Programming 3-10: Matching and Cover

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2018.12.14

1 Problem 3-10-A: 魔方社

1.1 代码样例

```cpp
#include<cstring>
#include <iostream>
using namespace std;
#define MAXV 110

int n,m,k;
int map[MAXV][MAXV];
int link[MAXV],use[MAXV];

int dfs(int x){
    int i,j;
    for(i=1;i<=m;i++)
        if(map[x][i] && !use[i]){
            j=link[i];
            use[i]=1;
            link[i]=x;
            if(j==-1 || dfs(j)) return true;
            link[i]=j;
        }
    return false;
}

int hungary(){
    int num=0;
    int i,j;
    memset(link,-1,sizeof(link));
    for(i=1;i<=n;i++){
        for(j=1;j<=m;j++) use[j]=0;
        if(dfs(i)) num++;
    }
    return num;
}

int main(){
    int a,b,c,i;
    while(scanf("%d",&n) && n){
        scanf("%d%d",&m,&k);
        memset(map,0,sizeof(map));
```

```
39        for(i=0;i<k;i++){
40            scanf("%d%d%d",&a,&b,&c);
41            map[b][c]=1;
42        }
43        printf("%d\n",hungary());
44    }
45    return 0;
46 }
47
48 /***************************************************************
49     Problem: 1571
50     User: 171860609
51     Language: C++
52     Result: 正确
53     Time:16 ms
54     Memory:1596 kb
55 ***************************************************************/
```

Listing 1: A by 171860609

2   Problem 3-10-B: 星星 VS 小圆

2.1   代码样例

```cpp
#include<bits/stdc++.h>
using namespace std;
const int mod=998244353;
//const int mod=1e9+7;
typedef long long ll;
const int N=405;
const int M=2000;
#define INF 0x3f3f3f3f
#define clr(x) memset(x,0,sizeof(x))
int T,n,kase,qry,ql,qr,op,r,c,ans,totcnt;

int match[405];
bool vis[405];
char s[42][12];

int tote,fir[N],nxt[M],to[M];
void adde(int u,int v){
    nxt[++tote]=fir[u];
    fir[u]=tote;
    to[tote]=v;
}

bool dfs(int u){
    //vis[u]=1;
    for (int j=fir[u];j;j=nxt[j]){
        int v=to[j];
        if (!vis[v]){
            vis[v]=1;
            if (!match[v] || dfs(match[v])){
                match[v]=u;//match[u]=i;
                return 1;
            }
        }
    }
    return 0;
}

const int dx[2]={0,1};
const int dy[2]={1,0};

bool inside(int x,int y){
    return x>=0 && x<r && y>=0 && y<c;
}
void init(){
    ans=0;totcnt=0;
    clr(match);

    tote=0;
    clr(fir);clr(nxt);clr(to);
}

int main(){
```

```cpp
53      scanf("%d",&T);
54      while (T--){
55          init();
56          scanf("%d%d",&r,&c);
57          for (int i=0;i<r;i++){
58              scanf("%s",s[i]);
59          }
60          for (int i=0;i<r;i++)
61              for (int j=0;j<c;j++){

63                      if (s[i][j]=='*'){
64                          totcnt++;
65                          for (int k=0;k<2;k++){

67                      int ni=i+dx[k],nj=j+dy[k];
68                      if (inside(ni,nj)){
69                          if (s[ni][nj]=='*'){
70                              adde(i*c+j,ni*c+nj);
71                              adde(ni*c+nj,i*c+j);
72                          }
73                      }
74                  }
75                  }
76              }
77          for (int i=0;i<r*c;i++){
78              clr(vis);
79              if (dfs(i)) ans++;
80          }
81          printf("%d\n",totcnt-ans/2);
82      }

84  }

86  /************************************************************
87      Problem: 1572
88      User: 171860547
89      Language: C++
90      Result: 正确
91      Time:0 ms
92      Memory:1568 kb
93  ************************************************************/
```

Listing 2: B by 171860547

3   Problem 3-10-D: 探测机器

3.1   代码样例

```cpp
#include<string.h>
#include<iostream>
#define N 510
using namespace std;

int map[N][N];
int visit [N];
int match[N];
int T, n, m, Count;

bool Find(int u)
{
    for (int v = 1; v <= n; v++)
    {
        if (map[u][v] && !visit[v])
        {
            visit [v] = 1;
            if (match[v] == 0 || Find(match[v]))
            {
                match[v] = u;
                return true;
            }
        }
    }
    return false;
}
void floyd_warshall()
{
    for (int k = 1; k <= n; k++)
        for (int i = 1; i <= n; i++)
            if (map[i][k])
                for (int j = 1; j <= n; j++)
                    if (map[k][j])
                        map[i][j] = 1;
}
int main()
{
    int u, v;
    while (cin >> n >> m && (n || m))
    {
        memset(map, 0, sizeof(map));
        memset(match, 0, sizeof(match));
        for (int i = 0; i < m; i++)
        {
            cin >> u >> v;
            map[u][v] = 1;
        }
        floyd_warshall();
        int result = 0;
        for (int i = 1; i <= n; i++)
        {
            memset(visit, 0, sizeof(visit));
```

```
53          if (Find(i))
54              result++;
55      }
56      cout << n − result << endl;
57  }
58  return 0;
59 }
60 /**************************************************************
61     Problem: 1574
62     User: 171860578
63     Language: C++
64     Result: 正确
65     Time:264 ms
66     Memory:2568 kb
67 **************************************************************/
```

Listing 3: D by 171860578

```cpp
#include<bits/stdc++.h>
using namespace std;
int sum,T,m,n,x,y,a[500][500],matching[1000];
bool vis[1000];
bool hungarian(int x)
{
    int v;
    for(int i=1;i<=n;i++)
    if(a[x][i])
    {
        v=i;
        if(vis[v])
        {
            vis[v]=false;
            if(matching[v]==−1 || hungarian(matching[v]))
            {
                matching[v]=x;
                return true;
            }
        }
    }
    return false;
}
string str;
int main()
{
    while(true)
    {
        memset(a,0,sizeof(a));
        scanf("%d%d",&n,&m);
        if(n==0) break;
        for(int i=1;i<=m;i++)
            {
                scanf("%d%d",&x,&y);
                a[x][y]=1;
            }

        for(int k=1;k<=n;k++)
```

```
39              for(int i=1;i<=n;i++)
40                  for(int j=1;j<=n;j++)
41                      if(a[i][k] && a[k][j]) a[i][j]=1;
42
43          int ans=0;
44          memset(matching,-1,sizeof(matching));
45          for(int i=1;i<=n;i++)
46          {
47              memset(vis,true,sizeof(vis));
48              if(hungarian(i)) ans++;
49          }
50
51          printf("%d\n",n-ans);
52      }
53      return 0;
54  }
55  /*************************************************************
56      Problem: 1574
57      User: 171860017
58      Language: C++
59      Result: 正确
60      Time:384 ms
61      Memory:2528 kb
62  *************************************************************/
```

Listing 4: D by 171860017

4 Problem 3-8-D: 临时英雄执照考试

4.1 代码样例

```
1  #include<stdio.h>
2  int main(){
3      int m,n,i,u,v,num = 0,a[5001] = {0};
4      scanf("%d %d",&n,&m);
5      for(i = 0;i<m;i++){
6          scanf("%d %d",&u,&v);
7          a[u]++,a[v]++;
8      }
9      for(i = 1;i<=n;i ++){
10         if (a[i]==1) num++;
11     }
12     printf("%d\n", (num+1)/2);
13 }
14 /*************************************************************
15     Problem: 1566
16     User: 171240525
17     Language: C++
18     Result: 正确
19     Time:4 ms
20     Memory:956 kb
21 *************************************************************/
```

Listing 5: D by 171240525