
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

实例4: 文本进度条

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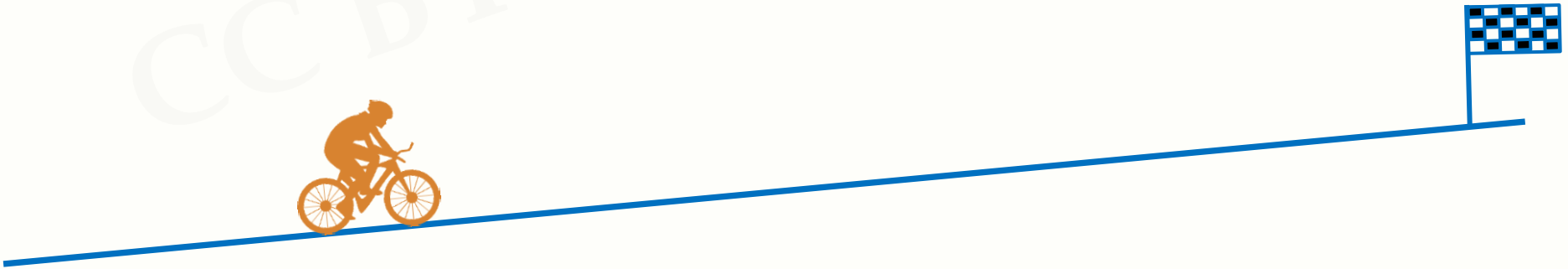
"文本进度条"问题分析

文本进度条

用过计算机的都见过

- 进度条什么原理呢？



需求分析

文本进度条

- 采用字符串方式打印可以动态变化的文本进度条
- 进度条需要能在一行中逐渐变化

问题分析

如何获得文本进度条的变化时间？

- **采用sleep()模拟一个持续的进度**
- **似乎不那么难**

"文本进度条"简单的开始

简单的开始

```
#TextProBarV1.py
import time
scale = 10
print("------执行开始------")
for i in range(scale+1):
    a = '*' * i
    b = '.' * (scale - i)
    c = (i/scale)*100
    print("{:^3.0f}%[{}->{}]".format(c,a,b))
    time.sleep(0.1)
print("------执行结束------")
```

```
------执行开始------
  0 %[->.........]
 10 %[*->........]
 20 %[**->.......]
 30 %[***->......]
 40 %[****->.....]
 50 %[*****->....]
 60 %[******->...]
 70 %[*******->..]
 80 %[********->.]
 90 %[*********->]
100%[**********->]
------执行结束------
```

"文本进度条"单行动态刷新

单行动态刷新

刷新的关键是 \r

- **刷新的本质是：用后打印的字符覆盖之前的字符**
- **不能换行：print()需要被控制**
- **要能回退：打印后光标退回到之前的位置 \r**

单行动态刷新

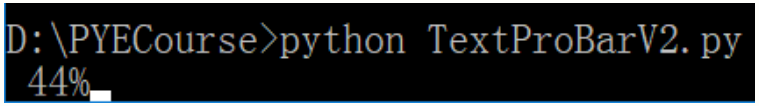
```
#TextProBarV2.py
import time
for i in range(101):
    print("\r{:3}%".format(i), end="")
    time.sleep(0.1)
```

```
  0%  1%  2%  3%  4%  5%  6%  7%  8%  9% 10% 11% 12% 13% 14% 15% 16% 17% 18% 19%
 20% 21% 22% 23% 24% 25% 26% 27% 28% 29% 30% 31% 32% 33% 34% 35% 36% 37% 38% 39%
 40% 41% 42% 43% 44% 45% 46% 47% 48% 49% 50% 51% 52% 53% 54% 55% 56% 57% 58% 59%
 60% 61% 62% 63% 64% 65% 66% 67% 68% 69% 70% 71% 72% 73% 74% 75% 76% 77% 78% 79%
 80% 81% 82% 83% 84% 85% 86% 87% 88% 89% 90% 91% 92% 93% 94% 95% 96% 97% 98% 99%
```

IDLE屏蔽了\r功能

单行动态刷新

```
#TextProBarV2.py
import time
for i in range(101):
    print("\r{:3}%".format(i), end="")
    time.sleep(0.1)
```



命令行执行

"文本进度条"实例完整效果

完整效果

```
#TextProBarV3.py
import time
scale = 50
print("执行开始".center(scale//2, "-"))
start = time.perf_counter()
for i in range(scale+1):
    a = '*' * i
    b = '.' * (scale - i)
    c = (i/scale)*100
    dur = time.perf_counter() - start
    print("\r{:^3.0f}%[{}->{}]{:.2f}s".format(c,a,b,dur),end='')
    time.sleep(0.1)
print("\n"+"执行结束".center(scale//2,'-'))
```

```
D:\PYECourse>python TextProBar.py
----------执行开始----------
100%[**************************************************->]5.02s
----------执行结束----------
```

准备好电脑，与老师一起编码吧！

"文本进度条"举一反三

```
#TextProBarV3.py
import time
scale = 50
print("执行开始".center(scale//2, "-"))
start = time.perf_counter()
for i in range(scale+1):
    a = '*' * i
    b = '.' * (scale - i)
    c = (i/scale)*100
    dur = time.perf_counter() - start
    print("\r{:^3.0f}%[{}->{}]{:.2f}s".format(c,a,b,dur),end='')
    time.sleep(0.1)
print("\n"+"执行结束".center(scale//2,'-'))
```

举一反三

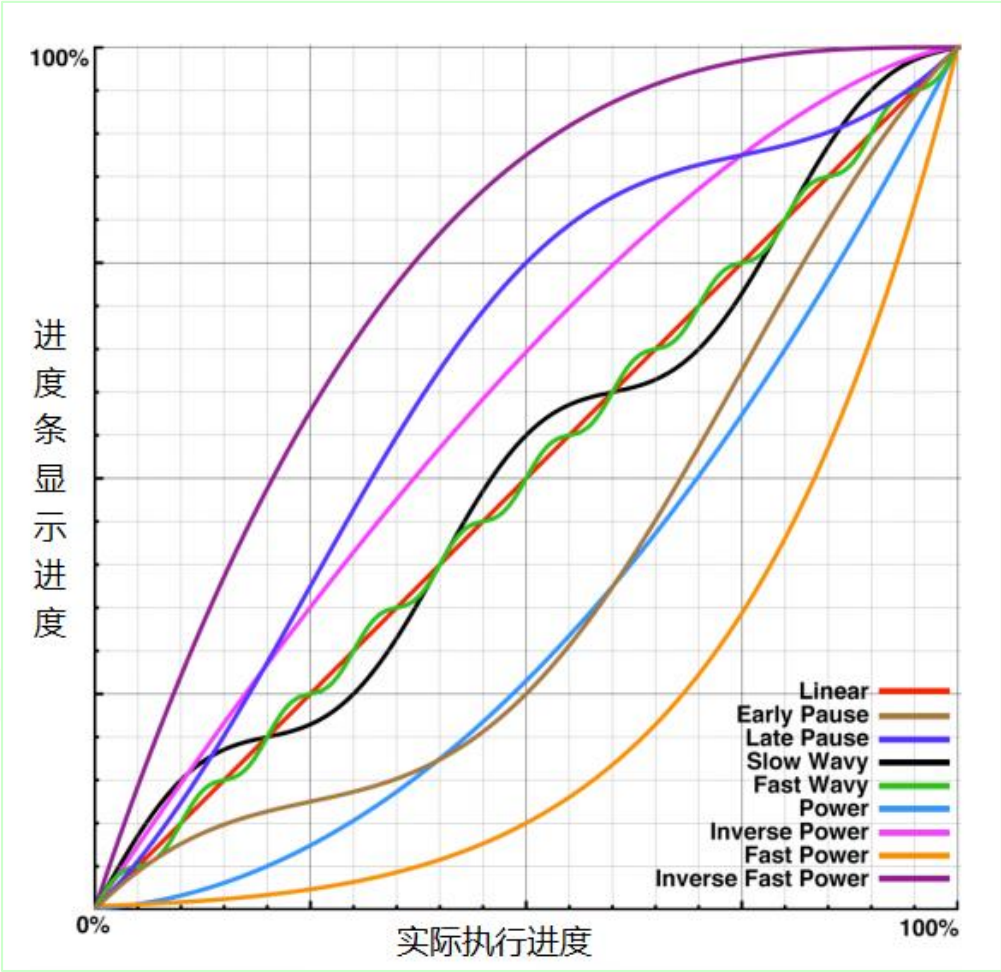
计算问题扩展

- 文本进度条程序使用了perf_counter()计时
- 计时方法适合各类需要统计时间的计算问题
- 例如：比较不同算法时间、统计部分程序运行时间

举一反三

进度条应用

- 在任何运行时间需要较长的程序中增加进度条
- 在任何希望提高用户体验的应用中增加进度条
- 进度条是人机交互的纽带之一



Harrison C. et al. Rethinking the Progress Bar. In ACM Symposium on User Interface Software and Technology, 2007

举一反三

文本进度条的不同设计函数

设计名称	趋势	设计函数
Linear	Constant	f(x) = x
Early Pause	Speeds up	f(x) = x+(1-sin(x*π*2+π/2)/-8
Late Pause	Slows down	f(x) = x+(1-sin(x*π*2+π/2)/8
Slow Wavy	Constant	f(x) = x+sin(x*π*5)/20
Fast Wavy	Constant	f(x) = x+sin(x*π*20)/80

举一反三

文本进度条的不同设计函数

设计名称	趋势	设计函数
Power	Speeds up	$f(x) = (x+(1-x)*0.03)^2$
Inverse Power	Slows down	$f(x) = 1+(1-x)^{1.5} *-1$
Fast Power	Speeds up	$f(x) = (x+(1-x)/2)^8$
Inverse Fast Power	Slows down	$f(x) = 1+(1-x)^3 *-1$