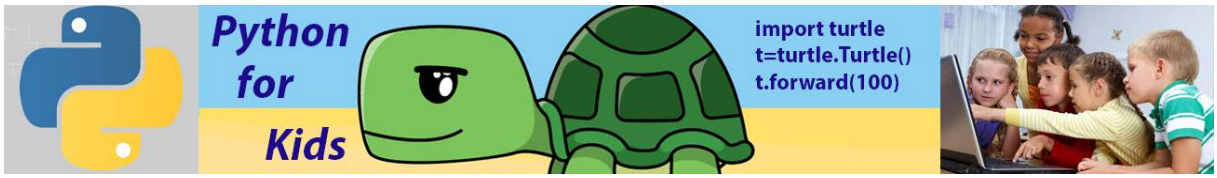


Lesson 14: Animation with inserted to Python Images

Today we continue to create animation examples with inserted images using Python turtle graphics.

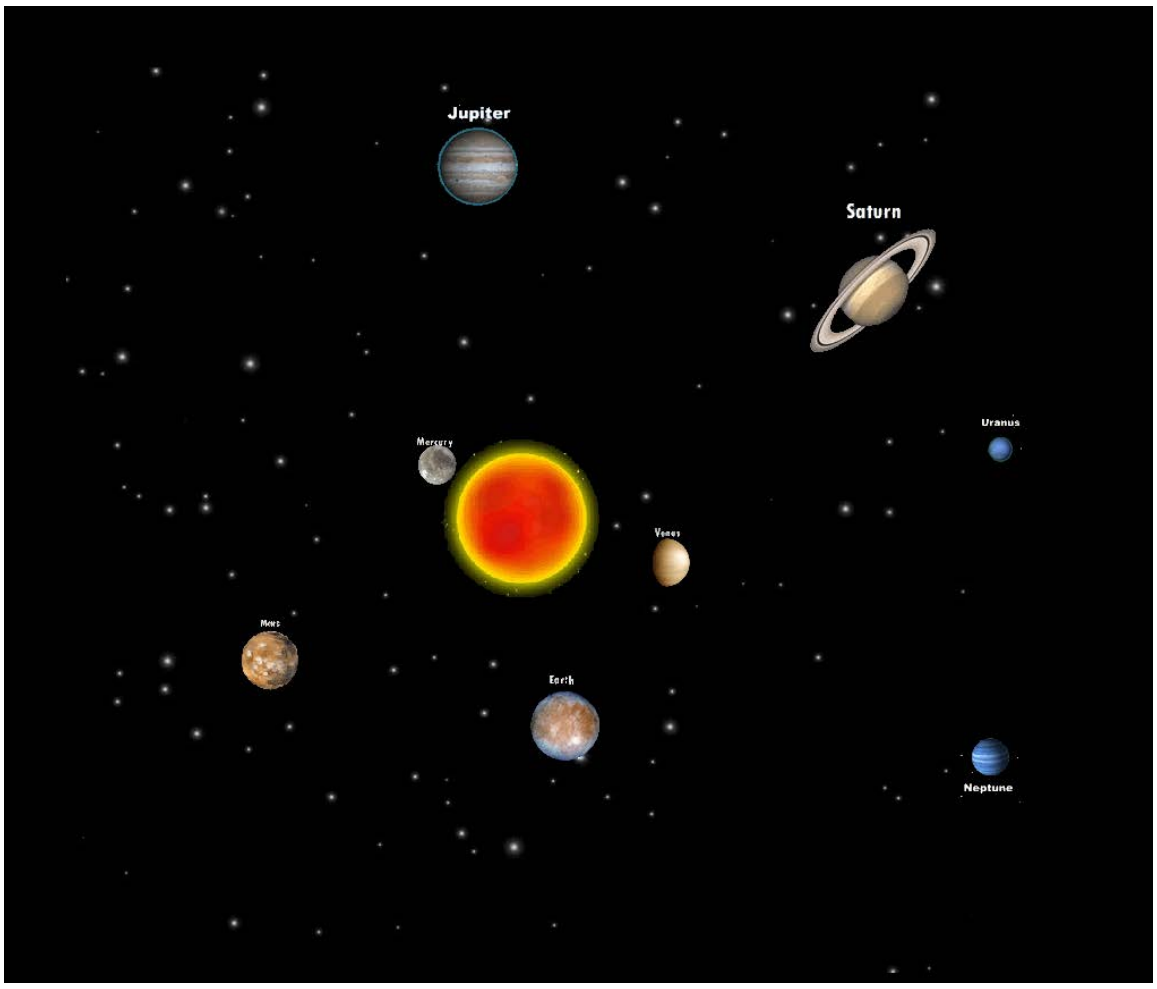
Last lesson we built animation with Earth that orbits around the Sun. For animation we used two inserted images: Earth image and Sun image. As you know our Sun planet system contains the Sun and the following planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Let's generate simulation of the orbiting these 8 planets around the Sun using Python code.

1. **Example #1** (Solar System Planets)

Code (next page):

As you can see code includes 9 almost identical blocks: for 8 planets and one for sun. Each planet is a turtle object, only instead turtle shapes (Lesson #5) we use an image downloaded from the Internet. With turtle object we can routine all turtle module codes, that determine motion commands and any other commands specify for Turtle module. You can download planet images to your computer from the site python.kidsgo.ca, Lesson #14. Lines #62 to 70 generate orbiting planets around the Sun.

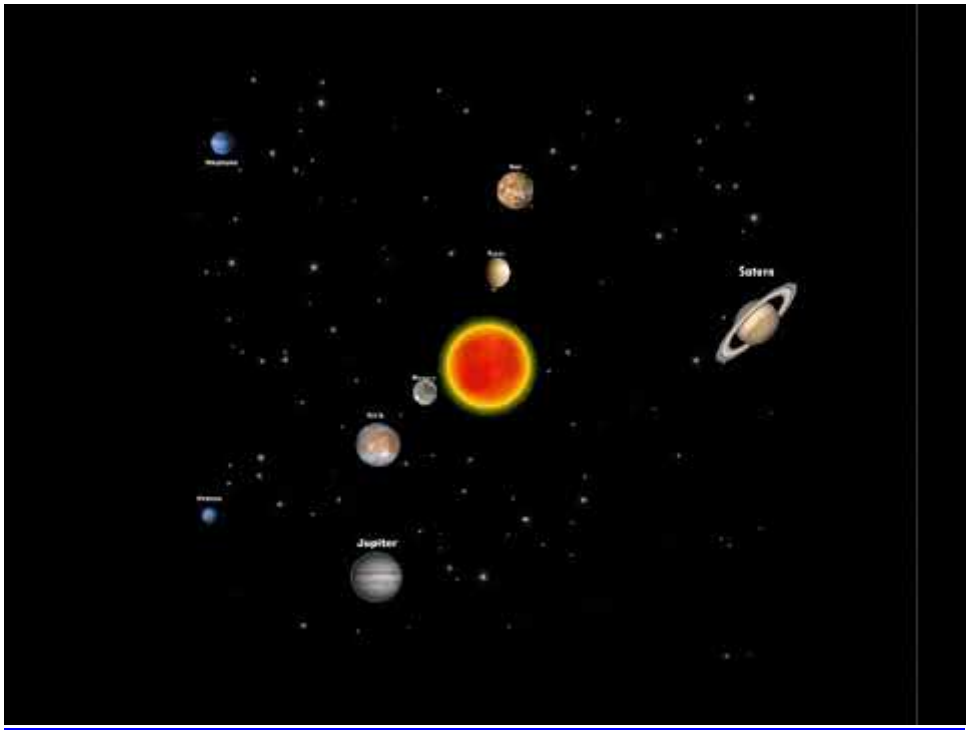
Static Output RESULT:



```
import turtle
import random
wn=turtle.Screen()
wn.setup(1200,1000)
wn.bgpic('sky.gif')
wn.bgcolor('black')
wn.tracer(30)
sun=turtle.Turtle('circle')        #Sun
sun.penup()
Sun_image='Sun.gif'
wn.addshape(Sun_image)
sun.shape(Sun_image)
sun.setposition(0,0)
mercury=turtle.Turtle()            #Mercury
mercury.up()
Mercury_image='mercury.gif'
wn.addshape(Mercury_image)
mercury.shape(Mercury_image)
mercury.setposition(0,-90)
venus=turtle.Turtle()               #Venus
venus.up()
Venus_image='venus1.gif'
wn.addshape(Venus_image)
venus.shape(Venus_image)
venus.setposition(0,-135)
earth=turtle.Turtle()              #Earth
earth.up()
Earth_image='earth3.gif'
wn.addshape(Earth_image)
earth.shape(Earth_image)
earth.setposition(0,-180)
mars=turtle.Turtle()               #Mars
mars.up()
Mars_image='Mars1.gif'
wn.addshape(Mars_image)
mars.shape(Mars_image)
mars.setposition(0,-250)
jupiter=turtle.Turtle()           #Jupiter
jupiter.up()
Jupiter_image='Jupiter2.gif'
wn.addshape(Jupiter_image)
jupiter.shape(Jupiter_image)
jupiter.setposition(0,-320)
saturn=turtle.Turtle()           #Saturn
saturn.up()
Suturn_image='Saturn4.gif'
wn.addshape(Suturn_image)
saturn.shape(Suturn_image)
saturn.setposition(0,-380)
uranus=turtle.Turtle()            #Uranus
uranus.up()
Uranus_image='Uranus.gif'
wn.addshape(Uranus_image)
uranus.shape(Uranus_image)
uranus.setposition(0,-430)
neptune=turtle.Turtle()          #Neptune
neptune.up()
Neptune_image='Neptune.gif'
wn.addshape(Neptune_image)
neptune.shape(Neptune_image)
neptune.setposition(0,-470)
while True:
    mercury.circle(90,0.478)
    venus.circle(135,0.35)
    earth.circle(180,0.3)
    mars.circle(250,0.24)
    jupiter.circle(320,0.15)
    saturn.circle(380,0.1)
    uranus.circle(430,0.08)
    neptune.circle(470,0.05)
```

Real video RESULT:

https://youtu.be/ruYDsDNvrho



2. **Example #2** (Dolphins jump out of the water)

There is an ongoing debate about why dolphins jump out of the water. Scientists think about different reasons for this behaviour. Among them, some believe that dolphins jump while traveling to save energy as going through the air consume less energy than going through the water. Some others believe that jumping is to get a better view of distant things in the water, mainly prey. So, in this way, dolphins jump to locate food or food related activity like seagulls eating or pelicans hunting. Other explanations suggest that dolphins use jumping to communicate either with a mate or with another pod as they can hear and interpret the splashes. Some people even think that dolphins jump for cleaning, trying to get rid of parasites while jumping. Below we will create Python code that demonstrates animation of dolphins jumps out of the water.

CODE:

```
import turtle
import time
wn = turtle.Screen()
wn.bgcolor('green')
wn.setup(1000,800)
wn.bgpic('more.gif')

image=['do1.gif','do2.gif']
t1=turtle.Turtle()
t1.up()
t1.speed(10)

while True:
    t1.hideturtle()
    t1.goto(-300,-200)
    t1.showturtle()

    t1.setheading(45)
    for i in range(10):

        wn.addshape(image[0])
        t1.shape(image[0])
        t1.showturtle()
        t1.fd(40)
        time.sleep(0.0001)

    t1.setheading(-45)
    for i in range(20):
        wn.addshape(image[1])
        t1.shape(image[1])
        t1.showturtle()
        t1.fd(40)
        time.sleep(0.0001)
    time.sleep(1)
```

RESULT:

Let’s take a look for the code. Line #8 inserts two images: one for three dolphins that jump out of the water and one for dolphins that drop into the water. Motion of the dolphins also includes two blocks of codes: lines 19-25 for dolphins jumping out of the water and lines 28-33 for dolphins that drop into the water. All images are presented in the Lesson #14.

Code for example #2 can be simplified if to introduce function, because thes two blocks that specify dolphins motion almost identical.

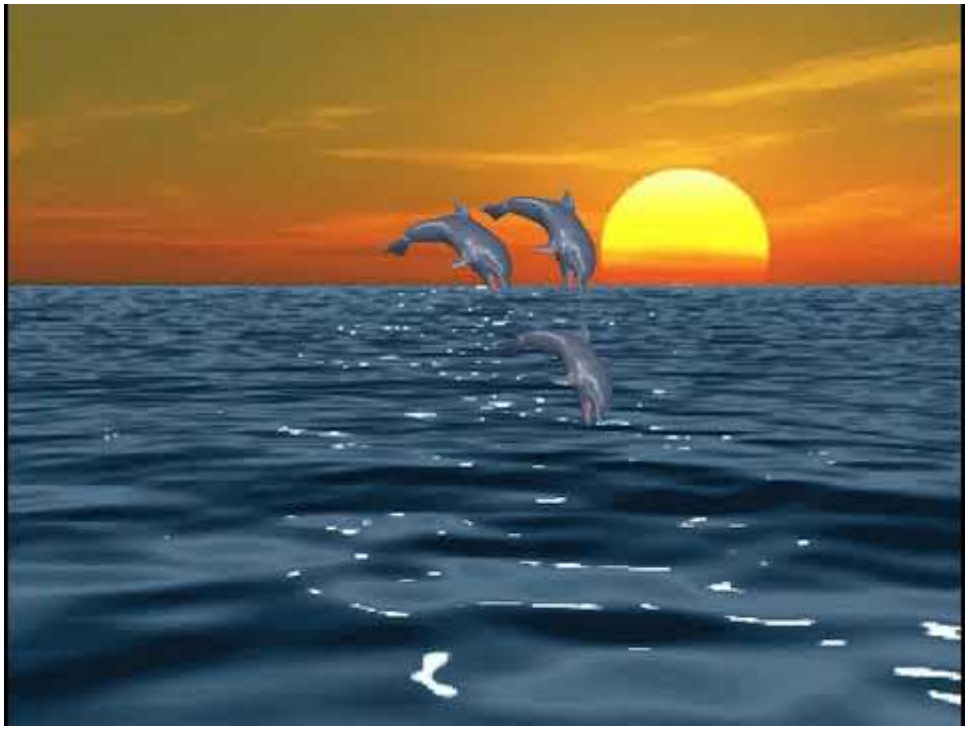
Simplified CODE (Example #2)

```
import turtle
import time
wn = turtle.Screen()
wn.bgcolor('green')
wn.setup(1000,800)
wn.bgpic('more.gif')

image=['dol.gif','do2.gif']
tl=turtle.Turtle()
tl.up()
tl.speed(10)

def motion (n, direction,img):
    tl.setheading(direction)
    for i in range(n):
        wn.addshape(img)
        tl.shape(img)
        tl.showturtle()
        tl.fd(40)
        time.sleep(0.0001)

while True:
    tl.hideturtle()
    tl.goto(-300,-200)
    tl.showturtle()
    motion(10,45,image[0])
    motion(20,-45,image[1])
    time.sleep(1)
'
```

More complicated dolphins jumping code version with water wave animation is shown on the site python.kidsgo.ca, Lesson 14.

Real result of the code with water motion is shown below:

https://youtu.be/qhXDb4E2XdY



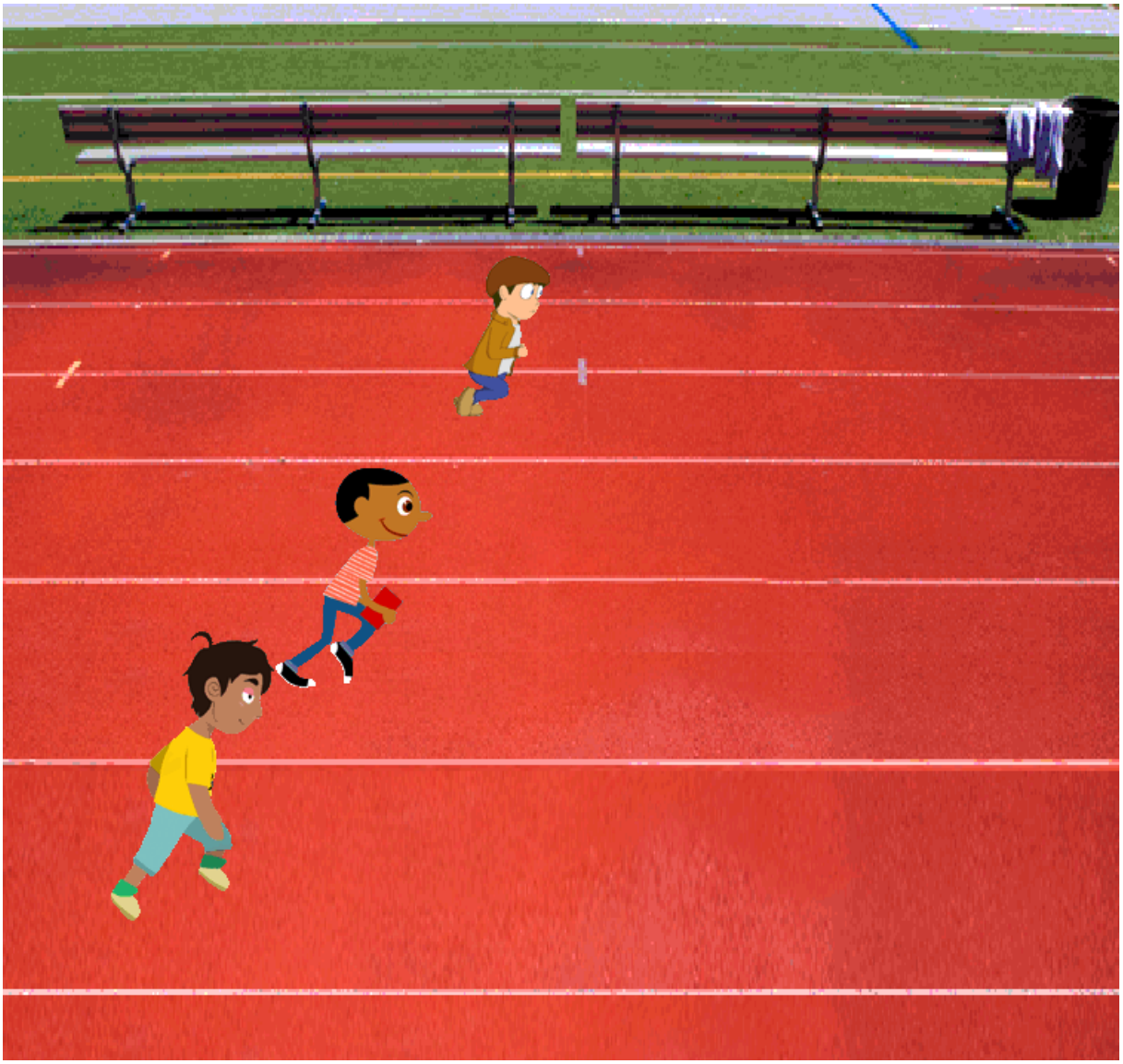
3. **Example #3** (Three Running Boys)

Code:

```
import turtle
import time
import winsound
winsound.PlaySound('music3.wav', winsound.SND_ASYNC)
t1=turtle.Turtle()
t2=turtle.Turtle()
t3=turtle.Turtle()

wn = turtle.Screen()
wn.setup(800,800)
wn.bgpic('field.gif')
turtle.tracer(2)


image1=['boy11.gif','boy12.gif','boy13.gif','boy14.gif']
image2=['boy21.gif','boy22.gif','boy23.gif','boy24.gif']
image3=['boy31.gif','boy32.gif','boy33.gif','boy34.gif']

def boy(turtle,X,Y,img):
  wn.addshape(img)
  turtle.shape(img)
  turtle.up()
  turtle.goto(X,Y)
  turtle.setheading(0)
  #turtle.showturtle()
X1=0
X2=100
X3=200
i=0
while True:
  i=i+1
  i1=i%4
  boy(t1,X1,-150,image1[i1])
  X1=X1+10
  boy(t2,X2,0,image2[i1])
  X2=X2+10
  boy(t3,X3,150,image3[i1])
  X3=X3+10
  time.sleep(0.1)
  if X1>400:
    X1=-400
    boy(t1,X1,-150,image1[i1])
  if X2>400:
    X2=-400
    boy(t2,X2,0,image2[i1])
  if X3>400:
    X3=-400
    boy(t3,X3,150,image3[i1])
```

Take a look at this code. It three lists of images (Lines #15-#17). The same as in the last Lesson #13 Take a look on this code. To generate the animation effect we have chosen four different boy images-positions that create illusion that a boy is running. Each line (#15-#17) describes 4 positions of each boy, so we can simulate boy running. Lines #3 and #4 provides sound when running. Line #3 imports sound module and line #4 calls sound file music3.wav. Turtle module allows to record sound for files with an extension **wav**. Function boy has parameters: turtle, which can be t1,t2 or t3, boy position X and Y, and image number according to the lists of images. Line #30 to #39 determine image motion for each boy. If boy runs out of the screen, conditions (lines #40 to #48) return him to the left of the screen and motion continues again.

Static Result of Code:



Video below shows the final result (click on the image or link to watch video)

https://youtu.be/4L2BMKNKJH8