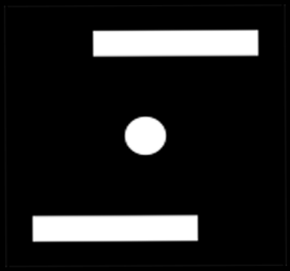
PONG



by Simon Guo & Jesse Zhao

powered by python™

Modifying Pong to meet new specifications

By Simon Guo and Jesse Zhao

Description:

Pong is a really famous and original game. In the samples of Pippy on OLPC, there is also a Pong game in the graphics categories. In order to understand python better, we started a project to modify pong through coding in python.

What is Python?

Python is a **widely used, general-purpose, high-level programming language**. Its **design emphasizes code readability**, and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C++ or Java. Python is an **object-oriented programming language**. It has gained popularity because of its **clear syntax and readability.**

What is Pong?

Pong **is one of the first computer games that was ever created**, this simple "tennis like" game usually features two paddles and a ball, or one paddle and a few lives and a close edged wall for the ball to bounce off of. The goal is to **prevent the ball from going on the line that your paddle is moving on.** Once you lose for a certain amount of times, it's game over!

What is Pygame?

Pygame is **a cross-platform set of Python modules designed for writing video games**. It includes computer graphics and sound libraries designed to be used with the Python programming language. Pygame adds functionality on top of the excellent SDL library. This allows you to **create fully featured games and multimedia programs in the python language.** Pygame is **highly portable** and **runs on nearly every platform and operating system**. Pygame itself has been downloaded millions of times, and has had millions of visits to its website.

Where do I get the Pong from?

We need to get Pong from the OLPC, using linux commands to find them and copy to the usb device.

Linux/Unix commands

These are linux and unix basic commands to access file, switch directory, and run program.
pwd outputs the name of the current working directory.
ls lists all files and directories in the working directory.
cd switches you into the directory you specify.
cd.. move up one directory
mkdir creates a new directory in the working directory.
cp copies files or directories.
rm remove files or directories
cat Concatenate files and print on the standard output
mount list directory for system hardware and outside devices
program name + file name use program to run a file

How to transfer a file from OLPC to a computer

1. Determine the path name to the USB stick using the mount command

```
[olpc@xo-4f-ff-dc graphics]$ mount
```

Mount is the command you can use to find outside device connected to the computer.
after tying mount, we can find a directory of our usb stick (“TRANSFER”)

```
tmpfs on /run type tmpfs (rw,nosuid,nodev,mode=755)
tmpfs on /sys/fs/cgroup type tmpfs (rw,nosuid,nodev,noexec,mode=755)
cgroup on /sys/fs/cgroup/systemd type cgroup (rw,nosuid,nodev,noexec,relatime,release_agent=/usr/l
ib/systemd/systemd-cgroups-agent,name=systemd)
cgroup on /sys/fs/cgroup/cpu type cgroup (rw,nosuid,nodev,noexec,relatime,cpu)
debugfs on /sys/kernel/debug type debugfs (rw,relatime)
mqueue on /dev/mqueue type mqueue (rw,relatime)
vartmp on /var/tmp type tmpfs (rw,relatime,size=51200k)
/tmp on /tmp type tmpfs (rw,relatime,size=51200k)
varlog on /var/log type tmpfs (rw,relatime,size=20480k)
none on /var/lib/stateless/writable type tmpfs (rw,relatime,size=1024k,nr_inodes=1024)
none on /var/cache/man type tmpfs (rw,relatime,size=1024k,nr_inodes=1024)
none on /var/lib/xkb type tmpfs (rw,relatime,size=1024k,nr_inodes=1024)
none on /var/lib/dhclient type tmpfs (rw,relatime,size=1024k,nr_inodes=1024)
none on /etc/adjtime type tmpfs (rw,relatime,size=1024k,nr_inodes=1024)
none on /var/lib/logrotate.status type tmpfs (rw,relatime,size=1024k,nr_inodes=1024)
none on /var/spool type tmpfs (rw,relatime,size=1024k,nr_inodes=1024)
/dev/mmcblk0p1 on /etc/ssh type ext4 (rw,relatime)
/dev/mmcblk0p1 on /etc/hosts type ext4 (rw,relatime)
/dev/mmcblk0p1 on /var/lib/dbus type ext4 (rw,relatime)
/dev/mmcblk0p1 on /var/lib/random-seed type ext4 (rw,relatime)
/dev/mmcblk0p1 on /etc/NetworkManager/system-connections type ext4 (rw,relatime)
gvfsd-fuse on /run/user/1000/gvfs type fuse.gvfsd-fuse (rw,nosuid,nodev,relatime,user_id=1000,grou
p_id=1000)
/dev/sda1 on /run/media/olpc/TRANSFER type vfat (rw,nosuid,nodev,relatime,uid=1000,gid=1000,fmask=
0022,dmask=0077,codepage=cp437,iocharset=ascii,shortname=mixed,showexec,utf8,flush,errors=remount-
ro,uhelper=udisks2)
```

directory of USB

2. Find the directory of Pong

The Pong program is in the Pippy data directory, we need to navigate to /home/olpc/Activities/Pippy.activity/data/graphics using the cd Linux command

```
[olpc@xo-4f-ff-dc ~]$ cd /home/olpc/Activities/Pippy.activity/data/graphics
[olpc@xo-4f-ff-dc graphics]$ pwd
/home/olpc/Activities/Pippy.activity/data/graphics
```

3. Copy pong to the USB as pong using the Linux cp command

```
[olpc@xo-4f-ff-dc graphics]$ cp pong /run/media/olpc/TRANSFER/.
```

Use cp command to copy pong from current directory to new directory with the same name.

4. Check if the file is in the USB

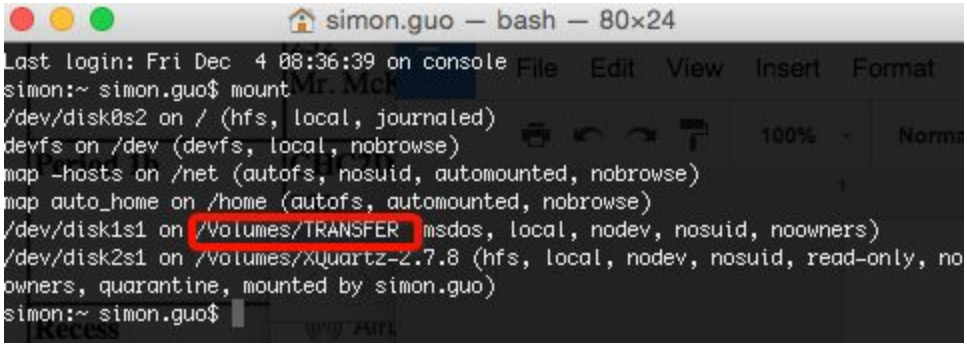
```
[olpc@xo-4f-ff-dc graphics]$ cd /run/media/olpc/TRANSFER/
[olpc@xo-4f-ff-dc TRANSFER]$ ls
pascal                                          Screenshot of _Snow_.png
pong                                            Screenshot of _Terminal Activity__1.png
pygame-1.9.2pre-py2.7-macosx10.7.mpkg.zip       Screenshot of _Terminal Activity__2.png
Screenshot of _Pippy Activity__1.png            Screenshot of _Terminal Activity__3.png
Screenshot of _Pippy Activity_.png              Screenshot of _Terminal Activity_.png
Screenshot of _Snow__1.png                      XQuartz-2.7.8.dmg
Screenshot of _Snow__2.png
[olpc@xo-4f-ff-dc TRANSFER]$
```

Use cd command to go to USB directory, and then use ls to list all file to see the file is in or not.

How to transfer a file from USB to a computer

1. Find the path of USB by mount command

Determine the path name to the USB stick using the mount command



2. Navigate to the USB using the cd command

```
simon:~ simon.guo$ cd /Volumes/TRANSFER
simon:TRANSFER simon.guo$ pwd
/Volumes/TRANSFER
```

We find TRANSFER under Volumes directory.

3.Copy pong.py from the USB to ~/pong.py using the Unix cp command

```
simon:TRANSFER simon.guo$ cp pong ~/pong.py
```

instead of /., we change the name of pong to pong.py, with .py file type, it is easier to recognize and run. We will copy that to the compsci folder later, so that we can organize our programs more easily.

How do I edit the code, debug, and run?

Through terminal, we can use vi editor to edit it.

```
simon:pong simon.guo$ vi PONG 0.0.py
```

Pong — vim — 80×24

```
 1 ()
 2 ng: hit the ball with the paddle
 3 #
 4 # use the escape key to exit
 5 #
 6 # on the XO, the escape key is the top lefthand key,
 7 # circle with an x in it.
 8
 9 import pippy
10 import pygame
11 import sys
12 from pygame.locals import *
13 from random import *
14
15 # always need to init first thing
16 pygame.init()
17
18 # create the window and keep track of the surface
19 # for drawing into
20 screen = pygame.display.set_mode((0, 0), pygame.FULLSCREEN)
21
22 # ask for screen's width and height
23 size = width, height = screen.get_size()
-- INSERT --
```

Also, we can run it by type python PONG 0.0.py

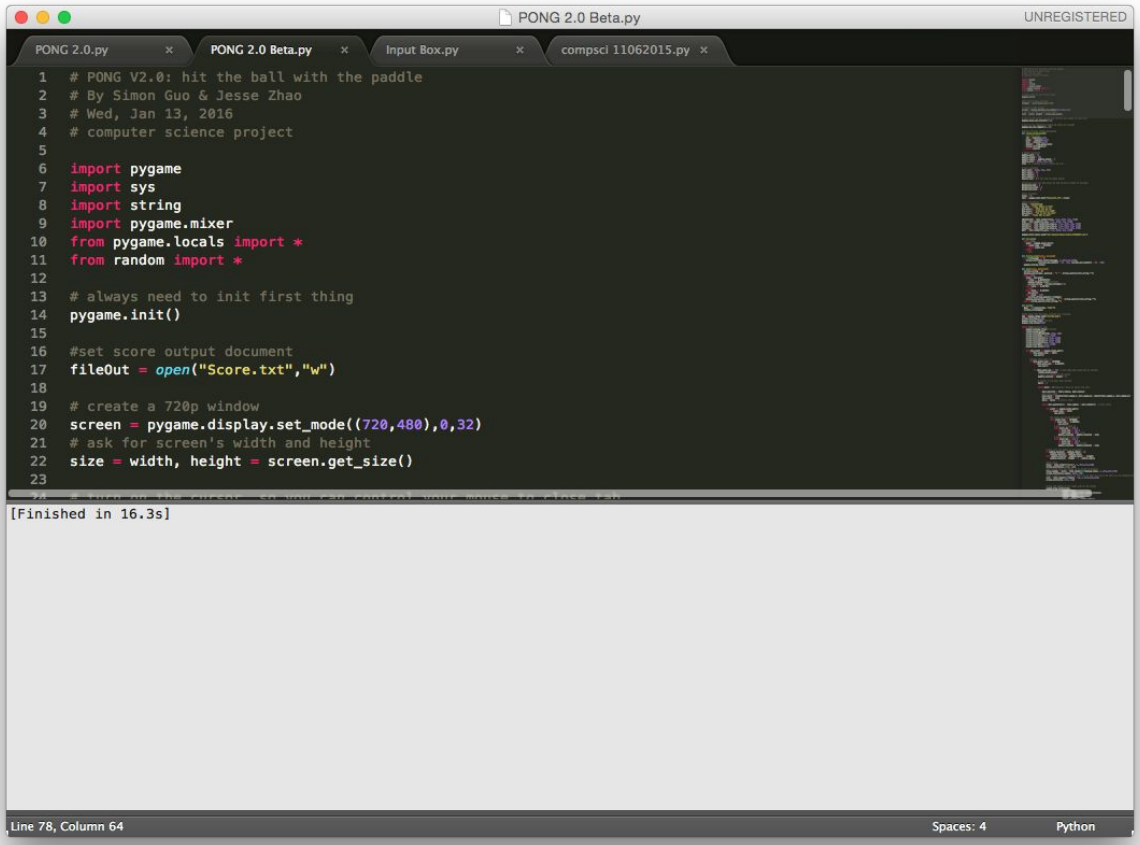
```
simon:pong simon.guo$ python PONG 0.0.py
```

VI editor is the basic editor in the Linux system. It is really basic. It is really complicated when you switch between writing and running. It takes a lot of extra time. Also, it is hard to edit, because you cannot just use normal command for example command+c to copy. It is not really efficient when you do a lot of programming.

We can solve these problems by downloading a programming IDE.

IDE stands for integrated development environment, it is a software application that provides comprehensive facilities to computer programmers for software development. An IDE normally consists of a source code editor, build automation tools and a debugger.

Sublime Text Editor is a cross-platform source code editor with a Python application programming interface (API). It natively supports many programming languages and markup languages, and its functionality can be extended by users with plugins, typically community-built and maintained under free-software licenses.



The top half is programming space, you can write code there.
The bottom half (can be hidden) is running and compile space, which shows error and run time. When you need to run the program, you just need to press command + B to start building it. It is really easy and useful.

Error type

There are three errors that we experienced when modifying the program:

1. Syntax In linguistics, syntax is the set of rules, principles, and processes that govern the structure of sentences in a given language, specifically word order.
A syntax error is a character or string incorrectly placed in a command or instruction that causes a failure in execution.

This is an easy error to fix, some IDE will show you the syntax error, you just need to fix it.

2. Logic is the branch of philosophy concerned with the use and study of valid reasoning. The study of logic also features prominently in mathematics and computer science.
A logic error is a bug in a program that causes it to operate incorrectly, but not to terminate abnormally or crash. A logic error produces unintended or undesired output or other behaviour, although it may not immediately be recognised as such.

This is harder to solve, you need to show yourself the program algorithm again to figure out what is wrong.

3. Run time is the time during which a program is running (executing), in contrast to other program lifecycle phases such as compile time, link time and load time.
A runtime error is a problem that prevents a program from working correctly. Runtime errors might cause you to lose information in the file you're working on, cause errors in the file (corrupt the file) so you can't work with it, or prevent you from using a feature.

It is more unlikely to get a Runtime error than the first two, it has many problems related to it. It may be an extra forever loop, or perhaps logic error causing a runtime error which might make the program delay for a long time.

Specific experience with debugging will be showed later

Before Writing the code

SSRGMIO

Python is a Sequential, Selective(if statements), Repetitive, Graphics, Modular(function, actions), Input, Output function.
We try to demonstrate these seven key elements in our programs.

Mindstorm

Before we start our project, we discussed what kind of functions we want the program to have. These are some of them:

- Game's instruction give a brief introduction about how to play the game
- Game's information give some information for the game and author
- Smaller window make a smaller window, easier to play and debug
- Colorful background make the game look fancy
- Score system add score in it to make the game competitive
- Pixel font make pixel time to let it look old-timed
- Increasing difficulty make the game more difficult
- Better game interface change constants of balls and paddle to make look more friendly
- ball sound but sound when the ball bounce on the paddle
- Game over display Game Over when the game is over
- Output High Score put your high score to a document
- Output Your name put your name to a document

Technology Requirements of Python Pong

Before running the game, we need to install XQuartz and Pygame.

XQuartz
The XQuartz project is an open-source effort to develop a version of the X.Org X Window System that runs on OS X. Together with supporting libraries and applications, it forms the X11.app that Apple shipped with OS X versions 10.5 through 10.7.
http://www.xquartz.org/

Pygame
Pygame is a cross-platform set of Python modules designed for writing video games. It includes computer graphics and sound libraries designed to be used with the Python programming language. This is based on the assumption that the most expensive functions inside games (mainly the graphics part) can be abstracted from the game logic, making it possible to use a high-level programming language, such as Python, to structure the game.
http://pygame.org/hifi.html

After that, you are ready to go!
You can either use linux command in terminal or build shortcut in sublime text.(mentioned in vi editor and sublime editor)

Below are the different versions we modified.produced except for the original one.

Version 0.0

Description: a fresh version of Pong, copy from olpc. Cannot run on Mac OS, because pippy IDE is not installed in OLPC

```
# pong: hit the ball with the paddle
# use the escape key to exit
# on the XO, the escape key is the top left-hand key,
# circle with an x in it.

#import files
import pippy
import pygame
import sys
from pygame.locals import *
from random import *

# always need to init first thing
pygame.init()

# create the window and keep track of the surface
# for drawing into
screen = pygame.display.set_mode((0, 0), pygame.FULLSCREEN)

# ask for screen's width and height
size = width, height = screen.get_size()

# turn off the cursor
pygame.mouse.set_visible(False)

# turn on key repeating (repeat 40 times per second)
pygame.key.set_repeat(25, 25)

# start the screen all black
bgcolor = (0, 0, 0)  #This makes the screen all black (0, 0, 0) is black.
screen.fill(bgcolor)  #This fills the screen black

# paddle constants
paddle_width = 20    #this is setting the paddle width on the game to be 20 units
paddle_length = 100   #this is setting the paddle length on the game to be 100 units
paddle_radius = paddle_length / 2 #
paddle_color = (250, 250, 250) # This colors the paddle by implementing the RGB color code
(in this case the color would be white)
step = 6  #paddle moves 3 pixels at a go
```

```
# ball constants
ball_color = (250, 250, 250) #defining the ball's color which is white
ball_radius = 25  #defining the ball's radius which is 25 units

# game constants
fsize = 48  #this is the font size for the words displayed
msg = 'Press \'g\' to start game' #displays this message when you open the game
#set font information
font = pygame.font.Font(None, fsize)
text = font.render(msg, True, (250, 250, 250))
textRect = text.get_rect()
textRect.centerx = screen.get_rect().centerx
textRect.centery = screen.get_rect().centery
#launch pygame in pippy
while pippy.pygame.next_frame():

    # display msg
    screen.fill(bgcolor)
    screen.blit(text, textRect)
    pygame.display.flip()

    # chill until a key is pressed
    for idle_event in pygame.event.get():
        if idle_event.type == QUIT:
            sys.exit()

        if idle_event.type == KEYDOWN:
            if idle_event.key == K_ESCAPE:
                sys.exit()

            if idle_event.key == 103:  # g key

                # play a game!

                # start the paddle in the center
                paddle_location = height / 2

                # number of balls to a game
                balls = 4

                while balls > 0: #you are still alive or have a few lives
```

```
ball_position = [ball_radius, ball_radius]
ball_mvect = [randint(3, 5), randint(3, 5)] #set ball speed
ball_limit = size #paddle did not meet the ball
balls = balls - 1 #lost one ball

while ball_position[0] + ball_radius < ball_limit[0]:  #in play

    for event in pygame.event.get():
        if event.type == QUIT:
            sys.exit()
                #press esc to quit
        elif event.type == KEYDOWN:
            if event.key == K_ESCAPE:
                sys.exit()
            elif event.key == 273 \
                or event.key == 265 \
                or event.key == 264:  # press up to go up
                paddle_location = paddle_location - step
            elif event.key == 274 \
                or event.key == 259 \
                or event.key == 258:  # press down to go down
                paddle_location = paddle_location + step

    # make sure the paddle is in-bounds
    if paddle_location - paddle_radius < 0:
        paddle_location = paddle_radius
    elif paddle_location + paddle_radius >= height:
        paddle_location = height - 1 - paddle_radius

    # clear the screen
    screen.fill(bgcolor)

    # draw the paddle on the right side of the screen
    pygame.draw.line(screen,
                     paddle_color,
                     (width - paddle_width, paddle_location -
                     paddle_radius),
                     (width - paddle_width,
                     paddle_location + paddle_radius),
                     paddle_width)

    # draw the ball
```

```
pygame.draw.circle(screen, ball_color, ball_position, ball_radius)

# draw the unused balls
for i in range(balls):
    pygame.draw.circle(screen, ball_color,
        (int(round(30 + i * ball_radius * 2.4)), 30),
        ball_radius)

# update the display
pygame.display.flip()

# update the ball
for i in range(2):
    ball_position[i] = ball_position[i] + ball_mvect[i]

    # bounce on top and left
    if ball_position[i] < ball_radius:
        ball_position[i] = ball_radius
        ball_mvect[i] = -1 * ball_mvect[i]
    # bounce on bottom
    elif i == 1 \
        and ball_position[i] >= ball_limit[i] - ball_radius:
        ball_position[i] = ball_limit[i] - ball_radius - 1
        ball_mvect[i] = -1 * ball_mvect[i]

    # bounce on paddle
    elif i == 0 \
        and ball_position[i] >= ball_limit[i] - ball_radius - paddle_width \
        and ball_position[1] > paddle_location - paddle_radius \
        and ball_position[1] < paddle_location + paddle_radius:
        ball_position[i] = ball_limit[i] - ball_radius - paddle_width - 1
        ball_mvect[i] = (-1) * ball_mvect[i]
```

How the code works?

The code works by scanning and calculating the ball position, with different special situation in it, like esc keys. It have major two parts, the wait part and play part. The wait part and play part runs sequentially in a forever while loop. Inside the while loop, there are several nested selective loop, which give ball different action.

Version 1.0

Description: a version that stops using pippy library and could run on OS X.

```
8   import pippy
```
---->
```
8   #import pippy
```

do not import pippy anymore, we can get library from pygame

```
55   while pippy.pygame.next_frame():
```
```
55   while True: #pippy.pygame.next_frame():
```

Change while pippy is available to while True, which both runs forever loop, but while True is recognized on OS X

Benefits: We can play on OS X

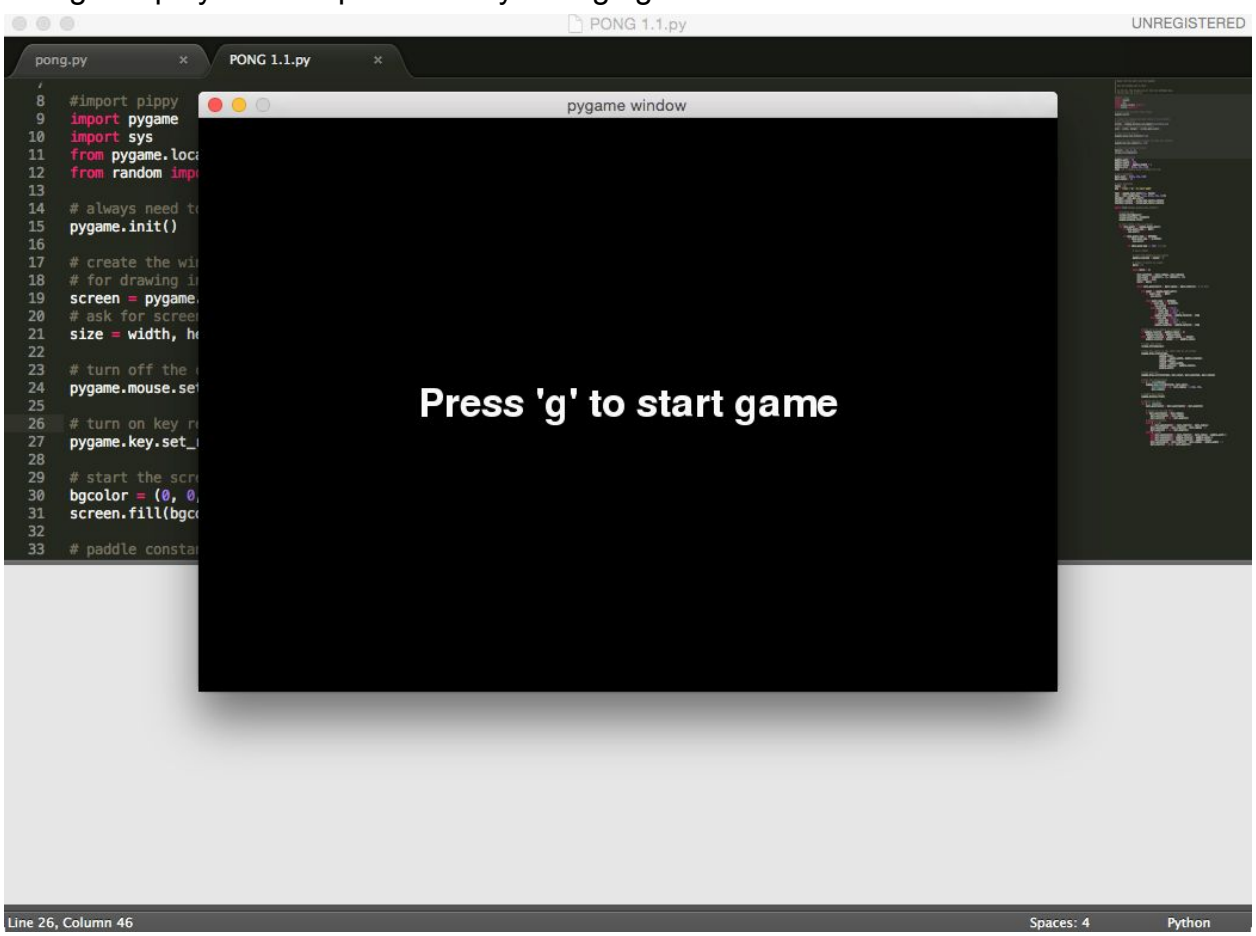
Version 1.1 smaller playing window

Description: a version that has a smaller window and visible mouse to play

```
19   screen = pygame.display.set_mode((0, 0), pygame.FULLSCREEN
```

```
19   screen = pygame.display.set_mode((720,480),0,32)
```

change display to a 720p window by changing set mode.



Also, I make the mouse visible, by changing the boolean.

```
pygame.mouse.set_visible(False)
```

```
pygame.mouse.set_visible(True)
```

Benefits: A smaller window will make the program launch faster, easier to play and debug. Visible mouse help us to close the window easily.

Version 1.2 Font

Description: a version that use pixel font, also improves moving speed and size.

```
font = pygame.font.Font(None, fsize)
```

```
font = pygame.font.Font("Minecraft.ttf", fsize)
```

By downloading Minecraft.ttf, we can make the font have pixel look.

Benefits: Changing ball speed and size make the game more friendly. The font make it looks a like an old-time game(it actually is).

Version 1.3 Improved game difficulty

Description: a version that increases the game difficulty. The ball will increase speed as the more life is lost.

```
ball_mvect = [randint(3, 5), randint(3, 5)]
```

```
                    elif i == 0 \
                        and ball_position[i] >= ball_limit[i] - ball_radius - paddle_width \
                        and ball_position[1] > paddle_location - paddle_radius \
                        and ball_position[1] < paddle_location + paddle_radius:
                        ball_position[i] = ball_limit[i] - ball_radius - paddle_width - 1
                        ball_mvect[i] = (-1) * ball_mvect[i]
                        step = step + 0.2
                        ball_speed_1 = ball_speed_1 + 10
                        ball_speed_2 = ball_speed_2 + 10
```

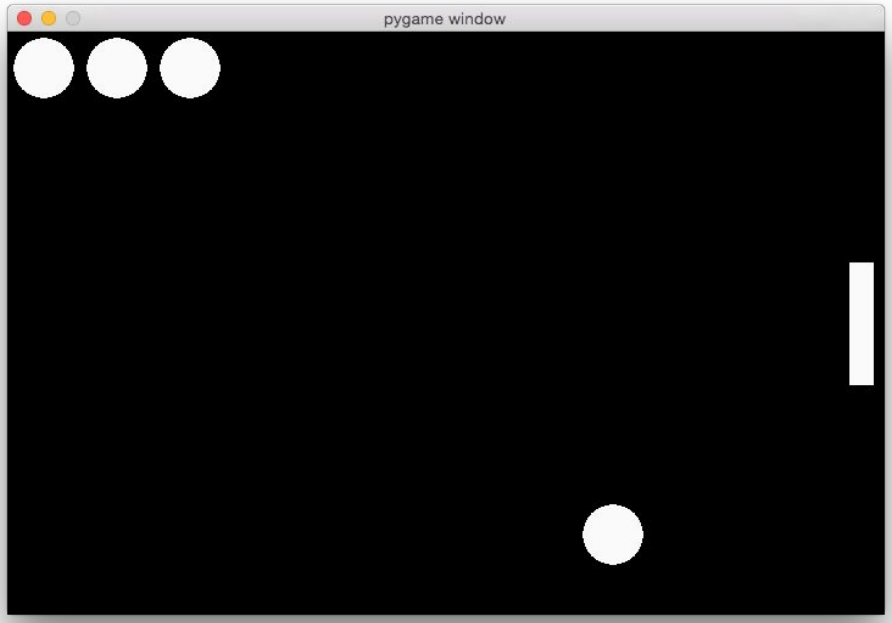
The ball speed will increase as the more life is lost.
The paddle will also increase speed to make the game better for playing.
Benefit: The game will become more challenging.

Version 1.5 Score Display

Description:It will display the score on the top of the window, and the life left beside the balls.
These codes are for displaying score and life. Because the numbers are integers, we need to change them to string to display.

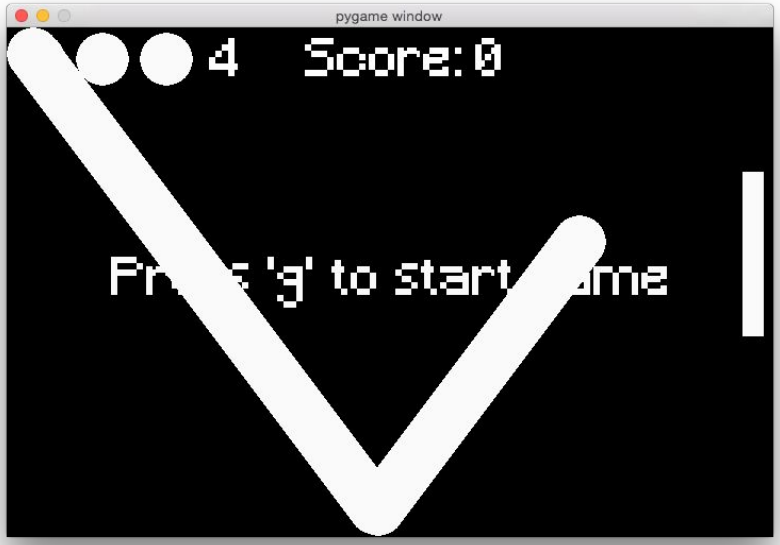
```
                    Score = font.render("Score:", 1, (255,255,255))
                    screen.blit(Score, (280, 10))



                    Score_number = Score = font.render(str(bounce_time), 1, (255,255,255))
                    screen.blit(Score_number, (440, 10))


                    Life = font.render(str(balls + 1), 1, (255,255,255))
                    screen.blit(Life, (190, 10))

                    screen.fill(bgcolor)
                    # clear the screen
```

I met a problem. The Score does not show up. It is a **Logic Error.**



I think the screen fill function has some relation to it. So I try to disable this function and see what happened.

```
#screen.fill(bgcolor)
# clear the screen
```



I noticed that the screen fill function cover the graphics were drawn.

I changed the order of screen fill and display score. And it works.

```
118                 screen.fill(bgcolor)
119                 # clear the screen
120
121                 Score = font.render("Score:", 1, (255,255,255))
122                 screen.blit(Score, (280, 10))
123
124                 Score_number = Score = font.render(str(bounce_time), 1, (255,255,255))
125                 screen.blit(Score_number, (440, 10))
126
127                 Life = font.render(str(balls + 1), 1, (255,255,255))
128                 screen.blit(Life, (190, 10))
129
```

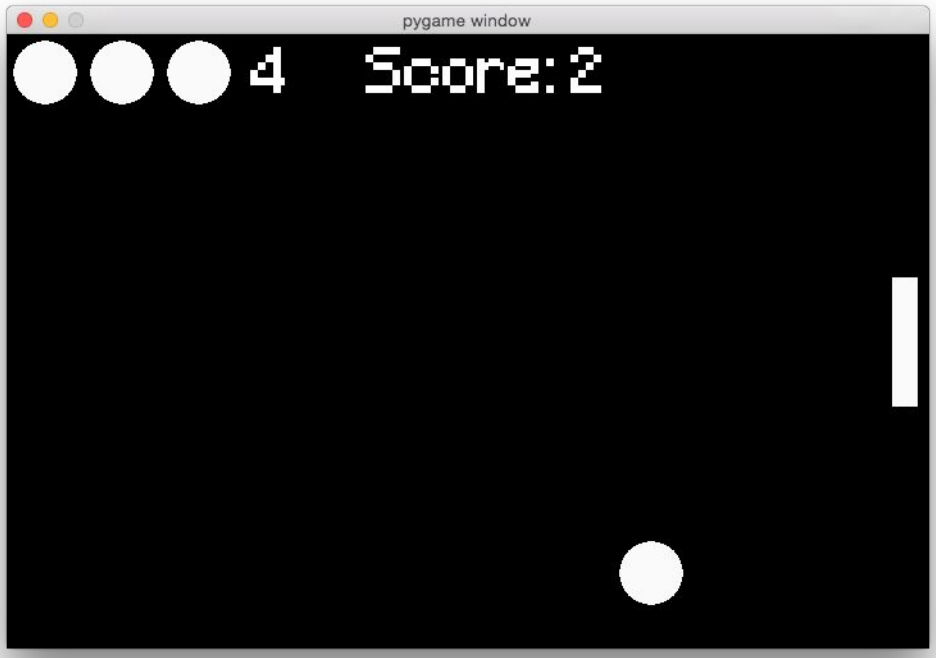
On line 127, I put a balls +1, because the balls in the code does not count the ball that is being played by you at that time.

```
46    bounce_time = 0
```

We set bounce_time as a variable. It will begin from 0. When the ball hit the paddle, it will add one.

```
bounce_time = bounce_time + 1
```

So this is a sequential problem. Now the screen will cover the path right now and display the score later.



Version 1.6 colorful introduction background

Description: This version has a colorful intro page instead of the black background. It will change the color every 1.5 seconds, which make the game look more fancy.

RGB: color model is an additive color model in which red, green, and blue light are added together in various ways to reproduce a broad array of colors. The name of the model comes from the initials of the three additive primary colors, red, green, and blue. Each of red, green, and blue color is from 0 to 255. Different combination can make different colors together.

```
def random_background():

    red = randint(0,255)
    green = randint(0,255)
    blue = randint(0,255)
    bgcolor = (red,green,blue)
    screen.fill(bgcolor)
    return bgcolor

```

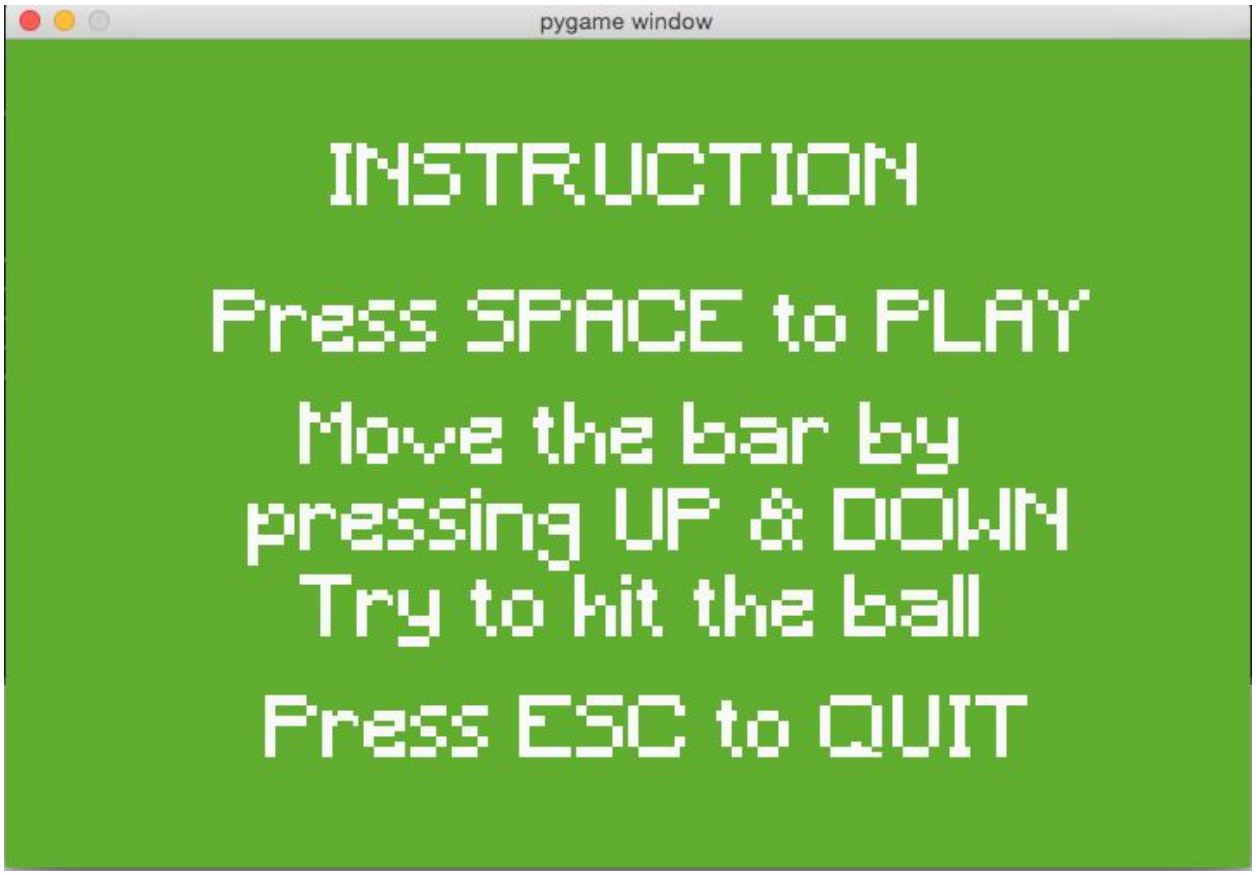
I defined a function called random background. It will make a random color and fill it on screen.

```
Title = 'INSTRUCTION'
To_play = 'Press SPACE to PLAY'
How_play_1 = 'Move the bar by'
How_play_2 = 'pressing UP & DOWN'
How_play_3 = 'Try to hit the ball'
To_quit = 'Press ESC to QUIT'

font = pygame.font.Font("Minecraft.ttf", fsize)

INSTRUCTION = font.render(Title, True, (250, 250, 250))
PLAY = font.render(To_play, True, (250, 250, 250))
Content_1 = font.render(How_play_1, True, (250, 250, 250))
Content_2 = font.render(How_play_2, True, (250, 250, 250))
Content_3 = font.render(How_play_3, True, (250, 250, 250))
QUIT = font.render(To_quit, True, (250, 250, 250))

```

I put several sentences on the colorful background, and change the start key to space.

```
while True: #pippy.pygame.next_frame():

    pygame.display.flip()
    random_background()
    screen.blit(INSTRUCTION, (185, 60))
    screen.blit(PLAY, (120, 145))
    screen.blit(Content_1, (170, 210))
    screen.blit(Content_2, (140, 260))
    screen.blit(Content_3, (170, 310))
    screen.blit(QUIT, (150, 380))
    pygame.time.delay(1500)
```

It will keeping showing them until the space key or a esc key is pressed.



Benefit: The space key is more common than the g key. Also, we made a fancy instruction page.

Version 1.6 Beta colorful game background

Description: The gaming background will change color when the ball hits the paddle

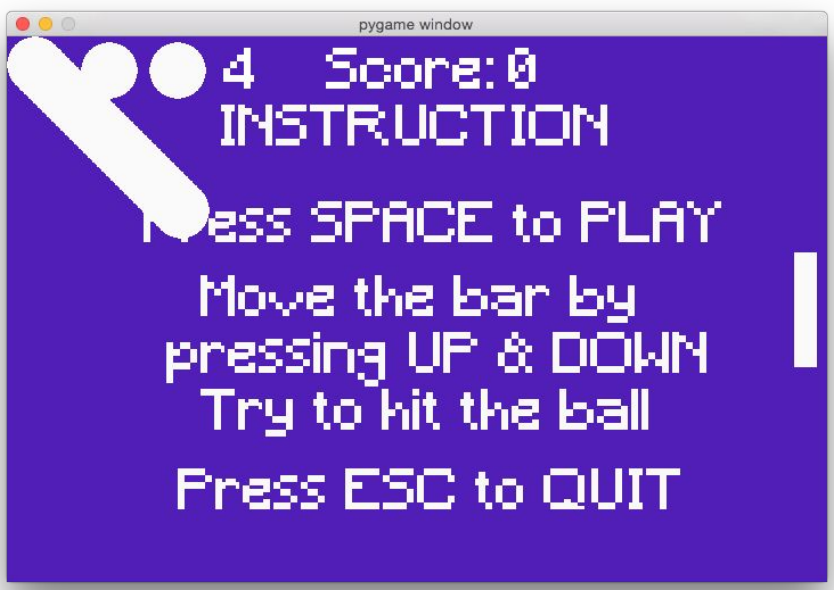
I met a logic error again. put the random_background inside the program. But it seems like it is always flashing or not refreshing the screen.

```
# start the screen all black
bgcolor = (0, 0, 0)
screen.fill(bgcolor)
```

```
def random_background():

    red = randint(0,255)
    green = randint(0,255)
    blue = randint(0,255)
    bgcolor = (red,green,blue)
    screen.fill(bgcolor)
    return bgcolor
```

```
                    screen.fill(bgcolor)
                    # clear the screen
```

```
                    random_background()
                    # clear the screen
```



I think this is happening because two subprograms are using one value, which can lead to a logic error that the color changes really fast(no delay).

The two sub programs are taking one set of random numbers and the variable cannot pass data to both of them without will defined.
I struggled on this for a long time. Finally, i come with an idea. I set another set of variables, which begin with black, then input the value when it hits the paddle. In that way, the program can get its own data and decide what to do.

```
Background_Red = 0
Background_Green = 0
Background_Blue = 0
```

```
screen.fill((Background_Red,Background_Green,Background_Blue))
# clear the screen
```

```
elif i == 0 \
    and ball_position[i] >= ball_limit[i] - ball_radius - paddle_width \
    and ball_position[1] > paddle_location - paddle_radius \
    and ball_position[1] < paddle_location + paddle_radius:
    ball_position[i] = ball_limit[i] - ball_radius - paddle_width - 1
    ball_mvect[i] = (-1) * ball_mvect[i]
    step = step + 0.2
    bounce_time = bounce_time + 1
    Background_Red = randint(0,254)
    Background_Green = randint(0,254)
    Background_Blue = randint(0,254)
```

It works and look like that.

Version 1.7 Game over

Description: In this version, it will show game over when you use up your life.

I first try to use a while loop, inside the big forever loop. Although, I put a break, it does not break out the loop after it shows game over.

```
while balls < 1:
    #break
    GameOver = 'Game Over'
    text = font.render('GameOver', True, (250, 250, 250))
    screen.blit(text, (170, 210))
    random_background()
    pygame.time.delay(2000)
    break
```

And then I try the if loop, which works perfectly.

```
if balls == 0:
    while idle_event.key != 32:  # space key
        while True:
            random_background()
            GameOver = 'Game Over'
            text = font.render('GameOver', True, (250, 250, 250))
            screen.blit(text, (220, 210))
            print ("GameOver")
            pygame.time.delay(1500)
```

The differences between if and while loop.
That is actually both a syntax and a logic error.
The program inside if statement runs **once** when the if statement is true.
The program in while statement runs **forever** when the while statement is true. I cannot let while statement run once here, because add one to the balls inside the balls < 1 statement, that will make a logic error.
So, the if statement is better here.
Thanks for Mr. Olds. He help me solve the problem.
Benefits: the game look systemically.

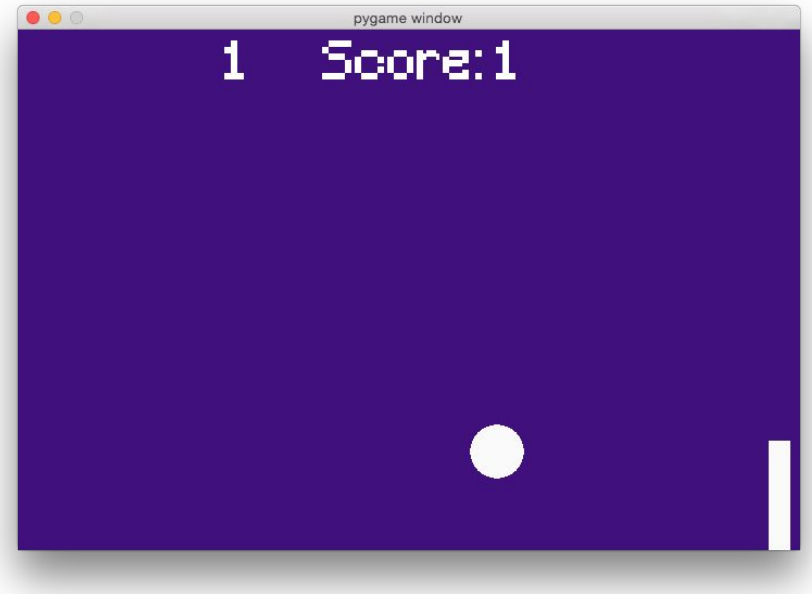
Version 1.8 Output high score to a document
Description: In this version, it will write score into a document.

```
fileOut = open("Score.txt","w")
```

I identify a file to output called Score.txt.

```
                if balls == 0:
                    screen.fill((0,0,0))
                    fileOut.write(str(bounce_time))
                    bounce_time = 0
                    pygame.time.wait(3000)
                    #GameOver = 'Game Over'
                    Game_Over = font.render("Game Over",True,(250,250,250))
                    screen.blit(Game_Over,(220,160))
                    #YourScore = 'Your Score is in Score.txt'
                    Your_Score = font.render("'Your Score is in Score.txt'",True,(250,250,250))
                    screen.blit(Your_Score,(70,250))
```

I write the score as a string time into the output document when the ball hits the paddle.



The score in the game is later output to the Score document.

Version 1.9

Description: I import a image I made as an introduction, which contains game name, version, author and running engine.

I import a picture in the same folder as the game folder, and delay for 3 seconds.

```
img = pygame.image.load('IntroV2.png')
screen.blit(img,(0,0))
pygame.time.delay(3000)
```

Benefits: It will shows a nice introduction image before instruction starts.

Version 2.0

Description: Fix bugs in the previous versions. That is our **latest stable program.** With all these functions demonstrated before, and fixed bugs like delay for no reason, unstable time for showing image.

In Version 1.9, when I show image or the game over page, it will delay for 2 or 3 seconds and then show the picture or game over for about half a second. I asked Mr. hoel, and fixed it.

I just need a simple line of code to totally refresh the screen.

It is pygame.display.flip.

I previously use screen.blit which only display tings.

The flip function refresh the screen.

That is a logic error, or i can call it a run time error(it do not have a clear instruction to delay the picture that long).

```
img = pygame.image.load('IntroV2.png')
pygame.display.flip() #refresh
```

```
            if balls == 0: #case when player have no life anymore
                #fill screen with black color
                screen.fill((0,0,0))
                #change bounce time to string, in order to write it to output
                fileOut.write(str(bounce_time))
                fileOut.write(" ")
                #reset the bounce_time(score) to zero
                bounce_time = 0
                #show game over on screen
                Game_Over = font.render("Game Over",True,(250,250,250))
                screen.blit(Game_Over,(220,160))
                #show your score is in Score.txt
                Your_Score = font.render("'Your Score is in Score.txt'",True,(250,250,250))
                screen.blit(Your_Score,(70,250))
                #wait for 3 seconds
                pygame.display.flip() #refresh
                pygame.time.wait(3000)
```

Benefits: More reliable and stable.

Below it is all the code of the V 2.0. Explanations are after # on the picture.

```python
# PONG V2.0: hit the ball with the paddle
# By Simon Guo & Jesse Zhao
# Wed, Jan 13, 2016
# computer science project

import pygame
import sys
from pygame.locals import *
from random import *

# always need to init first thing
pygame.init()

#set score output document
fileOut = open("Score.txt","w")

# create a 720p window
screen = pygame.display.set_mode((720,480),0,32)
# ask for screen's width and height
size = width, height = screen.get_size()

# turn on the cursor, so you can control your mouse to close tab
pygame.mouse.set_visible(True)

# turn on key repeating (repeat 40 times per second)
pygame.key.set_repeat(25, 25)

#define function random_background
def random_background():
    #use RGB color
    red = randint(0,255)
    green = randint(0,255)
    blue = randint(0,255)
    bgcolor = (red,green,blue)
    screen.fill(bgcolor)
    return bgcolor

# paddle constants
paddle_width = 22
paddle_length = 100
```

```python
paddle_radius = paddle_length / 2
paddle_color = (250, 250, 250)
step = 8  # paddle moves 8 pixels at a go

# ball constants
ball_color = (250, 250, 250)
ball_radius = 25
ball_speed_1 = 3
ball_speed_2 = 4
bounce_time = 0 # the time the ball bounce

#starting value for RGB value for the colorful screen in the game
Background_Red = 0
Background_Green = 0
Background_Blue = 0

#font constants
fsize = 48
font = pygame.font.Font("Minecraft.ttf", fsize)

#text information
Title = 'INSTRUCTION'
To_play = 'Press SPACE to PLAY'
How_play_1 = 'Move the bar by'
How_play_2 = 'pressing UP & DOWN'
How_play_3 = 'Try to hit the ball'
To_quit = 'Press ESC to QUIT'

INSTRUCTION = font.render(Title, True, (250, 250, 250))
PLAY = font.render(To_play, True, (250, 250, 250))
Content_1 = font.render(How_play_1, True, (250, 250, 250))
Content_2 = font.render(How_play_2, True, (250, 250, 250))
Content_3 = font.render(How_play_3, True, (250, 250, 250))
QUIT = font.render(To_quit, True, (250, 250, 250))

#load image into the game, display for 3 seconds
img = pygame.image.load('IntroV2.png')
screen.blit(img,(0,0))
pygame.display.flip() #refresh
pygame.time.delay(3000)
```

```python
while True: #forever loop
    pygame.display.flip() #refresh
    random_background()
    screen.blit(INSTRUCTION, (185, 60))
    screen.blit(PLAY, (120, 145))
    screen.blit(Content_1, (170, 210))
    screen.blit(Content_2, (140, 260))
    screen.blit(Content_3, (170, 310))
    screen.blit(QUIT, (150, 380))
    pygame.time.delay(1500)

    for idle_event in pygame.event.get():
        if idle_event.type == QUIT:
            sys.exit()

        #escape when press esc
        if idle_event.type == KEYDOWN:
            if idle_event.key == K_ESCAPE:
                sys.exit()

            if idle_event.key == 32:  # play game when space key is pressed
                random_background()
                # start the paddle in the center
                paddle_location = height / 2

                # number of the ball when started
                balls = 4

                while balls > 0: #case #1, there is still life left

                    ball_position = [ball_radius, ball_radius]
                    #set ball speed
                    ball_mvect = [randint(ball_speed_1, ball_speed_2), randint(ball_speed_1, ball_speed_2)]
                    ball_limit = size
                    balls = balls - 1 #lost a life

                    while ball_position[0] + ball_radius < ball_limit[0]:  # still alive

                        for event in pygame.event.get():
                            if event.type == QUIT:
```

```python
                                sys.exit()

                            #if press esc during the game
                            elif event.type == KEYDOWN:
                                if event.key == K_ESCAPE:
                                    sys.exit()
                                # press up to move up
                                elif event.key == 273 \
                                    or event.key == 265 \
                                    or event.key == 264:  # up
                                    paddle_location = paddle_location - step
                                # press down to move down
                                elif event.key == 274 \
                                    or event.key == 259 \
                                    or event.key == 258:  # down
                                    paddle_location = paddle_location + step

                        # make sure the paddle is in-bounds
                        if paddle_location - paddle_radius < 0:
                            paddle_location = paddle_radius
                        elif paddle_location + paddle_radius >= height:
                            paddle_location = height - 1 - paddle_radius

                        #show score
                        Score = font.render("Score:", 1, (255,255,255))
                        screen.blit(Score, (280, 10))
                        #get bounce time and change it to string to display
                        Score_number = Score = font.render(str(bounce_time), 1, (255,255,255))
                        screen.blit(Score_number, (440, 10))
                        #life = balls + 1, because in pong 1.0, it does not count the ball you are playing wit
                        Life = font.render(str(balls + 1), 1, (255,255,255))
                        screen.blit(Life, (190, 10))


                        # draw the paddle on the right side of the screen
                        pygame.draw.line(screen,
                                         paddle_color,
                                         (width - paddle_width, paddle_location -
                                         paddle_radius),
                                         (width - paddle_width,
```

```
                                    paddle_location + paddle_radius),
                                    paddle_width)

                    # draw the ball
                    pygame.draw.circle(screen, ball_color, ball_position, ball_radius)

                    # draw the unused balls
                    for i in range(balls):
                        pygame.draw.circle(screen, ball_color,
                             (int(round(30 + i * ball_radius * 2.4)), 30),
                             ball_radius)

                    # update the display
                    pygame.display.flip()

                    #keep the screen in a colorful background until the ball hit the paddle
                    screen.fill((Background_Red,Background_Green,Background_Blue))

                    # update the ball
                    for i in range(2):
                        ball_position[i] = ball_position[i] + ball_mvect[i]

                        # bounce on top and left
                        if ball_position[i] < ball_radius:
                            ball_position[i] = ball_radius
                            ball_mvect[i] = -1 * ball_mvect[i]

                        # bounce on bottom
                        elif i == 1 \
                            and ball_position[i] >= ball_limit[i] - ball_radius:
                            ball_position[i] = ball_limit[i] - ball_radius - 1
                            ball_mvect[i] = -1 * ball_mvect[i]
                            #ball become faster
                            ball_speed_1 = ball_speed_1 + 1
                            ball_speed_2 = ball_speed_2 + 1

                        #bounce on the paddle
                        elif i == 0 \
                            and ball_position[i] >= ball_limit[i] - ball_radius - paddle_width \
                            and ball_position[1] > paddle_location - paddle_radius \
```

```
                            and ball_position[1] < paddle_location + paddle_radius:
                            ball_position[i] = ball_limit[i] - ball_radius - paddle_width - 1
                            ball_mvect[i] = (-1) * ball_mvect[i]
                            step = step + 0.2 # the paddle will be faster
                            bounce_time = bounce_time + 1 #bounce_time + 1, score + 1
                            #choose background color again after it hits the paddle
                            Background_Red = randint(0,254)
                            Background_Green = randint(0,254)
                            Background_Blue = randint(0,254)

                if balls == 0: #case when player have no life anymore
                    #fill screen with black color
                    screen.fill((0,0,0))
                    #change bounce time to string, in order to write it to output
                    fileOut.write(str(bounce_time))
                    fileOut.write(" ")
                    #reset the bounce_time(score) to zero
                    bounce_time = 0
                    #show game over on screen
                    Game_Over = font.render("Game Over",True,(250,250,250))
                    screen.blit(Game_Over,(220,160))
                    #show your score is in Score.txt
                    Your_Score = font.render("'Your Score is in Score.txt'",True,(250,250,250))
                    screen.blit(Your_Score,(70,250))
                    #wait for 3 seconds
                    pygame.display.flip() #refresh
                    pygame.time.wait(3000)
```

Version 2.0 Beta

Description: a version with some new functions like input name and write in score.txt. Also, it will play a bounce sound when it hits the paddle.

```
def get_key():
  while True:
    event = pygame.event.poll()
    if event.type == KEYDOWN:
      return event.key
    else:
      pass

def display_box(screen, message):
  if len(message) != 0:
    screen.blit(font.render(message, 1, (255,255,255)),
                ((screen.get_width() / 2) - 300, (screen.get_height() / 2) -
  pygame.display.flip()

def ask(screen, question):
  current_string = []
  display_box(screen, question + ": " + string.join(current_string,""))
  while True:
    inkey = get_key()
    if inkey == K_BACKSPACE:
      pygame.display.flip() #refresh
      current_string = current_string[0:-1]
    elif inkey == K_RETURN:
      break
    elif inkey == K_ESCAPE:
      sys.exit()
    elif inkey < 128:
      current_string.append(chr(inkey))
    display_box(screen, question + ": " + string.join(current_string,""))
  return string.join(current_string,"")
```

I add these code to make a input line, which you can put your name in and submit with pressing return button.

```
def main():
  Name = str(ask(screen, "Name"))
  fileOut.write(Name)
```

```
#show your score is in Score.txt
screen.fill((0,0,0))

Your_Score = font.render("Your Score is in Score.txt",True,(250,250,250))
screen.blit(Your_Score,(70,300))
Put_Name = font.render("Please type your Name",True,(250,250,250))
screen.blit(Put_Name,(70,100))
pygame.display.flip() #refresh
if __name__ == '__main__': main()
pygame.time.wait(2000)

#change bounce time to string, in order to write it to output
fileOut.write(" ")
fileOut.write(str(bounce_time))
```

I added the main loop after showing game over.

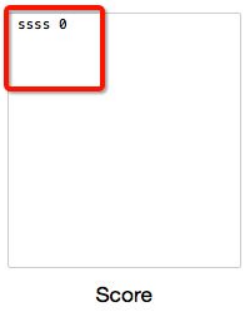
```
pygame.mixer.music.load('Ball_Bounce-Popup_Pixels-172648817.wav')
```

I downloaded a ball bounce music from http://soundbible.com/1626-Ball-Bounce.html pygame only supports .wmv

I loaded it before the while loop starts.

```
pygame.mixer.music.play(-1, 0.0)
```

I added this under when the ball bounce on the paddle.I have not really test it because my laptop voice output is broken: it works on the OLPC.

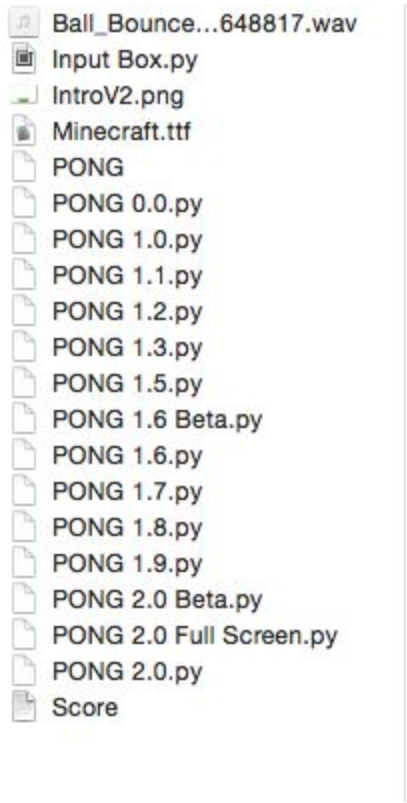


The player's name and score are shown on the screen.

There is a bug that you cannot delete your input and then input it. So we did not use this version on OLPC

Variable type:
We use a lot of variables, most of them are integers, some of them are strings. We listed them in the picture of V 2.0

How we manage our programs:
We put all our versions and input, output files in one folder



Making different version made debugging really easy, and we always have something done and working.

How we used SSRGMIO and what we learned:

S: Sequential
We learned how python runs sequentially from logic errors experienced in the coding process

S: Select a path (if statements)
We learned the differences between while and if loops, and used a lot of nested conditional loops.

R: Repeat (for and while loops) for (repeat 8 times) while (repeat while a condition is true)
We learn how these loop works, and also how to break them.

G: Graphics
We learn how to draw graphics in different situation.

M: Modular prog. “Actions”, functions, methods, sub prog.”byte sized modules”
We learned how to make sub functions, but while using them, we have to be careful about whether the data they used is defined clearly.

I: Input

We learn how to input pictures, fonts and text and sound into a program.

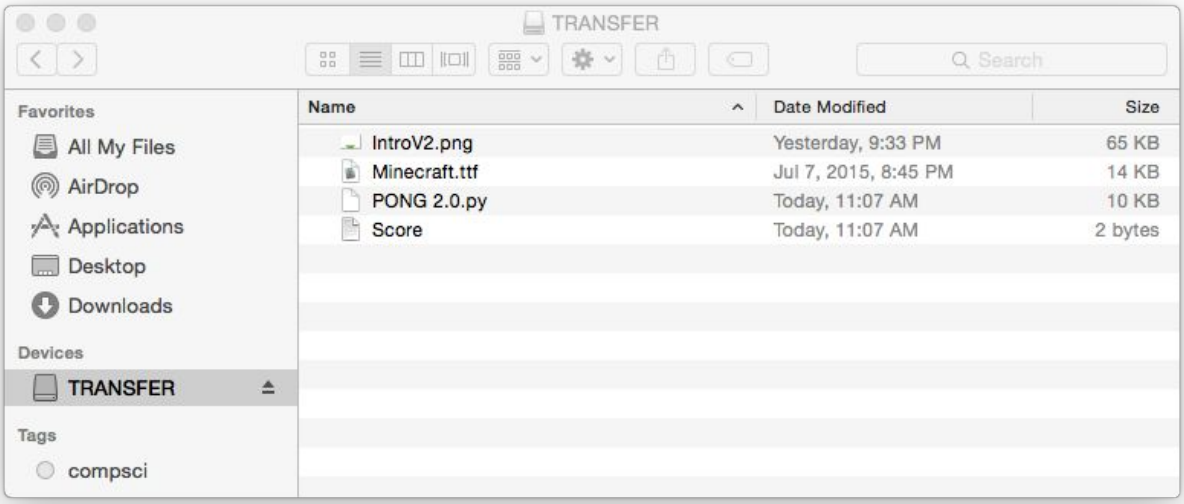
O: Output

We learn how to output string to a document.

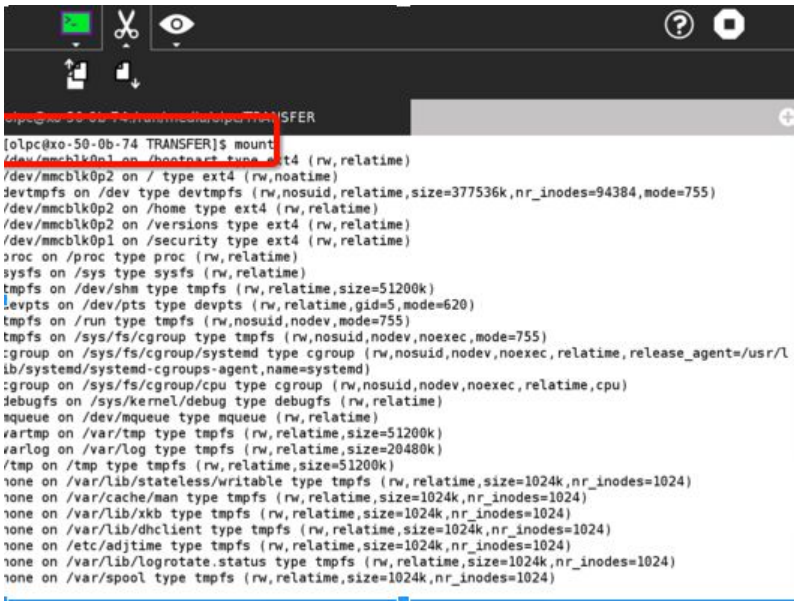
SSRGMIO was fully considered in our programming project.

How to copy file from Mac to OLPC

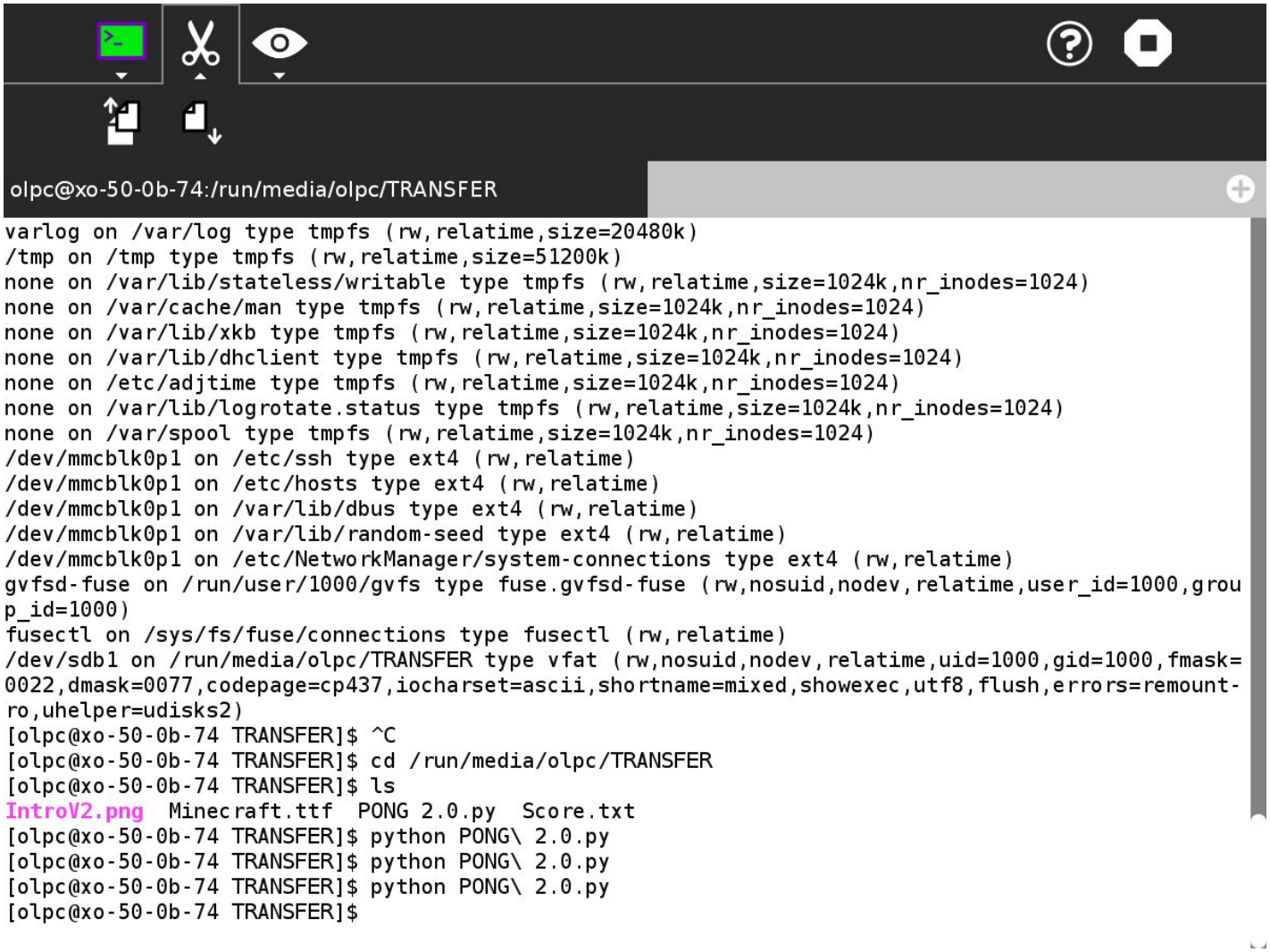
We need to test pong on the OLPC
1.Copy file to TRANSFER (USB DEVICE)
We need the image, the font, the score document and the version 2.0 game



2. copy these file to OLPC
put mount command



change directory to USB
cp all file to an OLPC directory, and then use python to run it.



here is a link to the video of it.
https://drive.google.com/open?id=0B_MW2YLgRt45NnlPaFd6MFRBaGs
How Pong run on olpc

Contributions to this project:

Simon Guo

I did most of the programming and debugging. I keep update the version of my pong. I give what I change and different version to my partner, so he can do the documentation. Also, I am doing some graphing design for our pong and document.

Jesse Zhao

I did most of the tutorial/documentation including taking some pictures. I designed most of the google document and explained some of simon's modifications as well as the other requirements on the document. I also gave a lot of ideas as to what modifications our program should have.

References:

1. http://pygame.org/docs/ref/display.html#pygame.display.set+mode
This is list of Pygame functions and describes how to use them and what they are used for.

2.http://trevorappleton.blogspot.ca/2014/04/writing-pong-using-python-and-pygame.html
Tutorials, Hints and Tips about the Raspberry Pi and Python.

3. http://www.theasciicode.com.ar/
ASCII code table.

4. http://pygame.org/docs/tut/intro/intro.html
An introduction about how to load an image into pygame.

5. http://pygame.org/hifi.html
Pygame news.

6. http://www.xquartz.org/
Information about xquartz and has the download link for xquartz on the website

7. http://soundbible.com/1626-Ball-Bounce.html
A website that has many different ball sounds that can be listened and downloaded. We implemented some in our project.

Thanks!