
python
import turtle
turtle.setup(650,350,200,200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for 1 in range(4):
turtle.circle(40, 80)
turtle.circle(-40, 80)
turtle.fd(40)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)

Python语言程序设计

turtle程序语法元素分析

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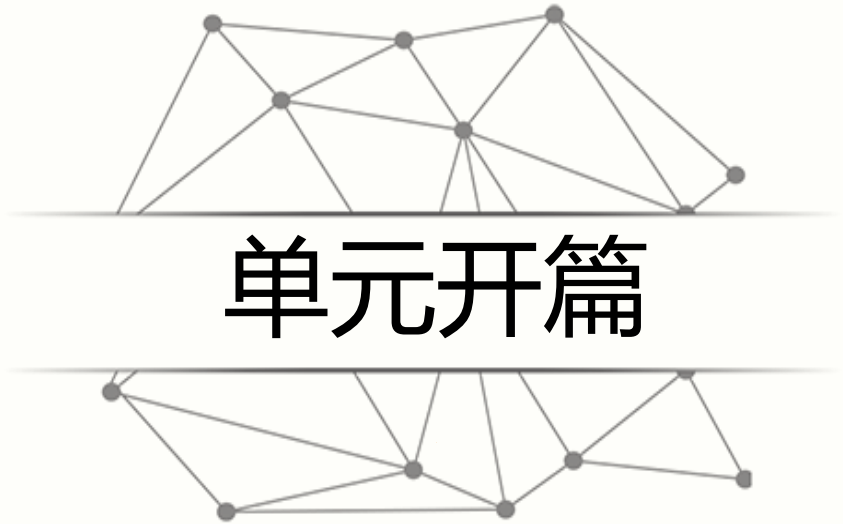
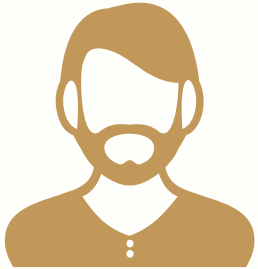
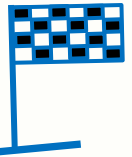


单元开篇

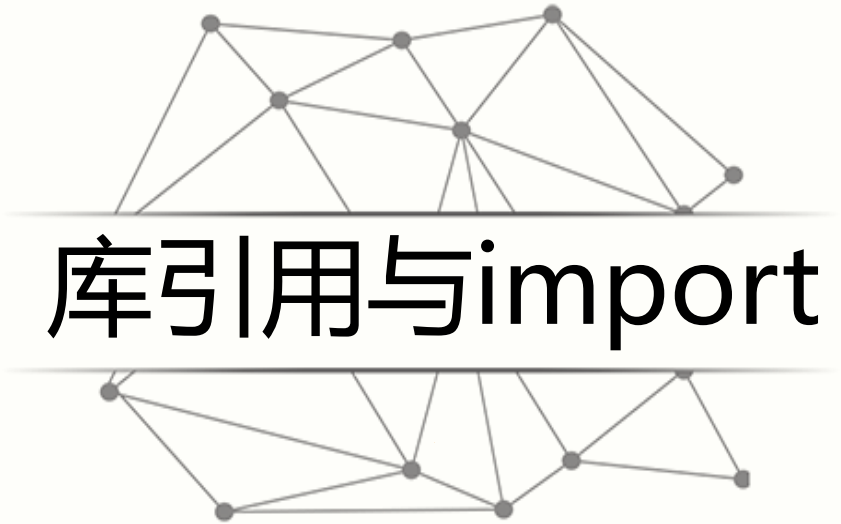
turtle程序语法元素分析



- 库引用与import
- turtle画笔控制函数
- turtle运动控制函数
- turtle方向控制函数
- 基本循环语句
- "Python蟒蛇绘制"代码分析



python
语言程序设计



库引用与import

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
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turtle.pensize(25)
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turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

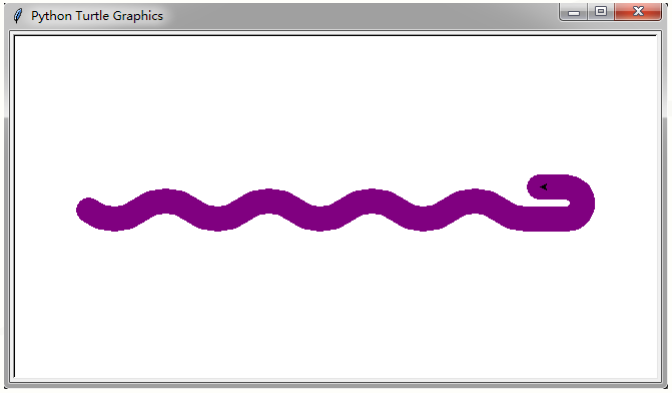

<a>.<b>()的编码风格

python

库引用

扩充Python程序功能的方式

- 使用import保留字完成，采用<a>.<b>()编码风格

import <库名>

<库名>.<函数名>(<函数参数>)

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
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    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

引入turtle库

使用turtle库函数

完成功能

可是可是, 好多turtle，很繁琐嘛...

import更多用法

使用from和import保留字共同完成

from <库名> import <函数名>

from <库名> import *

<函数名>(<函数参数>)

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

```
from turtle import *
setup(650, 350, 200, 200)
penup()
fd(-250)
pendown()
pensize(25)
pencolor("purple")
seth(-40)
for i in range(4):
    circle(40, 80)
    circle(-40, 80)
circle(40, 80/2)
fd(40)
circle(16, 180)
fd(40 * 2/3)
done()
```

老师老师, 这么好的方法为何不早说...

import更多用法

两种方法比较

import <库名>

<库名>.<函数名>(<函数参数>)

from <库名> import <函数名>

from <库名> import *

<函数名>(<函数参数>)

第一种方法不会出现函数重名问题，第二种方法则会出现

import更多用法

使用import和as保留字共同完成

import <库名> as <库别名>

<库别名>.<函数名>(<函数参数>)

给调用的外部库关联一个更短、更适合自己的名字

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

```
import turtle as t
t.setup(650, 350, 200, 200)
t.penup()
t.fd(-250)
t.pendown()
t.pensize(25)
t.pencolor("purple")
t.seth(-40)
for i in range(4):
    t.circle(40, 80)
    t.circle(-40, 80)
t.circle(40, 80/2)
t.fd(40)
t.circle(16, 180)
t.fd(40 * 2/3)
t.done()
```

这个方法好!

turtle画笔控制函数

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

penup(), pendown()

pensize(), pencolor()

画笔控制函数

画笔操作后一直有效，一般成对出现

- **turtle.penup()　　别名　　turtle.pu()**

抬起画笔，海龟在飞行

- **turtle.pendown()　　别名　　turtle.pd()**

落下画笔，海龟在爬行

画笔控制函数

画笔设置后一直有效，直至下次重新设置

- turtle.pensize(width)　别名　turtle.width(width)

  画笔宽度，海龟的腰围

- turtle.pencolor(color)　color为颜色字符串或r,g,b值

  画笔颜色，海龟在涂装

画笔控制函数

pencolor(color)的color可以有三种形式

- 颜色字符串　：turtle.pencolor("purple")
- RGB的小数值：turtle.pencolor(0.63, 0.13, 0.94)
- RGB的元组值：turtle.pencolor((0.63,0.13,0.94))

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

penup()

pendown()

pensize(width)

pencolor(colorstring)

pencolor(r,g,b)

pencolor((r,g,b))

turtle运动控制函数

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

fd()

circle()

运动控制函数

控制海龟行进：走直线 & 走曲线

- turtle.forward(d)　别名　turtle.fd(d)

  向前行进，海龟走直线

- d: 行进距离，可以为负数

运动控制函数

控制海龟行进：走直线 & 走曲线

- turtle.circle(r, extent=None)

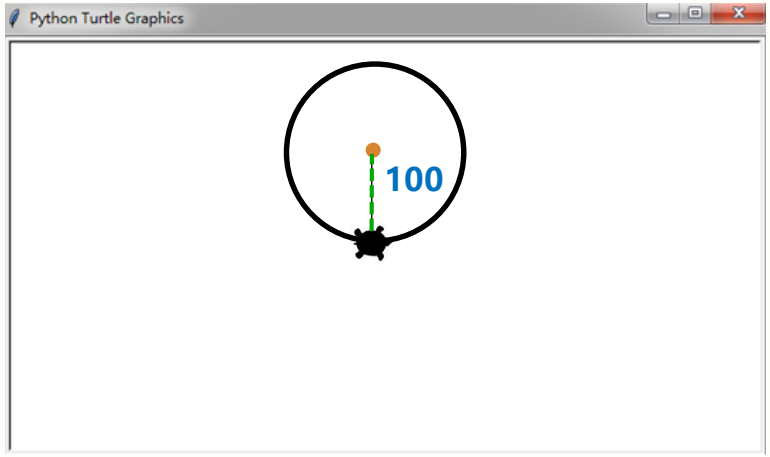
  根据半径r绘制extent角度的弧形

- r: 默认圆心在海龟左侧r距离的位置

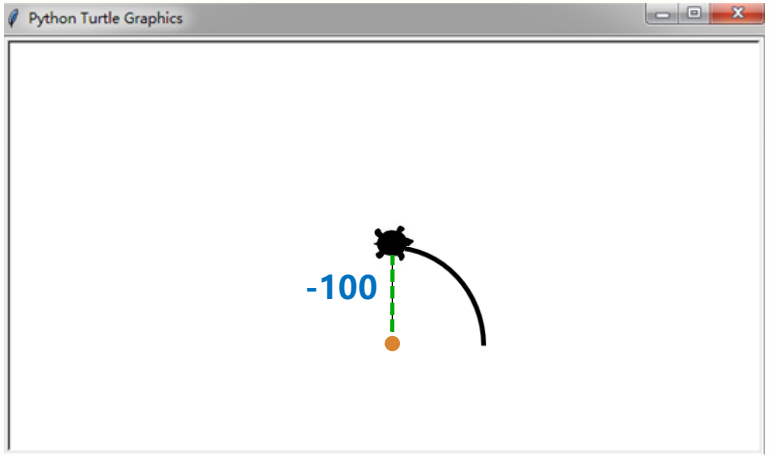
- extent: 绘制角度，默认是360度整圆

运动控制函数

```
turtle.circle(100)
```




```
turtle.circle(-100,90)
```



```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

fd(d)

circle(r,extent=None)

运动控制函数

画笔设置后一直有效，直至下次重新设置

- **turtle.forward(d)　别名　turtle.fd(d)**

  向前行进，海龟走直线

- **d: 行进距离，可以为负数**

turtle方向控制函数

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

seth()

方向控制函数

控制海龟面对方向: 绝对角度 & 海龟角度

- turtle.setheading(angle)　　别名　　turtle.seth(angle)

  改变行进方向，海龟走角度

- angle: 行进方向的绝对角度

方向控制函数

```
turtle.seth(45)
```


```
turtle.seth(-135)
```

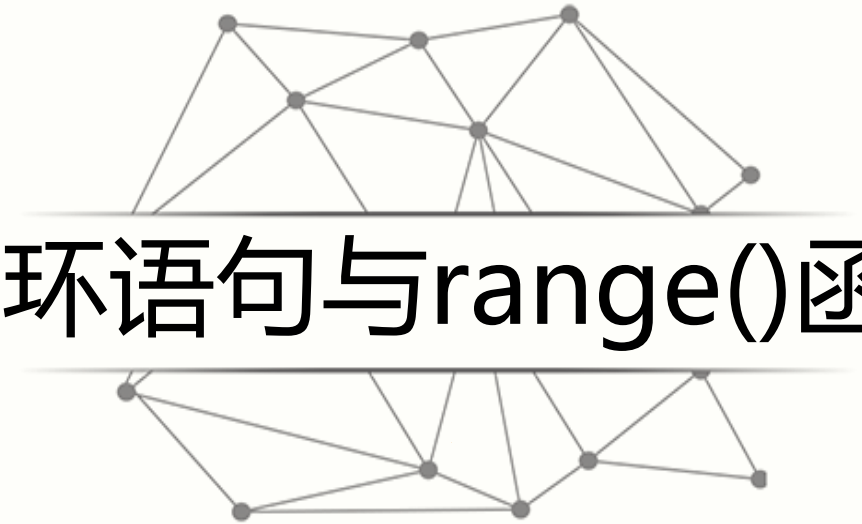
方向控制函数

控制海龟面对方向: 绝对角度 & 海龟角度

- turtle.left(angle)　　海龟向左转
- turtle.right(angle)　　海龟向右转
- angle: 在海龟当前行进方向上旋转的角度

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

seth(angle)



循环语句与range()函数

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
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    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

for 和 in 保留字

range()

循环语句

按照一定次数循环执行一组语句

```
for <变量>  in  range(<次数>):
    <被循环执行的语句>
```

- <变量>表示每次循环的计数，0到<次数>-1

循环语句

```
>>> for i in range(5):
        print(i)

0
1
2
3
4
```

```
>>> for i in range(5):
        print("Hello:",i)

Hello: 0
Hello: 1
Hello: 2
Hello: 3
Hello: 4
```

range()函数

产生循环计数序列

- **range(N)**

  产生 0 到 N-1的整数序列，共N个

- **range(M，N)**

  产生 M 到 N-1的整数序列，共N-M个

```
range(5)
    0, 1, 2, 3, 4
range(2, 5)
    2, 3, 4
```

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
turtle.pencolor("purple")
turtle.seth(-40)
for i in range(4):
    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

`for i in range(N):`

`range(N)`

`range(M, N)`

"Python蟒蛇绘制"代码分析

```
import turtle
turtle.setup(650, 350, 200, 200)
turtle.penup()
turtle.fd(-250)
turtle.pendown()
turtle.pensize(25)
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turtle.seth(-40)
for i in range(4):
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turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

```
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turtle.setup(650, 350, 200, 200)
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turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```

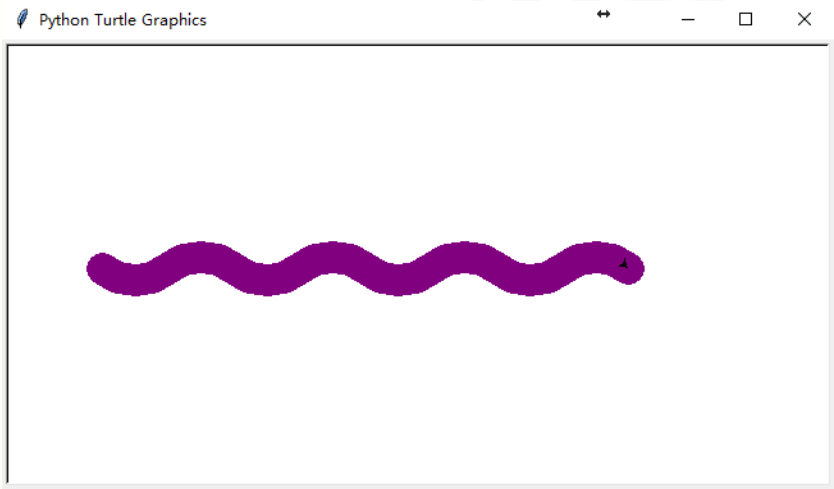

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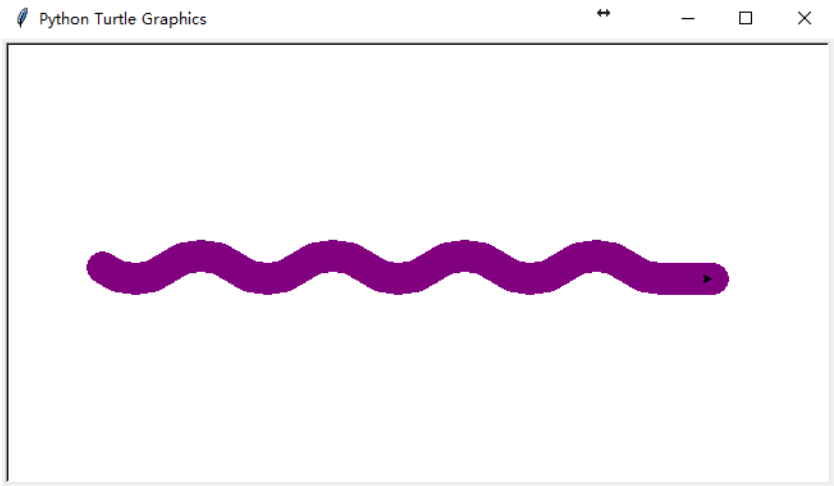
turtle.fd(40 * 2/3)
turtle.done()
```



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turtle.penup()
turtle.fd(-250)
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turtle.pensize(25)
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turtle.seth(-40)
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    turtle.circle(40, 80)
    turtle.circle(-40, 80)
turtle.circle(40, 80/2)
turtle.fd(40)
turtle.circle(16, 180)
turtle.fd(40 * 2/3)
turtle.done()
```
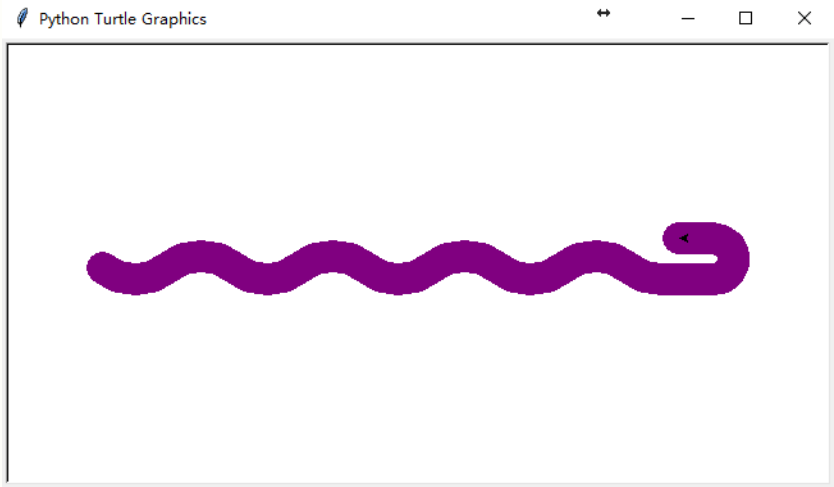
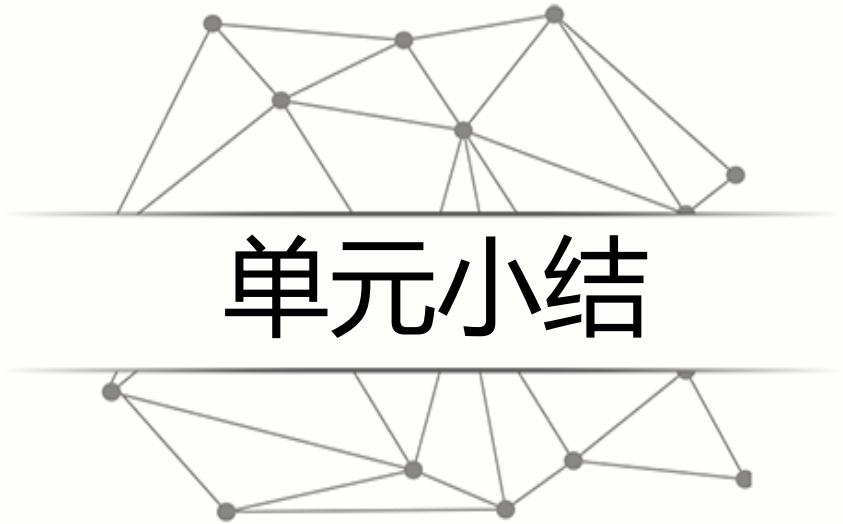
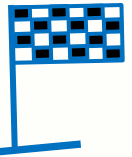





单元小结

turtle程序语法元素分析

- **库引用: import、from…import、import…as…**
- **penup()、pendown()、pensize()、pencolor()**
- **fd()、circle()、seth()**
- **循环语句：for和in、range()函数**



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