字符串

KMP

```
//can be overed
#include<bits/stdc++.h>
#define ll long long
using namespace std;
int n;
const int MAXN=1000020;
char s[MAXN],p[MAXN];
ll nex[MAXN];//you can add 1 to get normal next
void getNext(char strp[],ll nextt[]){
        ll las,pl=strlen(strp);
        nextt[0]=las=-1;
        for(ll i=1;i<pl;i++){
                while(las>-1&&strp[i]!=strp[las+1]){
                        las=nextt[las];
                }
                if(strp[i]==strp[las+1]){
                        las++;
                }
                nextt[i]=las;
        }
}
ll KMP(char strp[],char strs[],ll nextt[]){
        ll las=-1,pl=strlen(strp),sl=strlen(strs),ans=0;
        getNext(strp,nextt);
        for(ll i=0;i<sl;i++){
                while(las>-1&&strs[i]!=strp[las+1]){
                        las=nextt[las];
                }
                if(strs[i]==strp[las+1]) las++;
                if(las+1==pl){
                        ans++;
                        las=nextt[las];
                        //printf("%d\n",i-pl+2);//output the start
                }
        }
        return ans;
}
int main(){
        scanf("%d",&n);
        while(n--){
                scanf("%s%s",p,s);
                printf("%lld\n",KMP(p,s,nex));
        }
        return 0;
}
```

扩展KMP

```
1   //char
2   #include<bits/stdc++.h>
3   #define ll long long
4   #define db double
5   #define ioss ios::sync_with_stdio(false);cin.tie(0);cout.tie(0)
6   using namespace std;
7   const int MAXN=100020;
8   int n;
9   ll ext[MAXN],nex[MAXN];
10  char s[MAXN],p[MAXN];
11  void getNext(char strp[],ll nextt[]){
12      nextt[0]=0;
13      ll pl=strlen(strp);
14      ll fir=0,las=0;
15      for(ll i=1;i<pl;i++) {
16          nextt[i] = min(las - i + 1, nextt[i - fir]);
17          if (nextt[i] < 0) nextt[i] = 0;
18          while (i+nextt[i]<pl && strp[nextt[i]] == strp[i + nextt[i]]) {
19              nextt[i]++;
20          }
21          if (i + nextt[i] - 1 > las) {
22              las = i + nextt[i] - 1;
23              fir = i;
24          }
25      }
26  }
27  void exKMP(char strp[],char strs[],ll nextt[],ll extt[]){
28      getNext(strp,nextt);
29      ll pl=strlen(strp),sl=strlen(strs);
30      ll fir=0,las=-1,mnl=min(sl,pl);
31      while(las<mnl-1&&strp[las+1]==strs[las+1]){
32          las++;
33      }
34      extt[0]=las+1;
35      for(ll i=1;i<sl;i++){
36          extt[i]=min(las-i+1,nextt[i-fir]);
37          if(extt[i]<0) extt[i]=0;
38          while(extt[i]<pl && i+extt[i]<sl && strp[extt[i]]==strs[i+extt[i]]){
39              extt[i]++;
40          }
41          if(i+extt[i]-1>las){
42              las=i+extt[i]-1;
43              fir=i;
44          }
45      }
46  }
47  int main() {
48      scanf("%s%s",s,p);
49      exKMP(p,s,nex,ext);
50      printf("%d",strlen(p));
51      for(int i=1;i<strlen(p);i++){
52          printf(" %lld",nex[i]);
```

```
53            }
54        printf("\n");
55        for(int i=0;i<strlen(s);i++){
56            if(i!=0) printf(" ");
57            printf("%lld",ext[i]);
58        }
59        printf("\n");
60        return 0;
61    }
```

AC自动机

```
 1    //char
 2    #include<bits/stdc++.h>
 3    #define ll long long
 4    #define db double
 5    #define ioss ios::sync_with_stdio(false);cin.tie(0);cout.tie(0)
 6    using namespace std;
 7    const int MAXN=100020;
 8    int n;
 9    ll ext[MAXN],nex[MAXN];
10    char s[MAXN],p[MAXN];
11    void getNext(char strp[],ll nextt[]){
12        nextt[0]=0;
13        ll pl=strlen(strp);
14        ll fir=0,las=0;
15        for(ll i=1;i<pl;i++) {
16            nextt[i] = min(las - i + 1, nextt[i - fir]);
17            if (nextt[i] < 0) nextt[i] = 0;
18            while (i+nextt[i]<pl && strp[nextt[i]] == strp[i + nextt[i]]) {
19                nextt[i]++;
20            }
21            if (i + nextt[i] - 1 > las) {
22                las = i + nextt[i] - 1;
23                fir = i;
24            }
25        }
26    }
27    void exKMP(char strp[],char strs[],ll nextt[],ll extt[]){
28        getNext(strp,nextt);
29        ll pl=strlen(strp),sl=strlen(strs);
30        ll fir=0,las=-1,mnl=min(sl,pl);
31        while(las<mnl-1&&strp[las+1]==strs[las+1]){
32            las++;
33        }
34        extt[0]=las+1;
35        for(ll i=1;i<sl;i++){
36            extt[i]=min(las-i+1,nextt[i-fir]);
37            if(extt[i]<0) extt[i]=0;
38            while(extt[i]<pl && i+extt[i]<sl && strp[extt[i]]==strs[i+extt[i]]){
39                extt[i]++;
40            }
41            if(i+extt[i]-1>las){
```

```
42              las=i+extt[i]-1;
43              fir=i;
44          }
45      }
46  }
47  int main() {
48      scanf("%s%s",s,p);
49      exKMP(p,s,nex,ext);
50      printf("%d",strlen(p));
51      for(int i=1;i<strlen(p);i++){
52          printf(" %lld",nex[i]);
53      }
54      printf("\n");
55      for(int i=0;i<strlen(s);i++){
56          if(i!=0) printf(" ");
57          printf("%lld",ext[i]);
58      }
59      printf("\n");
60      return 0;
61  }
```