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（1）输入由1,2,3,4,5构成的字符串，设计能够识别字符串代表的整数为3的倍数，并且字符串长度也为3的倍数的有限状态自动机

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 状态 | | | 输入 | | | | |
| 状态 | 长度 | 数值 | 1 | 2 | 3 | 4 | 5 |
| S0 | Mod 3 = 0 | 3n | S4 | S5 | S3 | S4 | S5 |
| S1 | 3n+1 | S5 | S3 | S4 | S5 | S3 |
| S2 | 3n+2 | S3 | S4 | S5 | S3 | S4 |
| S3 | Mod 3 = 1 | 3n | S7 | S8 | S6 | S7 | S8 |
| S4 | 3n+1 | S8 | S6 | S7 | S8 | S6 |
| S5 | 3n+2 | S6 | S7 | S8 | S6 | S7 |
| S6 | Mod 3 = 2 | 3n | S1 | S2 | S0 | S1 | S2 |
| S7 | 3n+1 | S2 | S0 | S1 | S2 | S0 |
| S8 | 3n+2 | S0 | S1 | S2 | S0 | S1 |

#include <iostream>

#include <string>

using namespace std;

int Transform(int curr, char ch)

{

int nxt = 0;

if(curr==0 || curr==1 || curr==2)

nxt = 3 + (curr + (ch-'0'))%3;

else if(curr==3 || curr==4 || curr==5)

nxt = 6 + (curr + (ch-'0'))%3;

else if(curr==6 || curr==7 || curr==8)

nxt = (curr + (ch-'0'))%3;

return nxt;

}

void AutoMachine(string s)

{

int n = s.size();

int state;

for (int i = 0; i < n-2; i++) {

state = 0;

for (int j = i; j < i+3; j++) {

state = Transform(state, s[j]);

}

if (state == 0)

cout << "find: " << s[i] << s[i+1] << s[i+2] << endl;

}

}

int main()

{

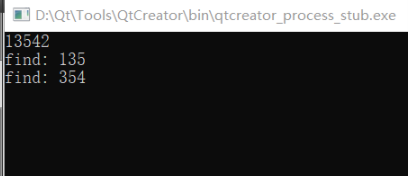
string input;

cin >> input;

AutoMachine( input);

return 0;

}



（2）给出下列字符串的prefix function tables.

aaaaaa

bbababbaabbb

abcabccbba

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| i | 1 | 2 | 3 | 4 | 5 | 6 |
| P[i] | a | a | a | a | a | a |
| Π[i] | 0 | 1 | 2 | 3 | 4 | 5 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| i | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| P[i] | b | b | a | b | a | b | b | a | a | b | b | b |
| Π[i] | 0 | 1 | 0 | 1 | 0 | 1 | 2 | 3 | 0 | 1 | 2 | 2 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| i | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| P[i] | a | b | c | a | b | c | c | b | b | a |
| Π[i] | 0 | 0 | 0 | 1 | 2 | 3 | 0 | 0 | 0 | 1 |

#include <iostream>

#include <string>

using namespace std;

void compute\_prefix\_function(string P, int PI[])

{

for (int i = 0; i<P.size(); i++) {

PI[i] = 0;

}

int m=P.size();

int k=0;

for(int q=2;q<=m;q++)

{

while(k>0 && P[k]!=P[q-1])

k=PI[k];

if(P[k]==P[q-1])

k++;

PI[q]=k;

}

}

int main()

{

int PI[100];

string P;

cin>>P;

compute\_prefix\_function(P, PI);

for(int i=1;i<=P.size();i++)

cout << PI[i] << " ";

cout << endl;

return 0;

}