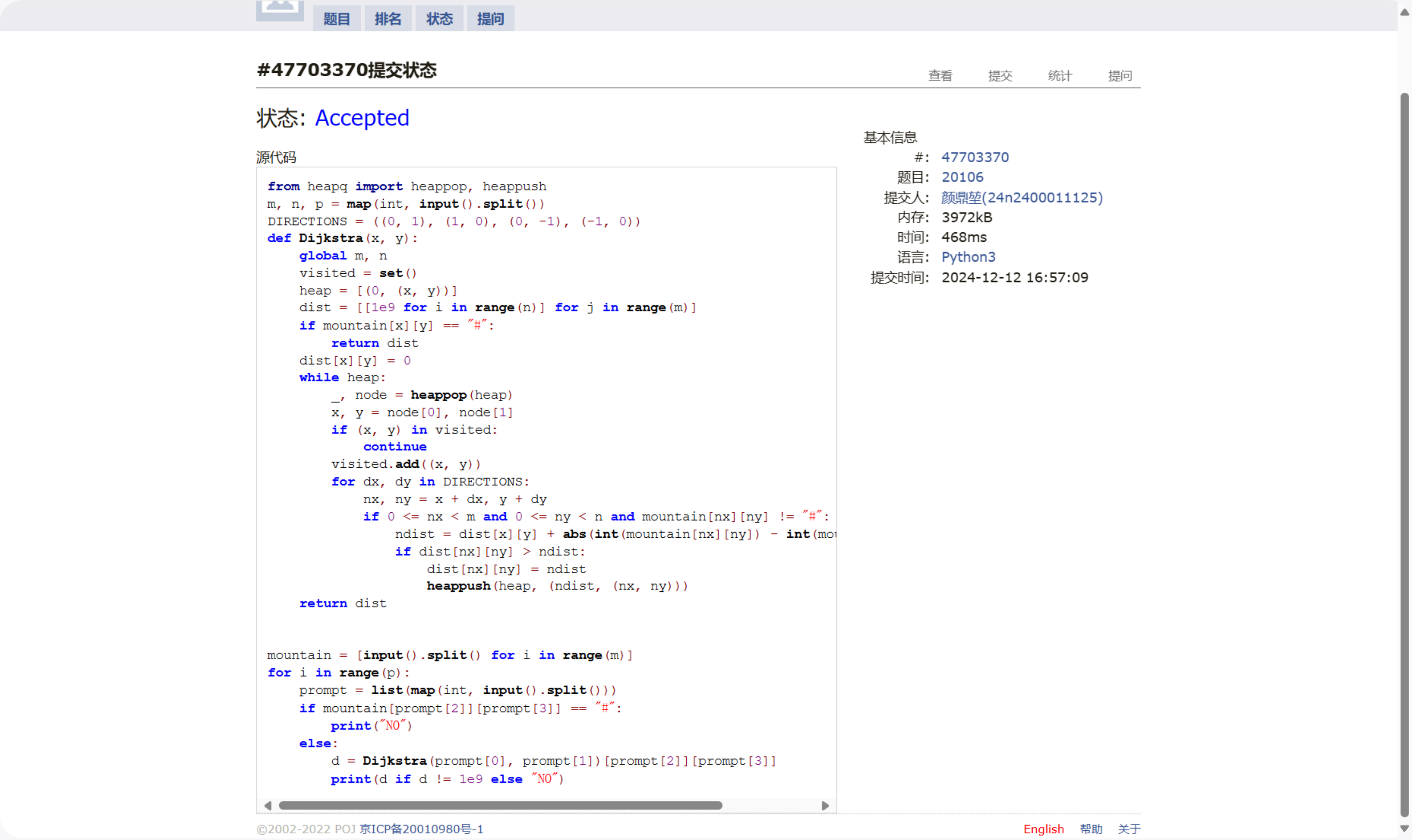
- 学了一下迪杰斯特拉算法

代码：

```python
from heapq import heappop, heappush
m, n, p = map(int, input().split())
DIRECTIONS = ((0, 1), (1, 0), (0, -1), (-1, 0))
def Dijkstra(x, y):
    global m, n
    visited = set()
    heap = [(0, (x, y))]
    dist = [[1e9 for i in range(n)] for j in range(m)]
    if mountain[x][y] == "#":
        return dist
    dist[x][y] = 0
    while heap:
        _, node = heappop(heap)
        x, y = node[0], node[1]
        if (x, y) in visited:
            continue
        visited.add((x, y))
        for dx, dy in DIRECTIONS:
            nx, ny = x + dx, y + dy
            if 0 <= nx < m and 0 <= ny < n and mountain[nx][ny] != "#":
                ndist = dist[x][y] + abs(int(mountain[nx][ny]) - int(mountain[x][y]))
                if dist[nx][ny] > ndist:
                    dist[nx][ny] = ndist
                    heappush(heap, (ndist, (nx, ny)))
    return dist


mountain = [input().split() for i in range(m)]
for i in range(p):
    prompt = list(map(int, input().split()))
    if mountain[prompt[2]][prompt[3]] == "#":
        print("NO")
    else:
        d = Dijkstra(prompt[0], prompt[1])[prompt[2]][prompt[3]]
        print(d if d != 1e9 else "NO")
```

代码运行截图（至少包含有"Accepted"）



#47703370提交状态

状态: Accepted

源代码

```python
from heapq import heappop, heappush
m, n, p = map(int, input().split())
DIRECTIONS = ((0, 1), (1, 0), (0, -1), (-1, 0))
def Dijkstra(x, y):
    global m, n
    visited = set()
    heap = [(0, (x, y))]
    dist = [[1e9 for i in range(n)] for j in range(m)]
    if mountain[x][y] == "#":
        return dist
    dist[x][y] = 0
    while heap:
        _, node = heappop(heap)
        x, y = node[0], node[1]
        if (x, y) in visited:
            continue
        visited.add((x, y))
        for dx, dy in DIRECTIONS:
            nx, ny = x + dx, y + dy
            if 0 <= nx < m and 0 <= ny < n and mountain[nx][ny] != "#":
                ndist = dist[x][y] + abs(int(mountain[nx][ny]) - int(mou
                if dist[nx][ny] > ndist:
                    dist[nx][ny] = ndist
                    heappush(heap, (ndist, (nx, ny)))
    return dist


mountain = [input().split() for i in range(m)]
for i in range(p):
    prompt = list(map(int, input().split()))
    if mountain[prompt[2]][prompt[3]] == "#":
        print("NO")
    else:
        d = Dijkstra(prompt[0], prompt[1])[prompt[2]][prompt[3]]
        print(d if d != 1e9 else "NO")
```

基本信息

#: 47703370
题目: 20106
提交人: 颜鼎堃(24n2400011125)
内存: 3972kB
时间: 468ms
语言: Python3
提交时间: 2024-12-12 16:57:09

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04129: 变换的迷宫

bfs, http://cs101.openjudge.cn/practice/04129/

思路：

- 处理 `visited` 集合时，加上此时的时间对 `K` 的模一起存入

代码：

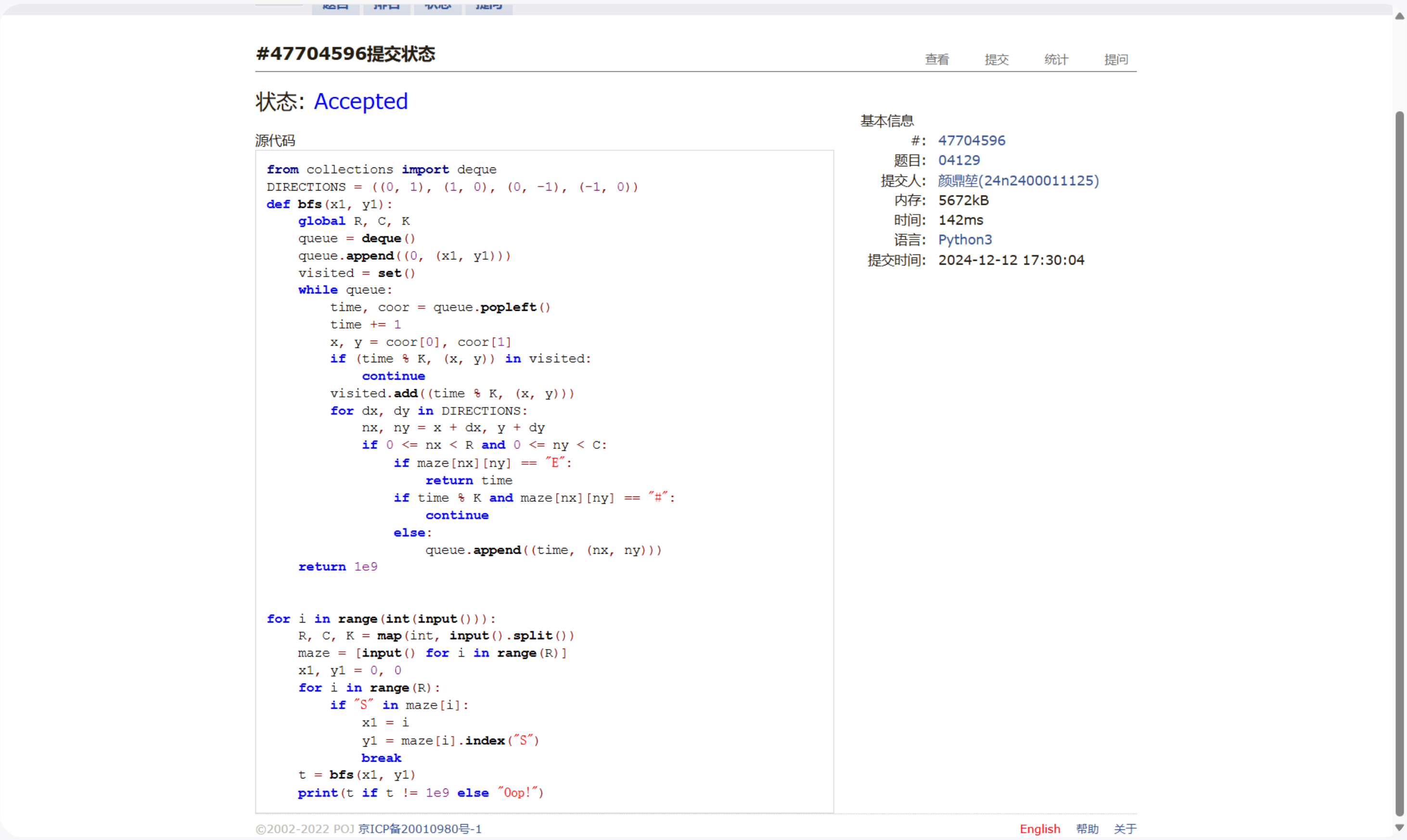
Python

```python
from collections import deque
DIRECTIONS = ((0, 1), (1, 0), (0, -1), (-1, 0))
```

```python
def bfs(x1, y1):
    global R, C, K
    queue = deque()
    queue.append((0, (x1, y1)))
    visited = set()
    while queue:
        time, coor = queue.popleft()
        time += 1
        x, y = coor[0], coor[1]
        if (time % K, (x, y)) in visited:
            continue
        visited.add((time % K, (x, y)))
        for dx, dy in DIRECTIONS:
            nx, ny = x + dx, y + dy
            if 0 <= nx < R and 0 <= ny < C:
                if maze[nx][ny] == "E":
                    return time
                if time % K and maze[nx][ny] == "#":
                    continue
                else:
                    queue.append((time, (nx, ny)))
    return 1e9


for i in range(int(input())):
    R, C, K = map(int, input().split())
    maze = [input() for i in range(R)]
    x1, y1 = 0, 0
    for i in range(R):
        if "S" in maze[i]:
            x1 = i
            y1 = maze[i].index("S")
            break
    t = bfs(x1, y1)
    print(t if t != 1e9 else "Oop!")
```

代码运行截图（至少包含有"Accepted"）



#47704596提交状态

状态: Accepted

源代码

```python
from collections import deque
DIRECTIONS = ((0, 1), (1, 0), (0, -1), (-1, 0))
def bfs(x1, y1):
    global R, C, K
    queue = deque()
    queue.append((0, (x1, y1)))
    visited = set()
    while queue:
        time, coor = queue.popleft()
        time += 1
        x, y = coor[0], coor[1]
        if (time % K, (x, y)) in visited:
            continue
        visited.add((time % K, (x, y)))
        for dx, dy in DIRECTIONS:
            nx, ny = x + dx, y + dy
            if 0 <= nx < R and 0 <= ny < C:
                if maze[nx][ny] == "E":
                    return time
                if time % K and maze[nx][ny] == "#":
                    continue
                else:
                    queue.append((time, (nx, ny)))
    return 1e9


for i in range(int(input())):
    R, C, K = map(int, input().split())
    maze = [input() for i in range(R)]
    x1, y1 = 0, 0
    for i in range(R):
        if "S" in maze[i]:
            x1 = i
            y1 = maze[i].index("S")
            break
    t = bfs(x1, y1)
    print(t if t != 1e9 else "Oop!")
```

基本信息

#:	47704596
题目:	04129
提交人:	颜鼎堃(24n2400011125)
内存:	5672kB
时间:	142ms
语言:	Python3
提交时间:	2024-12-12 17:30:04

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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“计概2024fall每日选做”、CF、LeetCode、洛谷等网站题目。

这次作业比上次作业简单，不过耗时也挺长的

欠的东西太多，熟练度不够，关键还有一大堆事要忙，一想到12月26号就要考试我就想把自己拎起来丢进未名湖里

对了，未名湖结冰了，挺好看的