# Assignment #9: dfs, bfs, & dp

Updated 2107 GMT+8 Nov 19, 2024

2024 fall, Complied by <mark>付耀贤，信息管理系</mark>

## 1. 题目

### 18160: 最大连通域面积

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

思路：
没学过 DFS 怎么写。向 AI 学习了写法，觉得思路甚至还没有某些 DP 难？

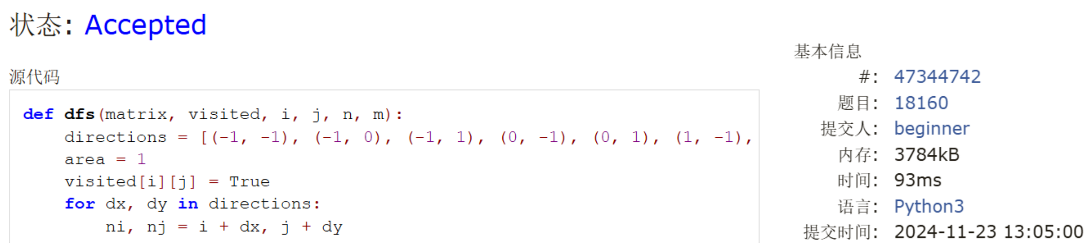
代码：

```python
def dfs(matrix, visited, i, j, n, m):
    directions = [(-1, -1), (-1, 0), (-1, 1), (0, -1), (0, 1), (1, -1), (1, 0), (1, 1)]
    area = 1
    visited[i][j] = True
    for dx, dy in directions:
        ni, nj = i + dx, j + dy
        if 0 <= ni < n and 0 <= nj < m and not visited[ni][nj] and matrix[ni][nj] == 'W':
            area += dfs(matrix, visited, ni, nj, n, m)
    return area

def max_connected_component(matrix, n, m):
    visited = [[False] * m for _ in range(n)]
    max_area = 0
    for i in range(n):
        for j in range(m):
            if matrix[i][j] == 'W' and not visited[i][j]:
                area = dfs(matrix, visited, i, j, n, m)
                max_area = max(max_area, area)
    return max_area

T = int(input())
for _ in range(T):
    N, M = map(int, input().split())
    matrix = [input().strip() for _ in range(N)]
    result = max_connected_component(matrix, N, M)
    print(result)
```

代码运行截图 <mark>（至少包含有"Accepted"）</mark>


状态: Accepted

源代码

```
def dfs(matrix, visited, i, j, n, m):
    directions = [(-1, -1), (-1, 0), (-1, 1), (0, -1), (0, 1), (1, -1),
    area = 1
    visited[i][j] = True
    for dx, dy in directions:
        ni, nj = i + dx, j + dy
```

基本信息

#: 47344742
题目: 18160
提交人: beginner
内存: 3784kB
时间: 93ms
语言: Python3
提交时间: 2024-11-23 13:05:00

### 19930: 寻宝

bfs, http://cs101.openjudge.cn/practice/19930

思路：
尝试用第一题 DFS 的思路套这一题，失败了，原来求最短路径要用 BFS。向 AI 学！

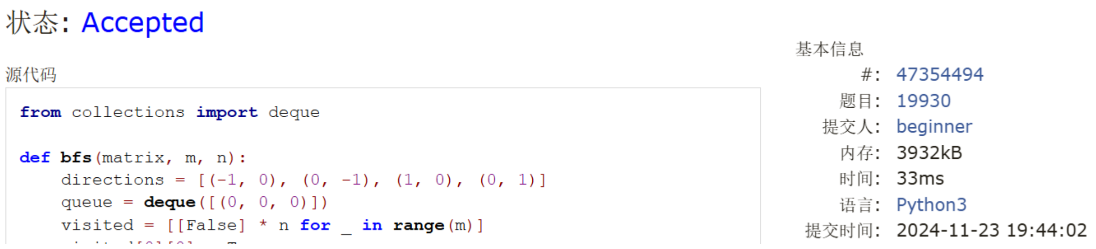
代码：

```
from collections import deque

def bfs(matrix, m, n):
    directions = [(-1, 0), (0, -1), (1, 0), (0, 1)]
    queue = deque([(0, 0, 0)])
    visited = [[False] * n for _ in range(m)]
    visited[0][0] = True
    while queue:
        i, j, steps = queue.popleft()
        if matrix[i][j] == 1:
            return steps
        for dx, dy in directions:
            ni, nj = i + dx, j + dy
            if 0 <= ni < m and 0 <= nj < n and not
visited[ni][nj] and matrix[ni][nj] != 2:
                visited[ni][nj] = True
                queue.append((ni, nj, steps + 1))
    return "NO"

m, n = map(int, input().split())
matrix = [list(map(int, input().split())) for _ in range(m)]
result = bfs(matrix, m, n)
print(result)
```

代码运行截图 == （至少包含有"Accepted"） ==


状态: Accepted

源代码

```
from collections import deque

def bfs(matrix, m, n):
    directions = [(-1, 0), (0, -1), (1, 0), (0, 1)]
    queue = deque([(0, 0, 0)])
    visited = [[False] * n for _ in range(m)]
```

基本信息

#:	47354494
题目:	19930
提交人:	beginner
内存:	3932kB
时间:	33ms
语言:	Python3
提交时间:	2024-11-23 19:44:02

### 04123: 马走日

dfs, http://cs101.openjudge.cn/practice/04123

思路：
虽然我不能很理解具体的运行步骤，但我主打一个模仿，把第一题的思路改一改就可以用在这一题目上。

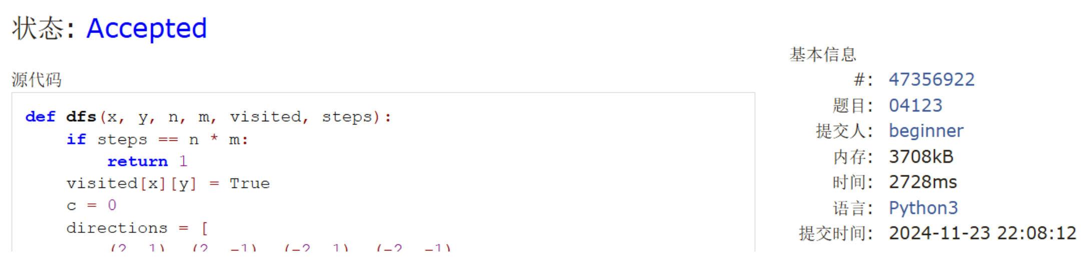
代码：

```python
def dfs(x, y, n, m, visited, steps):
    if steps == n * m:
        return 1
    visited[x][y] = True
    c = 0
    directions = [
        (2, 1), (2, -1), (-2, 1), (-2, -1),
        (1, 2), (1, -2), (-1, 2), (-1, -2)
    ]
    for dx, dy in directions:
        x1, y1 = x + dx, y + dy
        if 0 <= x1 < n and 0 <= y1 < m and not visited[x1][y1]:
            c += dfs(x1, y1, n, m, visited, steps + 1)
    visited[x][y] = False
    return c

def count(n, m, x, y):
    visited = [[False] * m for _ in range(n)]
    return dfs(x, y, n, m, visited, 1)

T = int(input())
for _ in range(T):
    n, m, x, y = map(int, input().split())
    result = count(n, m, x, y)
    print(result)
```

代码运行截图 <mark>（至少包含有"Accepted"）</mark>


状态: Accepted

源代码

```
def dfs(x, y, n, m, visited, steps):
    if steps == n * m:
        return 1
    visited[x][y] = True
    c = 0
    directions = [
        (2, 1), (2, -1), (-2, 1), (-2, -1)
```

基本信息

#:	47356922
题目:	04123
提交人:	beginner
内存:	3708kB
时间:	2728ms
语言:	Python3
提交时间:	2024-11-23 22:08:12

### sy316: 矩阵最大权值路径

dfs, https://sunnywhy.com/sfbj/8/1/316

思路：
虽然我知道思路都是一脉相承的，但只要一变复杂，我的思路就木住了...

代码：

```python
def dfs(matrix, x, y, n, m, visited, current_sum, max_sum, best_path, 
current_path):
    if x == n - 1 and y == m - 1:
        if current_sum > max_sum[0]:
            max_sum[0] = current_sum
            best_path[:] = current_path[:]
        return
    directions = [
        (1, 0),
        (0, 1),
        (-1, 0),
        (0, -1)
    ]
    for dx, dy in directions:
        x1, y1 = x + dx, y + dy
        if 0 <= x1 < n and 0 <= y1 < m and not visited[x1][y1]:
            visited[x1][y1] = True
            current_path.append((x1 + 1, y1 + 1))
            dfs(matrix, x1, y1, n, m, visited, current_sum + 
matrix[x1][y1], max_sum, best_path, current_path)
            current_path.pop()
            visited[x1][y1] = False

def find_max_path(matrix, n, m):
    visited = [[False] * m for _ in range(n)]
    max_sum = [-float('inf')]
    best_path = []
    visited[0][0] = True
    dfs(matrix, 0, 0, n, m, visited, matrix[0][0], max_sum, best_path,
[(1, 1)])  # 从(0, 0)开始
    return best_path

n, m = map(int, input().split())
matrix = [list(map(int, input().split())) for _ in range(n)]
result_path = find_max_path(matrix, n, m)
for x, y in result_path:
    print(x, y)
```

代码运行截图 <mark>（至少包含有"Accepted"）</mark>

完美通过　　　　查看题解

100% 数据通过测试

运行时长: 0 ms

### LeetCode62.不同路径

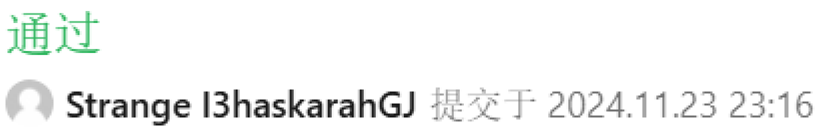
dp, https://leetcode.cn/problems/unique-paths/

思路：
高考组合数数学题。
用 DP 也不难：一个位置能从上方和左侧到达：dp[i][j] = dp[i - 1][j] + dp[i][j - 1]

代码：

```python
class Solution:
    def uniquePaths(self, m: int, n: int) -> int:
        a = min(m-1, n-1)
        if not a:
            return 1
        else:
            c = 1
            for i in range(a):
                c *= (m+n-2-i)
            for i in range(a):
                c = c//(i+1)
            return c
```

代码运行截图 <mark>（至少包含有"Accepted"）</mark>


通过

Strange l3haskarahGJ 提交于 2024.11.23 23:16

### sy358: 受到祝福的平方

dfs, dp, https://sunnywhy.com/sfbj/8/3/539

思路：
做不出来，但看题解能看懂，win！

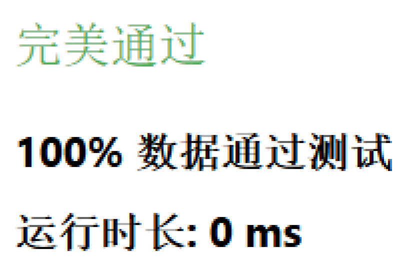
代码：

```python
def is_perfect_square(num):
    if num<0:
        return False
    else:
        root = int(num**0.5)
        return root * root == num

def is_blessed_id(A):
    squares = set()
    i = 1
    while i * i <= 10 ** 9:
        squares.add(i * i)
        i += 1
    digits = list(map(int, str(A)))
    def dfs(idx):
        if idx == len(digits):
            return True
        num = 0
        for i in range(idx, len(digits)):
            num = num * 10 + digits[i]
            if num in squares:
                if dfs(i + 1):
                    return True
        return False
    return "Yes" if dfs(0) else "No"

A = int(input())
print(is_blessed_id(A))
```

代码运行截图 <mark>（至少包含有"Accepted"）</mark>


完美通过

100% 数据通过测试

运行时长: 0 ms

## 2. 学习总结和收获
能在参考经典解法的基础上模仿着写出来一些拐弯比较少的题。但稍微有点复杂时，就有一种不知道怎么把题目内生性的要求嵌入到我已经掌握的思路的感觉...还是理解不动、理解不够。