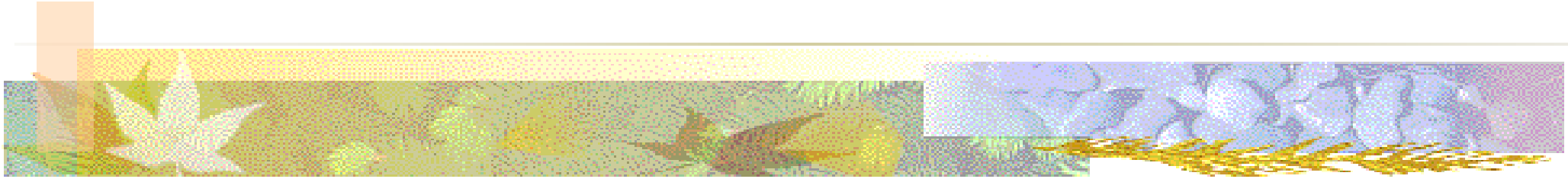
第5章 循环控制

——程序调试



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本节要讨论的主要问题

- 何为Bug？何为Debug？
- 程序中常见的出错原因有哪些？
- 常用的程序调试方法有哪些？

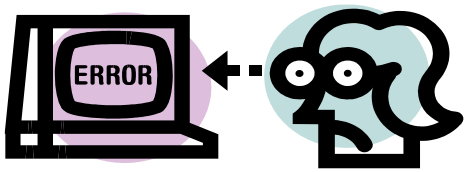
Bug与Debug

何谓Bug？

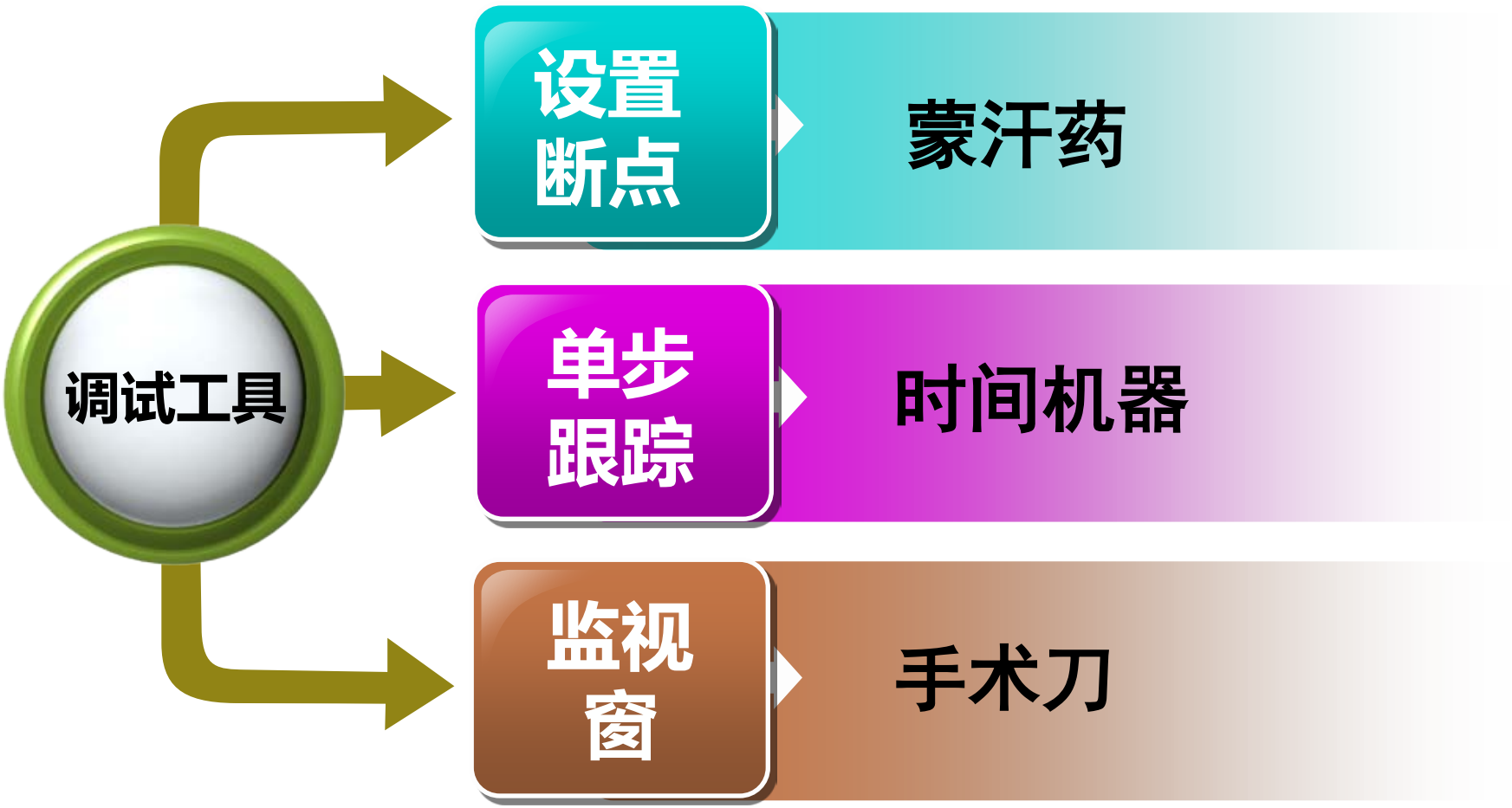
何谓Debug？

程序中常见的出错原因

编译错误	语法错误（Syntax Error）
链接错误	缺少包含文件、或者包含文件的路径错误等
运行时错误	运行结果与预期不一致 程序无法正常运行



调试工具



调试方法

逆向推理

粗分细找，逆向推理，定位大致的范围

分治排除

用注释切掉一些代码，调试无误后再打开注释

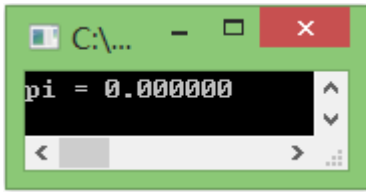
缩减输入

缩减输入数据，设法找到导致失败的最小输入

计算π的值

- 利用 $\frac{\pi}{2}=\frac{2}{1}\times\frac{2}{3}\times\frac{4}{3}\times\frac{4}{5}\times\frac{6}{5}\times\frac{6}{7}\times\cdots$ 前100项之积，计算π的值

```
#include <stdio.h>
int main()
{
   float term, result;
   int n;
   for (n=2; n<=100; n=n+2)
   {
       term = (n * n) / (( n - 1) * ( n + 1));
       result = result * term;
   }
   printf("pi = %f\n", 2 * result);
  return 0;
}
```

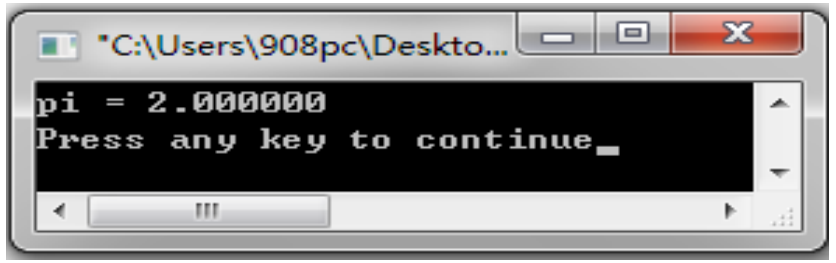


VC6.0和CB下运行不显示任何警告信息

程序改错

- 利用 $\frac{\pi}{2}=\frac{2}{1}\times\frac{2}{3}\times\frac{4}{3}\times\frac{4}{5}\times\frac{6}{5}\times\frac{6}{7}\times\cdots$ 前100项之积，计算π的值

```
#include <stdio.h>
int main()
{
   float term, result = 1;
   int n;
   for (n=2; n<=100; n=n+2)
   {
       term = (n * n) / (( n - 1) * ( n + 1));
       result = result * term;
   }
   printf("pi = %f\n", 2 * result);
  return 0;
}
```



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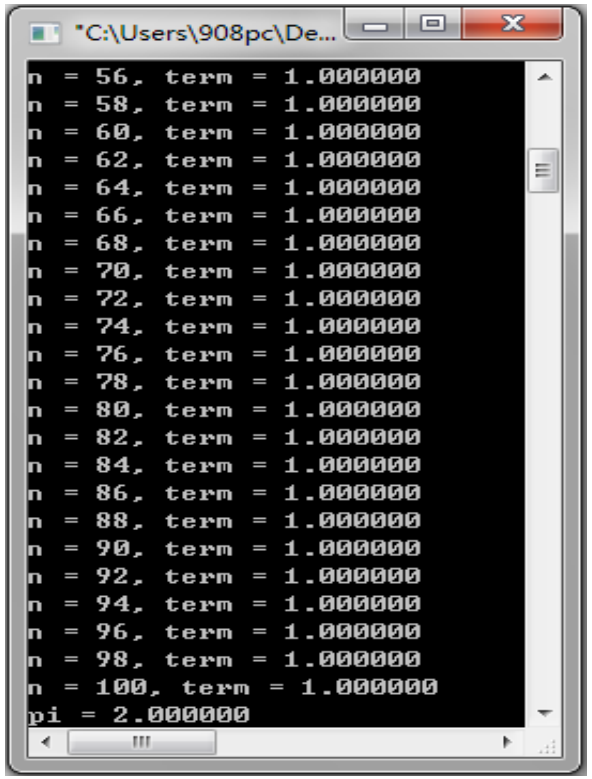
程序改错

- 利用 $\frac{\pi}{2}=\frac{2}{1}\times\frac{2}{3}\times\frac{4}{3}\times\frac{4}{5}\times\frac{6}{5}\times\frac{6}{7}\times\cdots$ 前100项之积，计算π的值

```
#include <stdio.h>
int main()
{
   float term, result = 1;
   int n;
   for (n=2; n<=100; n=n+2)
   {
        term = (n * n) / (( n - 1) * ( n + 1));
        printf("n = %d, term = %f\n", n, term);
        result = result * term;
   }
   printf("pi = %f\n", 2 * result);
  return 0;
}
```

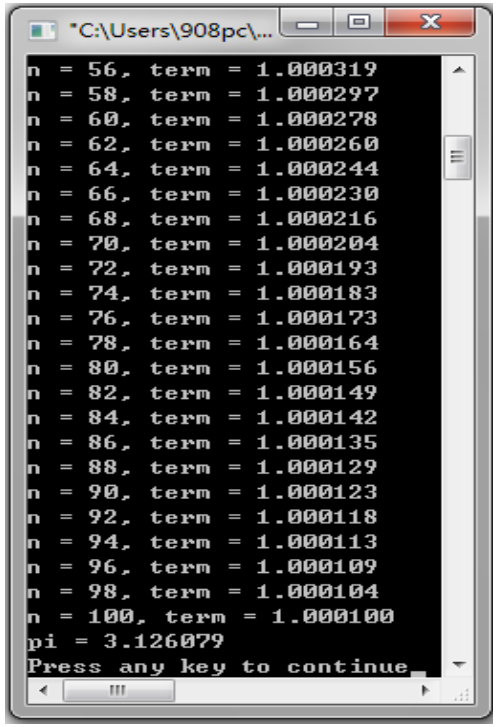


插入打印语句，打印中间结果信息

程序改错

- 利用 $\frac{\pi}{2}=\frac{2}{1}\times\frac{2}{3}\times\frac{4}{3}\times\frac{4}{5}\times\frac{6}{5}\times\frac{6}{7}\times\cdots$ 前100项之积，计算π的值

```
#include <stdio.h>
int main()
{
   float term, result = 1;
   int n;
   for (n=2; n<=100; n=n+2)
   {
        term = (float)(n * n) / (( n - 1) * ( n + 1));
        printf("n = %d, term = %f\n", n, term);
        result = result * term;
   }
   printf("pi = %f\n", 2 * result);
  return 0;
}
```



程序改错

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```
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int main()
{
   float term, result = 1;
   int n;
   for (n=2; n<=100; n=n+2)
   {
        term = (float)(n * n) / (( n - 1) * ( n + 1));

        result = result * term;
   }
   printf("pi = %f\n", 2 * result);
  return 0;
}
```
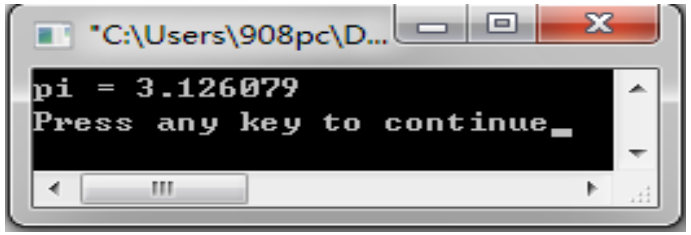
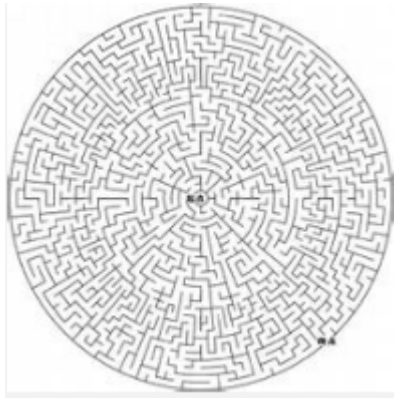



韩信点兵

```
#include <stdio.h>
int main()
{
   int  x = 1, find = 0;
   while (!find);
   {
       if (x%5==1 && x%6==5 && x%7==4 && x%11==10)
       {
             printf("x = %d\n", x);
             find = 1;
             x++;
       }
   }
    return 0;
}
```

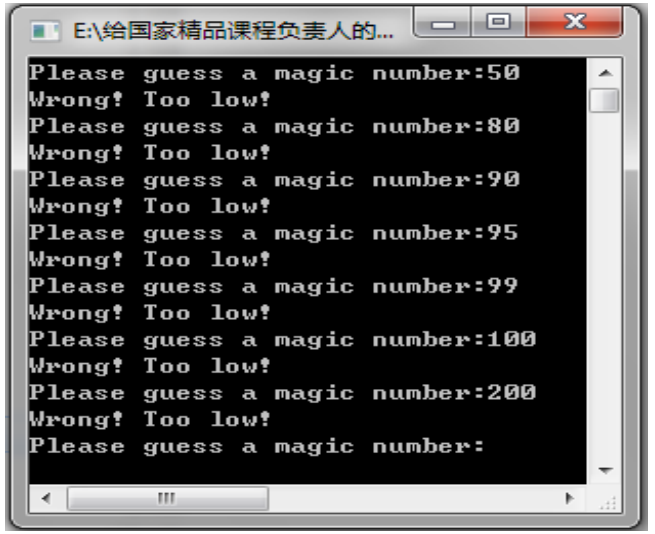


韩信点兵

```
#include <stdio.h>
int main()
{
   int  x = 1, find = 0;
   printf("before while\n");
   while (!find);
   {
       if (x%5==1 && x%6==5 && x%7==4 && x%11==10)
       {
             printf("x = %d\n", x);
             find = 1;
             x++;
       }
       printf("in while\n");
   }
   return 0;
}
```

```c
#include  <stdlib.h>
#include  <stdio.h>
#include  <time.h>
int main()
{
   int  magic, guess, counter;
   srand(time(NULL));
   magic = rand() % 100 + 1;
   counter = 0;
   do{
        printf("Please guess a magic number:");
        scanf("%d", &guess);
        counter++;
        if (guess > magic)
            printf("Wrong! Too low!\n");
        else if (guess < magic)
            printf("Wrong! Too high!\n");
         else
             printf("Right!\n");
   }while (guess != magic);
   printf("counter = %d \n", counter);
  return 0;
}
```

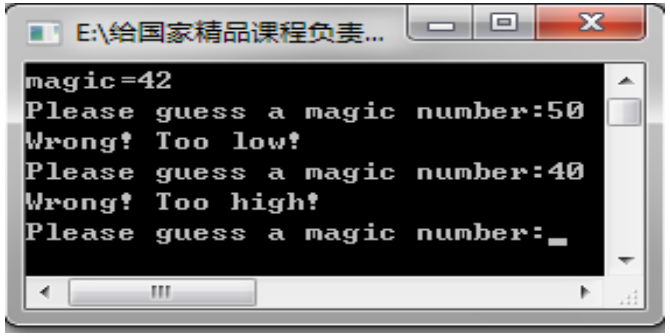
直到猜对为止



```c
#include  <stdlib.h>
#include  <stdio.h>
#include  <time.h>
int main()
{
   int  magic, guess, counter;
   srand(time(NULL));
   magic = rand() % 100 + 1;
   printf("magic=%d\n", magic);
   counter = 0;
   do{
        printf("Please guess a magic number:");
        scanf("%d", &guess);
        counter++;
        if (guess > magic)
            printf("Wrong! Too low!\n");
        else if (guess < magic)
            printf("Wrong! Too high!\n");
         else
             printf("Right!\n");
   }while (guess != magic);
   printf("counter = %d \n", counter);
  return 0;
}
```

直到猜对为止

插入打印语句



讨论题

- 从键盘任意输入两个符号各异的整数，直到输入的两个整数满足要求为止，然后打印这两个数。请通过测试找出下面这个程序存在的问题，并给出解决的方法。

```
#include <stdio.h>
int main()
{
   int x1, x2;
   do{
       printf("Input x1, x2:");
       scanf("%d,%d", &x1, &x2);
   }while (x1 * x2 > 0);
   printf("x1=%d,x2=%d\n", x1, x2);
   return 0;
}
```

讨论题

```
#include <stdio.h>
#include <math.h>
int main()
{
   int n, i;
   printf("Input n:");
   scanf("%d", &n);
   for (i=2; i<=sqrt(n); i++)
   {
       if (n % i = 0)
       {
             printf("No!\n");
       }
   }
   printf("Yes!\n");
   return 0;
}
```

- 从键盘任意输入一个正整数，编程判断它是否是素数，若是素数，输出“Yes!”，否则输出“No！”。
- 已知负数、0和1都不是素数。
- 请找出程序的错误并改正之。


Thank you for
your attention !
SuXiaoHong


Q&A