

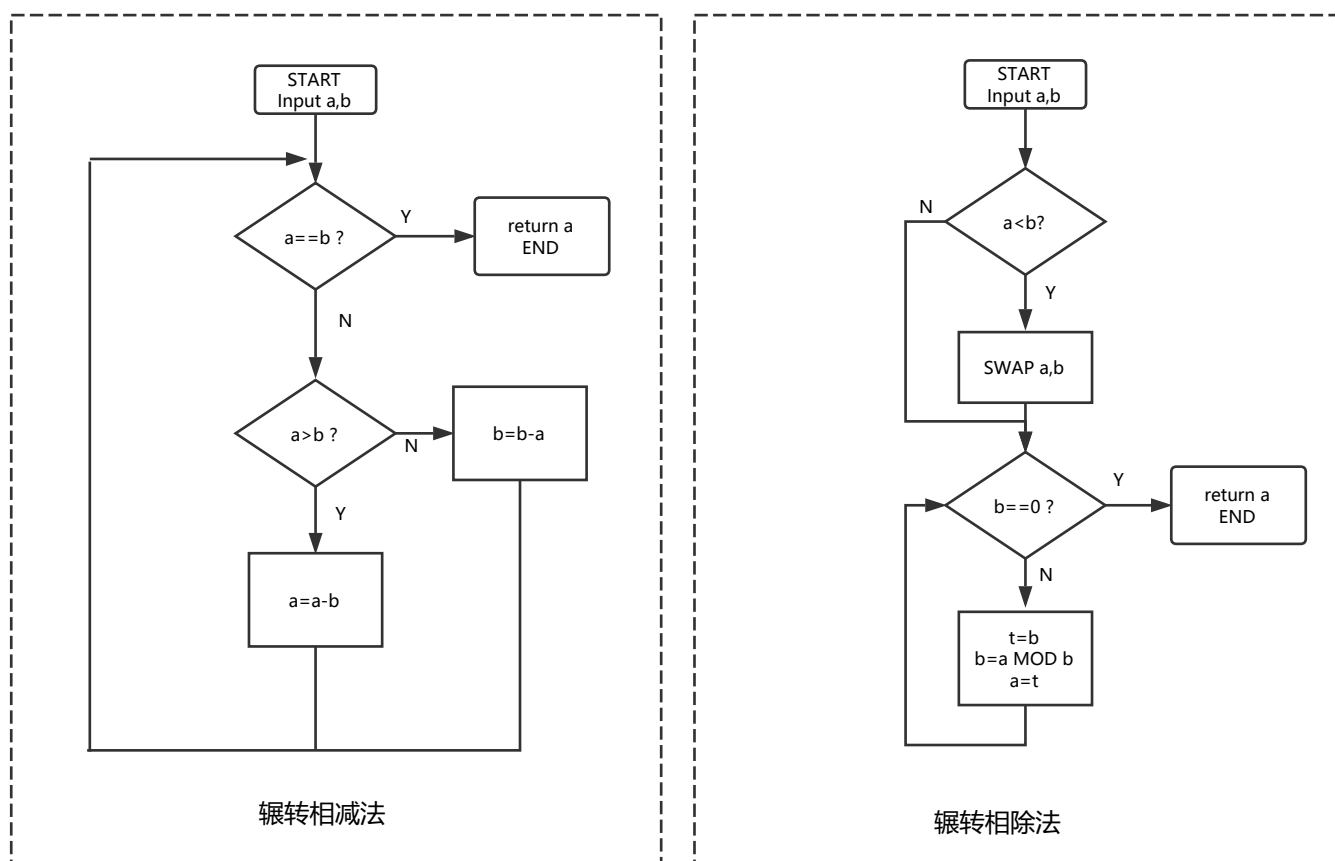
Algorithm experiment 1

算法实验报告一

201616070320 | 物联网1603 | 郭治洪 | 指导老师: 王明誠
MathJax 提供数学公式支持 | ProcessOn.com 提供流程图支持

题目: 输入两个数, 并计算它们的最大公约数

流程图:



该流程图存在问题, 并没有检测确保 $a, b \neq 0$, 因此输入之后应该检测并提示错误

伪代码:

确保 a , $b \neq 0$ 才可使用以下算法。

```
# 辗转相减法实现
while a ≠ b do
    if a > b then
        a ← a - b
    else
        b ← b - a
return a
# 辗转相除法实现
if a < b then
    SWAP a,b
while b ≠ 0 do
    t ← b
    b ← a MOD b
    a ← t
return a
```

代码：

```
#include <iostream>
/*****
* 题目：求两个数正整数 辗转相除法实现
* 物联网1603 201616070320 郭治洪
*****/
using namespace std;

unsigned int euclidean(unsigned int a,unsigned int b)
{
    unsigned int t;
    if(a<b)
    { //swap a,b
        t=a;
        a=b;
        b=t;
    }
    while(b!=0)
    {
        t=b;
        b=a%b;
        a=t;
    }
    return a;
}

int main(void)
{
    unsigned int a,b;
    do
```

```

    //check input two positive integers 检测输入的是两个正整数
    static int num=0;
    if(num>0)
        cout<<"Error,please retry."<<endl; //Output retry tip 在失败输入给重试提示
    cout<<endl<<"Input two positive integers:";
    cin>>a>>b;
    cout<<endl;
    num++;
}while((a<=0)&&(b<=0));
cout<<"The greatest common divisor is "<<euclidean(a,b)<<" ."<<endl;
}

```

Demo:

The screenshot shows a C++ IDE with a file named '实验1.cpp'. The code implements the Euclidean algorithm for finding the greatest common divisor (GCD) of two numbers. The function 'euclidean' uses a while loop to repeatedly calculate the remainder of 'a' divided by 'b' until 'b' becomes zero, at which point 'a' is the GCD. The 'main' function prompts the user to input two positive integers, checks for non-positive values, and then calls the 'euclidean' function to find the GCD. The output window shows the program running with inputs 6 and 36, resulting in a GCD of 6.

```

13  while(b!=0)
14  {
15      t=b;
16      b=a%b;
17      a=t;
18  }
19  return a;
20  }
21
22  int main(void)
23  {
24      unsigned int a,b;
25      do
26      {
27          //check input two positive integers
28          static int num=0;
29          if(num>0)
30              cout<<"Error,please retry."<<endl;
31          cout<<endl<<"Input two positive integers:";
32          cin>>a>>b;
33          cout<<endl;
34          num++;
35      }while((a<=0)&&(b<=0));
36      cout<<"The greatest common divisor is "<<euclidean(a,b)<<" ."<<endl;

```

Output window (D:\LEARNSTATION\算法\实验1.exe):

```

Input two positive integers:6 36
The greatest common divisor is 6 .
-----
Process exited after 1.496 seconds with return value 0
请按任意键继续. . .

```

参考链接:

<https://zh.wikipedia.org/wiki/%E6%9C%80%E5%A4%A7%E5%85%AC%E5%9B%A0%E6%95%B8>
 Wiki百科 最大公因数
<https://zh.wikipedia.org/wiki/%E8%BC%BE%E8%BD%89%E7%9B%B8%E9%99%A4%E6%B3%95>
 Wiki百科 辗转相除法