Tecnologías de la Información

Programación Orientada a Objetos - Teclado y Sonido

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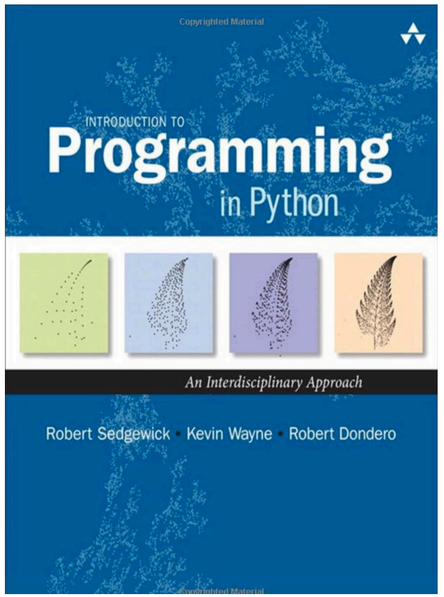


Basada en presentaciones oficiales de libro Introduction to Programming in Python (Sedgewick, Wayne, Dondero).

Disponible en https://introcs.cs.princeton.edu/python

Outline

- Interrogaciones
- Teclado en animaciones
- Sonido en animaciones
- Certamen 2 2018

Usando el teclado

```
balls = [
    Ball(.480, .860, .015, .023, .05, stddraw.BLACK),
    Ball(.480, .860, .030, .046, .05, stddraw.BLUE),
    Ball(.180, .260, .040, .026, .05, stddraw.GREEN)
]

while True:
    # get keystrokes
    if stddraw.hasNextKeyTyped():
        k = stddraw.nextKeyTyped()
        if k == stddraw.K_UP:
            for b in balls: b.increase_speed(0.1, 0.1)
        elif k == stddraw.K_DOWN:
            for b in balls: b.increase_speed(-0.1, -0.1)

    # update velocity
    for b in balls: b.update()

    # clear the background
    stddraw.clear(stddraw.LIGHT_GRAY)

    # draw the ball on the screen
    for b in balls: b.draw()

    # copy buffer to screen
    stddraw.show(0)
    stddraw.pause(20)
```

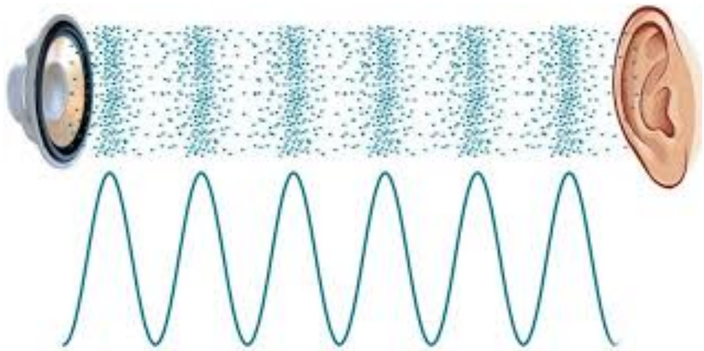
Códigos para teclas en https://github.com/josiest/pygtails/blob/master/docs/pygstants.rst

Keycode Name	Ascii	Description
K_BACKSPACE	\b	backspace
K_TAB	\t	tab
K_CLEAR		clear
K_RETURN	\r	return
K_PAUSE		pause
K_ESCAPE	^[	escape
K_SPACE		space
K_UP		up arrow
K_DOWN		down arrow
K_RIGHT		right arrow
K_LEFT		left arrow

Sonido

- El **sonido** es una percepción por un conjunto de vibraciones que se propagan por un medio elástico, como el aire.

- Un **tono es** la sensación auditiva o atributo psicológico de los sonidos que los caracteriza más agudos o más graves.



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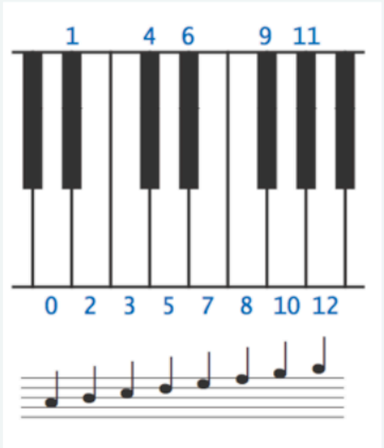
Sonido

- **Escala de notas occidental**

  - Concert A is 440 Hz.
  - 12 notes, logarithmic scale.



i	*frequency* ($440*2^{i/12}$)	*sinusodial waveform*
0	440	
1	466.16	
2	493.88	
3	523.25	
4	554.37	
5	587.33	
6	622.25	
7	659.26	
8	698.46	
9	739.99	
10	783.99	
11	830.61	
12	880	

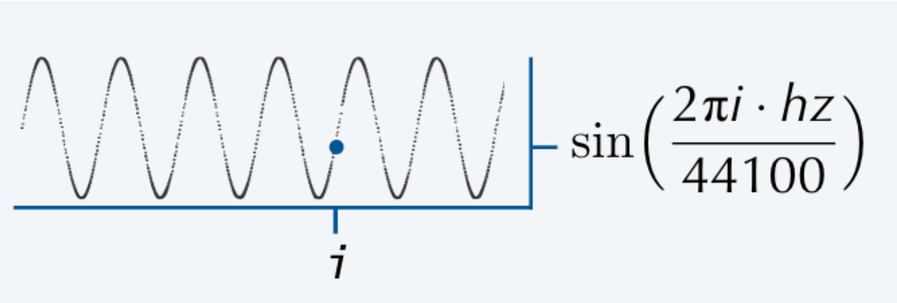
Audio digital

- Para representar un sonido en un computador debemos convertir una señal continua a una señal discreta.

- El computador toma muestras (sampling) en intervalos regulares

	samples/sec	*samples*	*sampled waveform*
1/40 second of concert A	5,512	137	
	11,025	275	
	22,050	551	
CD standard →	44,100	1102	

Módulo stdaudio




```
 1 import math
 2 import stdaudio
 3 import sys
 4
 5 def tone(hz, duration):
 6     n = int(44100 * duration)
 7     note = [0.0]*(n+1)
 8     for i in range(n+1):
 9         note[i] = math.sin(2.0 * math.pi * i * hz / 44100)
10     stdaudio.playSamples(note)
11
12 hz = float(sys.argv[1])
13 duration = float(sys.argv[2])
14 tone(hz, duration)
```

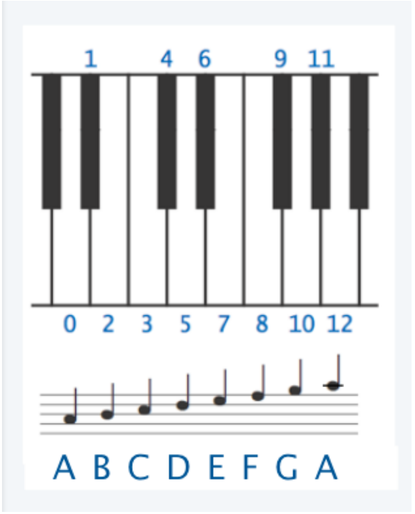
```
python3 playthatnote.py 440.0 3.0
python3 playthatnote.py 880.0 3.0
python3 playthatnote.py 220.0 3.0
python3 playthatnote.py 494.0 3.0
```

Reproducir canción

```
 1 import math
 2 import stdio # this is new!
 3 import stdaudio
 4
 5 SPS = 44100
 6 CONCERT_A = 440.0
 7 NOTES_ON_SCALE = 12.0
 8
 9 while not stdio.isEmpty():
10     pitch = stdio.readInt()
11     duration = stdio.readFloat()
12     hz = CONCERT_A * (2.0 ** (pitch / NOTES_ON_SCALE))
13     n = int(SPS * duration)
14     note = [0.0]*(n+1)
15     for i in range(n+1):
16         note[i] = math.sin(2.0 * math.pi * i * hz / SPS)
17     stdaudio.playSamples(note)
18
19 stdaudio.wait()
```

Lee desde teclado y convierte automáticamente a entero/float.

```
$ head elise.txt
7 .125
6 .125
7 .125
6 .125
7 .125
7 .125
2 .125
5 .125
3 .125
0 .25
```



http://www.cs.princeton.edu/courses/archive/fall18/cos126/lectures/CS.5.Functions.pdf

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