

Module Turtle

Laurent Signac

Ensip – Université de Poitiers

`Laurent.Signac@univ-poitiers.fr`

Module Turtle

Éduquons les tortues

- Monde selon logo : espace en deux dimensions.
- Une tortue peut s'y déplacer en traçant ou non.
- On commande la tortue (avance, tourne à gauche,...).

Apprendre à la tortue à faire un carré :

```
import turtle as tu
def carre(l) :
    for i in range(4) :
        tu.fd(l)
        tu.right(90)
```

► carretortue.py

Mise en place :

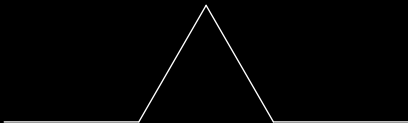
```
import turtle as tu
tu.reset()
tu.clearscreen()
tu.speed(0)
tu.tracer(5,0)
carre(100)
tu.update()
```

Bonus : ► bonustortue.py

```
def polygone(nb,l) :
    for c in range(nb) :
        tu.fd(l)
        tu.right(360/nb)

def rosace(nb,l,a) :
    for i in range(0,4*360,a) :
        polygone(nb,l)
        tu.right(a)
```

Courbe de Koch

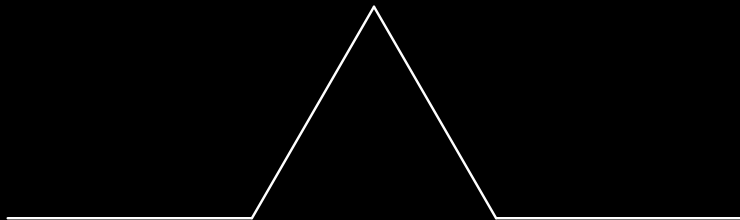


► koch1.py

```
def fig(1) :  
    tu.fd(1)  
    tu.lt(60)  
    tu.fd(1)  
    tu.rt(120)  
    tu.fd(1)  
    tu.lt(60)  
    tu.fd(1)
```

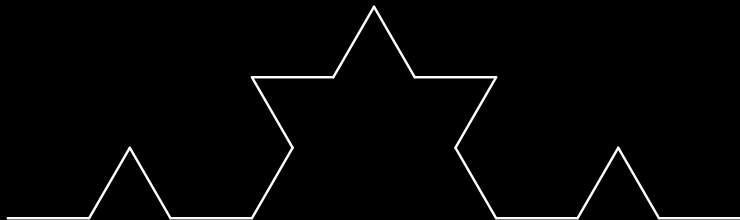
Courbe de Koch

Koch 1-2-3-4-5



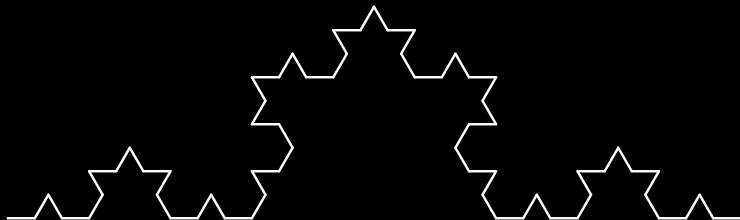
Courbe de Koch

Koch 1-2-3-4-5



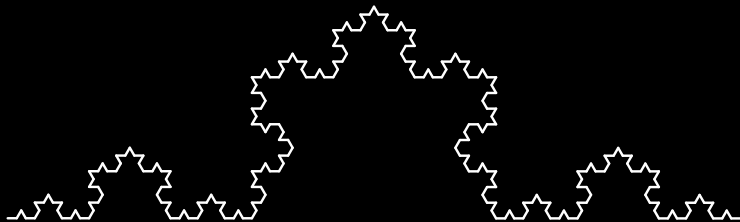
Courbe de Koch

Koch 1-2-3-4-5



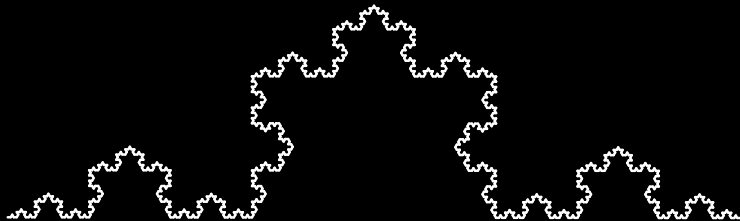
Courbe de Koch

Koch 1-2-3-4-5



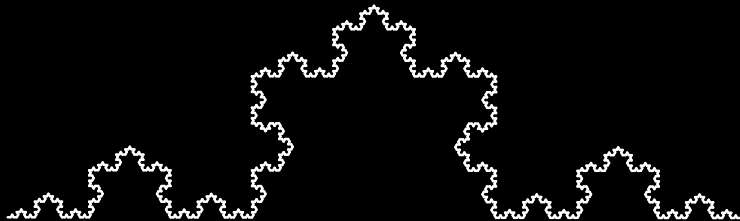
Courbe de Koch

Koch 1-2-3-4-5



Courbe de Koch

Koch 1-2-3-4-5



Idée :

Remplacer chaque segment par un appel à la primitive complète

Courbe de Koch (avec erreur)

```
def fig(l) :  
    tu.fd(l)  
    tu.lt(60)  
    tu.fd(l)  
    tu.rt(120)  
    tu.fd(l)  
    tu.lt(60)  
    tu.fd(l)
```

```
def fig(l) :  
    fig(l/3)  
    tu.lt(60)  
    fig(l/3)  
    tu.rt(120)  
    fig(l/3)  
    tu.lt(60)  
    fig(l/3)
```

► koch2.py

Qu'est ce qui cloche... ?

Courbe de Koch fonctionnelle

```
def fig(l) :  
    if l<20 :  
        tu.fd(l)  
        return  
    fig(l/3)  
    tu.lt(60)  
    fig(l/3)  
    tu.rt(120)  
    fig(l/3)  
    tu.lt(60)  
    fig(l/3)
```

Exercice :

Dessinez fig(300)

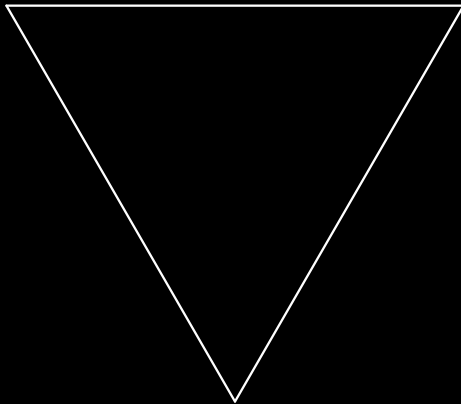
► koch3.py

La courbe de Koch a une «dimension» de 1.26.

Autres figures

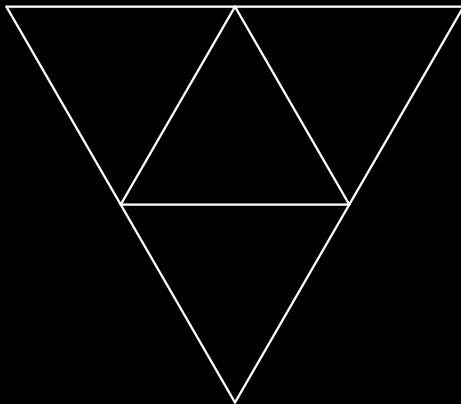
Triangle de Sierpinski

Sierpinsky 1-2-3-4-5-6-7



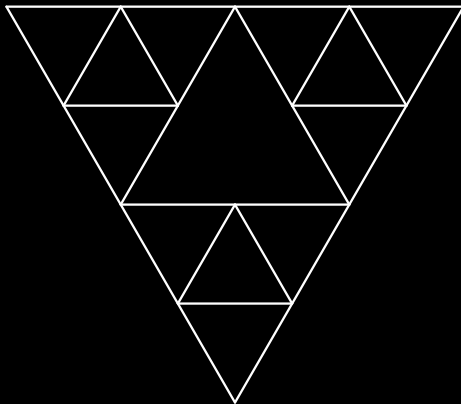
Triangle de Sierpinski

Sierpinsky 1-2-3-4-5-6-7



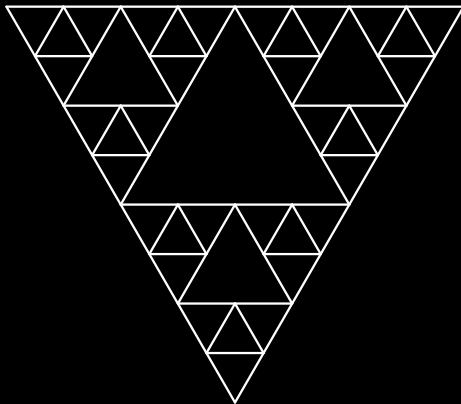
Triangle de Sierpinski

Sierpinsky 1-2-3-4-5-6-7



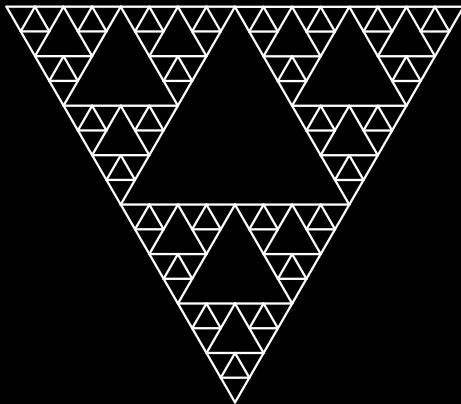
Triangle de Sierpinski

Sierpinsky 1-2-3-4-5-6-7



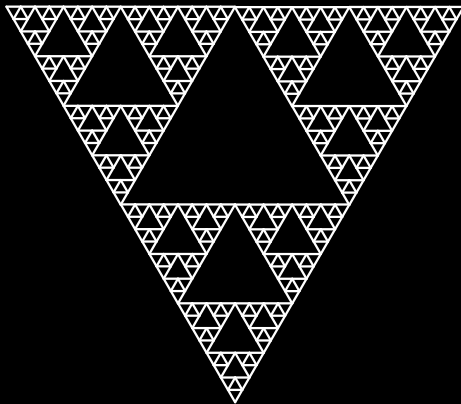
Triangle de Sierpinski

Sierpinsky 1-2-3-4-5-6-7



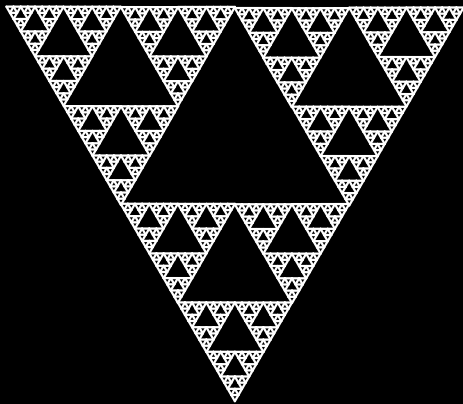
Triangle de Sierpinski

Sierpinsky 1-2-3-4-5-6-7



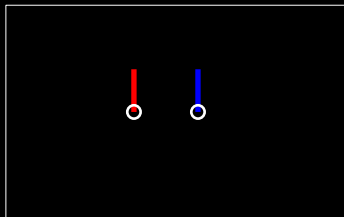
Triangle de Sierpinski

Sierpinsky 1-2-3-4-5-6-7



Courbe du dragon

Dragon gauche / droit



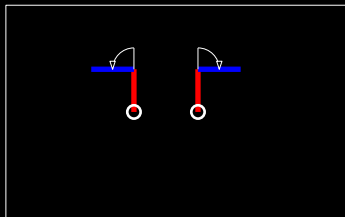
Profondeur 0

$$Ga(n) : Ga(n - 1) + \underset{+90}{rot} + Dr(n - 1)$$

$$Dr(n) : Ga(n - 1) + \underset{-90}{rot} + Dr(n - 1)$$

Courbe du dragon

Dragon gauche / droit



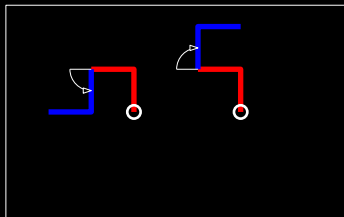
Profondeur 1

$$Ga(n) : Ga(n-1) + \underset{+90}{rot} + Dr(n-1)$$

$$Dr(n) : Ga(n-1) + \underset{-90}{rot} + Dr(n-1)$$

Courbe du dragon

Dragon gauche / droit



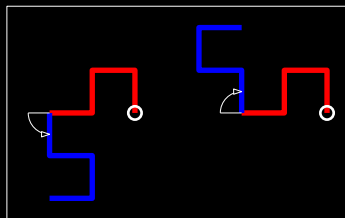
Profondeur 2

$$Ga(n) : Ga(n-1) + \underset{+90}{rot} + Dr(n-1)$$

$$Dr(n) : Ga(n-1) + \underset{-90}{rot} + Dr(n-1)$$

Courbe du dragon

Dragon gauche / droit



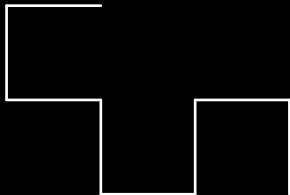
Profondeur 3

$$Ga(n) : Ga(n-1) + \underset{+90}{rot} + Dr(n-1)$$

$$Dr(n) : Ga(n-1) + \underset{-90}{rot} + Dr(n-1)$$

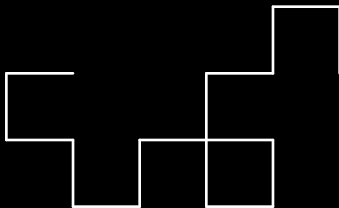
Courbe du dragon

Dragon droit 3



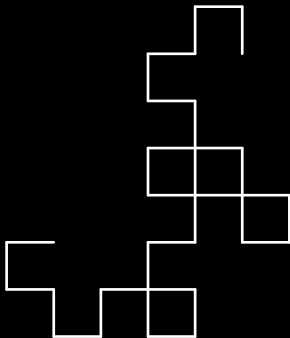
Courbe du dragon

Dragon droit 4



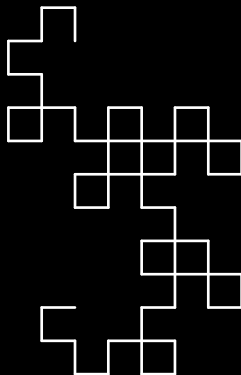
Courbe du dragon

Dragon droit 5



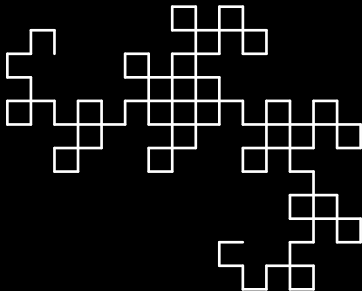
Courbe du dragon

Dragon droit 6



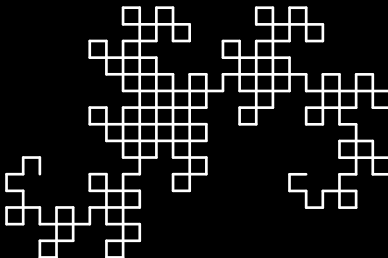
Courbe du dragon

Dragon droit 7



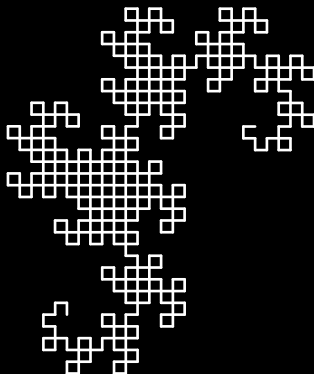
Courbe du dragon

Dragon droit 8



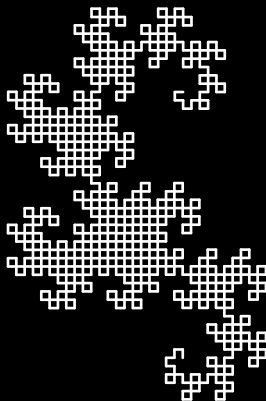
Courbe du dragon

Dragon droit 9



Courbe du dragon

Dragon droit 10



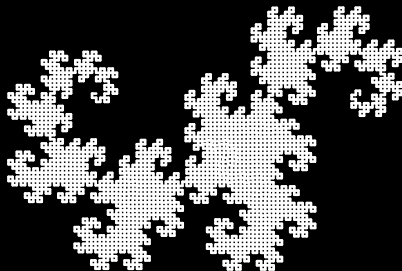
Courbe du dragon

Dragon droit 11



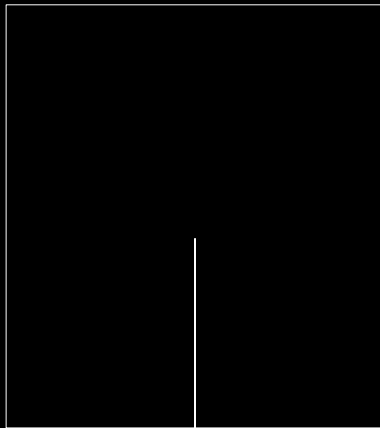
Courbe du dragon

Dragon droit 12..(fin)



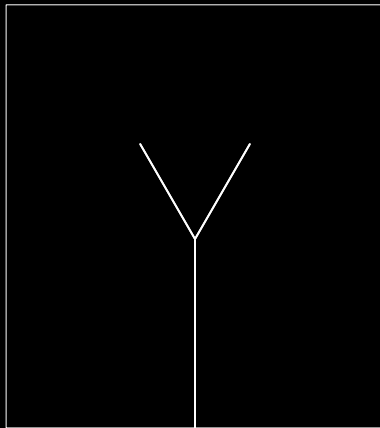
Arbres fractals

Arbre 1-2-3-4-5-6



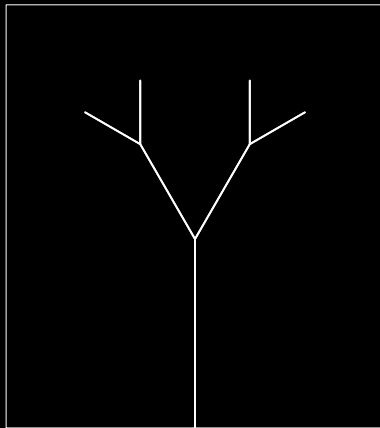
Arbres fractals

Arbre 1-2-3-4-5-6



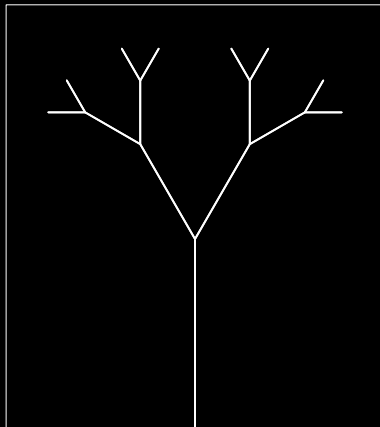
Arbres fractals

Arbre 1-2-3-4-5-6



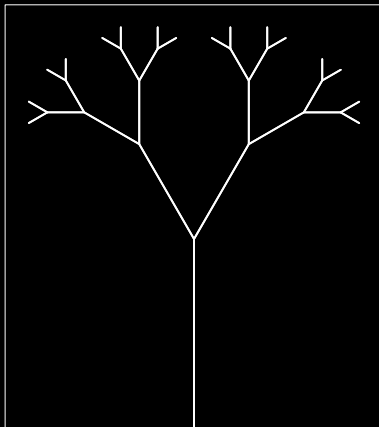
Arbres fractals

Arbre 1-2-3-4-5-6



Arbres fractals

Arbre 1-2-3-4-5-6



Arbres fractals

Arbre 1-2-3-4-5-6

