Universidad Politecnica Salesiana

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Materia: Inteligencia artificial 1

Fecha: 6/2/2021

In [15]:

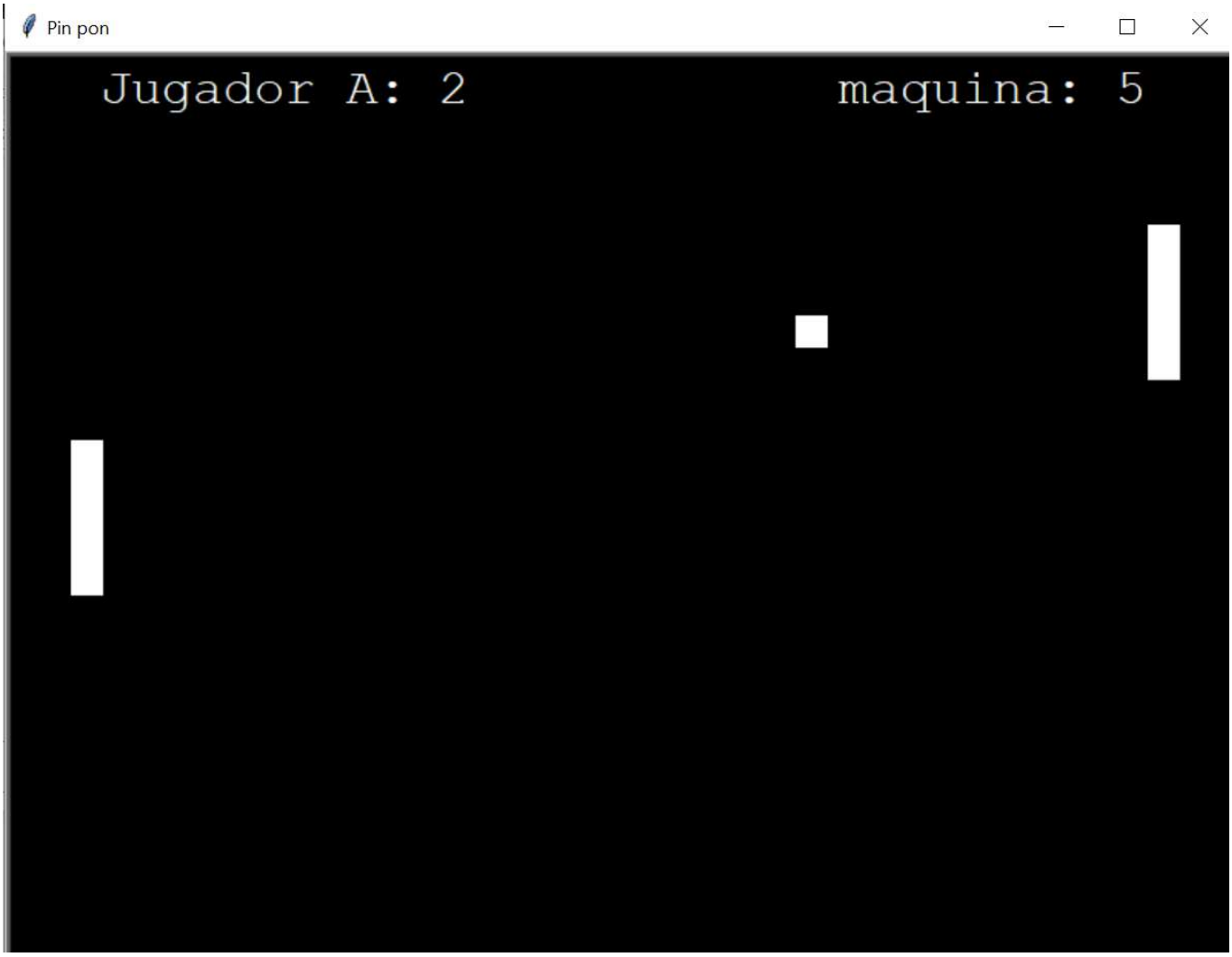
```
from easyAI import TwoPlayersGame, Human_Player, AI_Player, Negamax
#Interfaz grafica
from tkinter import *
from tkinter import messagebox
from neo4j import GraphDatabase
```

In [16]:

```
import turtle


class Pin_pong(TwoPlayersGame):

    def _init_(self, numeroJugadores):

        self.numeroJugadores=1

        #Ventana
        wn = turtle.Screen()
        wn.title("Pong by Mundo Python")
        wn.bgcolor("black")
        wn.setup(width=800, height=600)
        wn.tracer(0)

        #Marcador
        marcadorA = 1
        marcadorB = 1

        #JugadorA
        jugadorA = turtle.Turtle()
        jugadorA.speed(0)
        jugadorA.shape("square")
        jugadorA.color("white")
        jugadorA.penup()#Para eliminar linea que queda marcado.
        jugadorA.goto(-350, 0)#Posicion
        jugadorA.shapesize(stretch_wid=5, stretch_len=1)

        #JugadorA
        maquina = turtle.Turtle()
        maquina.speed(0)
        maquina.shape("square")
        maquina.color("white")
        maquina.penup()
        maquina.goto(350, 0)
        maquina.shapesize(stretch_wid=5, stretch_len=1)


        #Pelota
        pelota = turtle.Turtle()
        pelota.speed(0)
        pelota.shape("square")
        pelota.color("white")
        pelota.penup()
        pelota.goto(0,0)

        #Modificar estas variables para cambiar la velocidad de la pelota
        pelota.dx = 0.3
        pelota.dy = 0.3


        #Pen para dibujar el marcador.
        pen = turtle.Turtle()
        pen.speed(0)
        pen.color("white")
        pen.penup()
        pen.hideturtle()
        pen.goto(0, 260)
```

```
        pen.write("Jugador A: 0         jugadorB: 0", align="center", font=("Courier",
25, "normal"))


        #Teclado
        wn.listen()
        wn.onkeypress(jugadorA_up, "w")
        wn.onkeypress(jugadorA_down, "s")



        while True:
            wn.update()

            pelota.setx(pelota.xcor() + pelota.dx)
            pelota.sety(pelota.ycor() + pelota.dy)

            #Revisa colisiones con los bordes de la ventana
            if pelota.ycor() > 290:
                pelota.dy *= -1
            if pelota.ycor() < -290:
                pelota.dy *= -1

            # Si la pelota sale por la izq o derecha, esta regresa al centro.
            if pelota.xcor() > 390:
                pelota.goto(0,0)
                pelota.dx *= -1
                marcadorA += 1
                pen.clear()

                #Esta línea de codigo vuelve a pintar el marcador, utilizo "format" de
 la versión 3.6 en adelante de python.
                #Si tienes python menor a la versión 3.6 esta parte no te funcionará.
                pen.write(f"Jugador A: {marcadorA} Maquina: {marcadorB}", align="cente
r", font=("Courier", 25, "normal"))

            if pelota.xcor() < -390:
                pelota.goto(0,0)
                pelota.dx *= -1
                marcadorB += 1
                pen.clear()
                #Esta línea de codigo vuelve a pintar el marcador, utilizo "format" de
 la versión 3.6 en adelante de python.
                #Si tienes python menor a la versión 3.6 esta parte no te funcionará.
                pen.write(f"Jugador A: {marcadorA}     Maquina: {marcadorB}", align="ce
nter", font=("Courier", 25, "normal"))


            #Revisa las colisiones
            if ((pelota.xcor() > 340 and pelota.xcor() < 350)
                and (pelota.ycor() < maquina.ycor() + 50
                    and pelota.ycor() > maquina.ycor() - 50)):
                pelota.dx *= -1

            if ((pelota.xcor() < -340 and pelota.xcor() > -350)
                    and (pelota.ycor() < jugadorA.ycor() + 50
                    and pelota.ycor() > jugadorA.ycor() - 50)):
                pelota.dx *= -1
```

```
    def possible_moves(self):
        #Movimientos arriba
        y = maquina.ycor()
        y += 20
        #Movimientos abajo
        y = maquina.ycor()
        y -= 20
        maquina.sety(y)
        return y
        #maquina.sety(y)

    def make_move(self, y):
        maquina.sety(y)

    def unmake_move(self, y):
        maquina.sety(y)

    def lose(self):
        if marcadorA==10 and marcadorB<marcadorA:
            return True
        else:
            return False
    def show(self):
        print(marcadorA+marcadorB)

    def scoring(self):
        return -100 if self.lose() else 0

    def is_over(self):
        return self.lose()



    #Funciones
    def jugadorA_up():
        #Movimientos arriba
        y = jugadorA.ycor()
        y += 20
        jugadorA.sety(y)

    def jugadorA_down():
        y = jugadorA.ycor()
        y -= 20
        jugadorA.sety(y)


    """def maquina_up():
        y = maquina.ycor()
        y += 20
        maquina.sety(y)"""

    """def maquina_down():
        y = maquina.ycor()
        y -= 20
        maquina.sety(y)"""



    #wn.onkeypress(maquina_up, "Up")
    #wn.onkeypress(maquina_down, "Down")
```


Pin pon
Jugador A: 2
maquina: 5

In [46]:

```
class Algoritmo():
    def _init_():
        crear_catalogo()

        uri="localhost"
        driver = GraphDatabase.driver(uri, auth=('neo4j', 'Angel2019'))
        session = driver.session(database="system")
        session = driver.session()

    '''Algoritmo A*'''
    def algaestrella(lugar):
        result = session.run("""CALL gds.alpha.allShortestPaths.stream({
      nodeProjection: '"""+lugar+"""',
      relationshipProjection: {
        ROAD: {
          type: 'DISTANCIA',
          properties: 'distancia'
        }
      },
      relationshipWeightProperty: 'distancia'
    })
    YIELD sourceNodeId, targetNodeId, distance
    WITH sourceNodeId, targetNodeId, distance
    WHERE gds.util.isFinite(distance) = true

    MATCH (source:"""+lugar+""") WHERE id(source) = sourceNodeId
    MATCH (target:"""+lugar+""") WHERE id(target) = targetNodeId
    WITH source, target, distance WHERE source <> target

    RETURN source.name AS source, target.name AS target, distance
    ORDER BY distance DESC, source ASC, target ASC
    LIMIT 10""")

        return result
        #print(result)
        #for record in result:
         #   print("Origen => "+record["source"]+" | Destino => "+record["target"]+" |
 Distancia=> "+str(record["distance"]))

        #names = [record["source"] for record in result]

        #print(names)
        session.close()
        driver.close()

    '''Algoritmo de la ruta mas corta'''
    def rutamascorta(origen, destino):
        result = session.run("""MATCH (start:Lugar {name: '"""+origen+"""'}), (end:Luga
r {name: '"""+destino+"""'})
        CALL gds.alpha.shortestPath.stream({
          nodeProjection: 'Lugar',
          relationshipProjection: {
            ROAD: {
              type: 'DISTANCIA',
              properties: 'distancia',
              orientation: 'UNDIRECTED'
            }
          },
          startNode: start,
```

```
          endNode: end,
          relationshipWeightProperty: 'distancia'
        })
        YIELD nodeId, cost
        RETURN gds.util.asNode(nodeId).name AS name, cost""")

        return result
        #print(result)
        #for record in result:
         #   print("Origen => "+record["name"]+" | Costo => "+str(record["cost"]))

        #names = [record["source"] for record in result]

        #print(names)
        session.close()
        driver.close()

    '''Funcion para crear el catalogo para correr algoritmos'''
    def crear_catalogo():
        result = session.run("""CALL gds.graph.create('myGraph', 'Lugar', 'DISTANCIA',
 { relationshipProperties: 'distancia' })""")

        session.close()
        driver.close()

    '''Algoritmo de amplitud'''
    def algaplitud(nombreNodo,lugar):
        result = session.run("""MATCH ("""+nombreNodo+""":Lugar{name:'"""+lugar+"""'})
    WITH id("""+nombreNodo+""") AS startNode
    CALL gds.alpha.bfs.stream('myGraph', {startNode: startNode})
    YIELD path
    UNWIND [ n in nodes(path) | n.name ] AS names
    RETURN names
    ORDER BY names""")
        return result
        #print(result)
        #for record in result:
         #   print("Ruta => "+record["names"])


        #names = [record["source"] for record in result]

        #print(names)
        session.close()
        driver.close()

    '''Algoritmo de profundidad'''
    def algprofundidad(nombreNodoOrigen,lugarOrigen,nombreNodoDestino, lugarDestino):

        result = session.run("""MATCH ("""+nombreNodoOrigen+""":Lugar{name:'"""+lugarOr
igen+"""'}),
        ("""+nombreNodoDestino+""":Lugar{name:'"""+lugarDestino+"""'})
    WITH id("""+nombreNodoOrigen+""") AS startNode, [id("""+nombreNodoDestino+""")] AS
 targetNodes
    CALL gds.alpha.dfs.stream('myGraph', {startNode: startNode, targetNodes: targetNode
s})
    YIELD path
    UNWIND [ n in nodes(path) | n.name ] AS names
    RETURN names
    ORDER BY names""")
        #print(result)
```

```
        for record in result:
            print("Ruta => "+record["names"])

        #names = [record["source"] for record in result]

        #print(names)
        session.close()
        driver.close()

    def crearNodo(nombre, comida, lugar, animal, fruta):

        result = session.run("""CREATE ("""+nombre.lower().strip()+""":Gustos{name:'"""
+nombre+"""', comida='"""+comida+"""',
        lugar='"""+lugar+"""', animal='"""+animal+"""', fruta='"""+fruta+"""'})""")
        #print(result)
        session.close()
        driver.close()
        return True
```

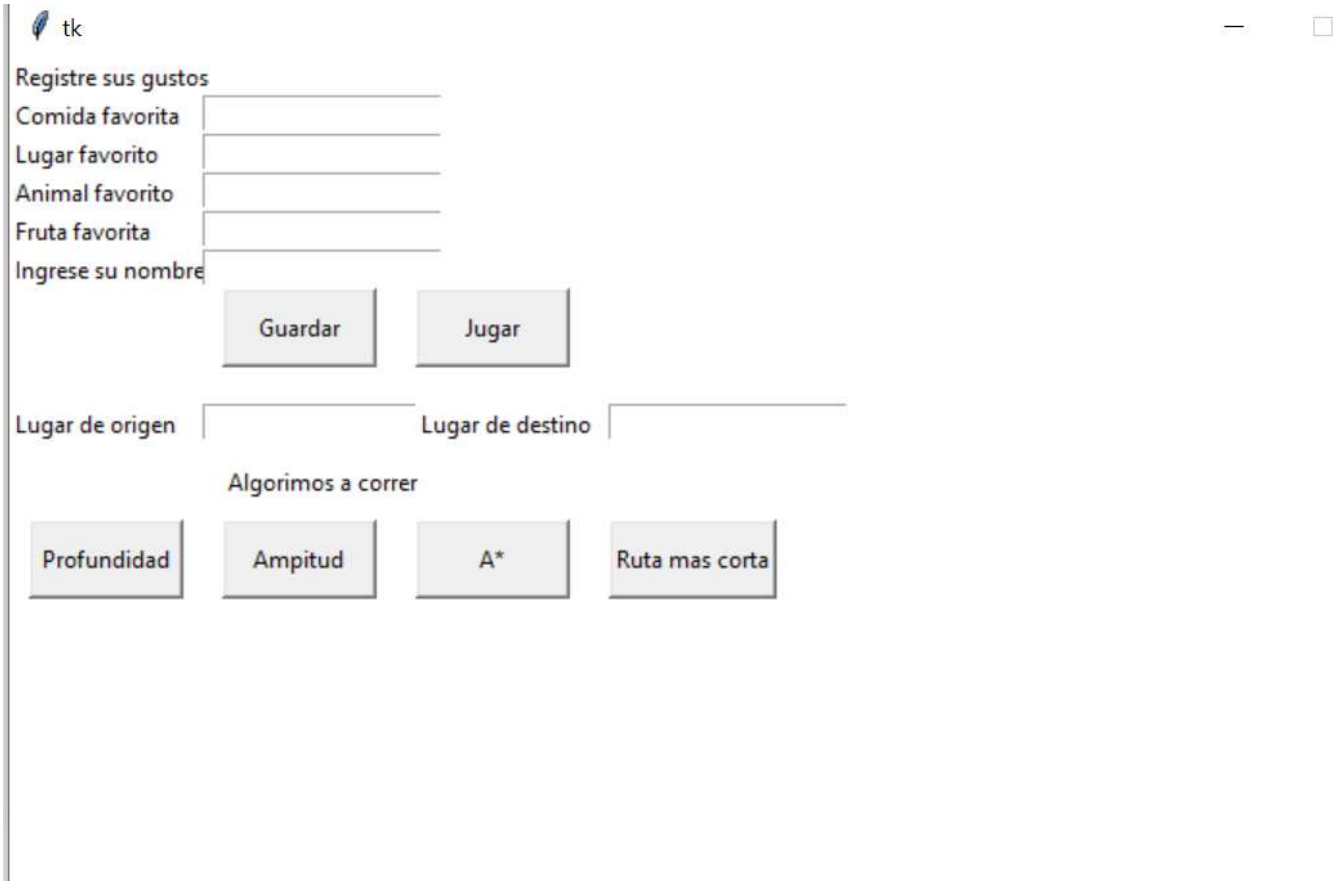
In [50]:

```
#Crear la ventana raiz
ventana = Tk()

#Cambio den el tamaño de la ventana
ventana.geometry("750x450")

ventana.configure(background="white")
#Bloquear el tamaño de la ventana
ventana.resizable(0,0)

#Etiqueta de texto
lbltitle = Label(ventana,text="Registre sus gustos",background="white").place(x=0,y=0)
lblnombre=Label(ventana,text="Comida favorita",background="white").place(x=0,y=20)
lbldireccion=Label(ventana,text="Lugar favorito",background="white").place(x=0,y=40)
lbltelefono=Label(ventana,text="Animal favorito",background="white").place(x=0,y=60)
lblcorreo=Label(ventana,text="Fruta favorita",background="white").place(x=0,y=80)
lblcorreo=Label(ventana,text="Ingrese su nombre",background="white").place(x=0,y=100)

comida=StringVar()
txtnombre=Entry(ventana,textvariable=comida).place(x=100,y=20)
#name=nombre.get()

lugar=StringVar()
txtdireccion=Entry(ventana,textvariable=lugar).place(x=100,y=40)

animal=StringVar()
txttelefono=Entry(ventana,textvariable=animal).place(x=100,y=60)

fruta=StringVar()
txtcorreo=Entry(ventana,textvariable=fruta).place(x=100,y=80)

nombre=StringVar()
txtcorreo=Entry(ventana,textvariable=nombre).place(x=100,y=100)


def guardar():
    com = comida.get()
    lug = lugar.get()
    frut = fruta.get()
    ani = animal.get()
    nomb = nombre.get()


    algoritmo = Algoritmo()
    res = algoritmo.crearNodo(nombre, com, lug, ani, frut)
    if res == True:
        messagebox.showinfo(message="Datos guardados", title="Sms")
        comida.set("")
        fruta.set("")
        lugar.set("")
        animal.set("")
        nombre.set("")
    else:
        messagebox.showinfo(message="No se ha podido guardar revise por favor", title=
"Sms")

def jugar():
    ai_algo = Negamax(6)
    pinpon = Pin_pong([Human_Player(), AI_Player(ai_algo)])
```

```
    pinpon.play()


#Boton de comando
cFuncion=Button(ventana, command = guardar , text="Guardar",width=10,height=2).place(x=
110, y=120)
cFuncion=Button(ventana, command = jugar , text="Jugar",width=10,height=2).place(x=210,
y=120)


lblorigen=Label(ventana,text="Lugar de origen",background="white").place(x=0,y=180)
origen=StringVar()
txtorigen=Entry(ventana,textvariable=origen).place(x=100,y=180)

lbldestino=Label(ventana,text="Lugar de destino",background="white").place(x=210,y=180)
origen=StringVar()
txtdestino=Entry(ventana,textvariable=origen).place(x=310,y=180)

algoritmo = Algoritmo()

def prof():
    nombreOrigen = txtorigen.get().strip().lower()
    lugarOrigen = txtorigen.get()
    nombreDestino = txtdestino.get().strip().lower()
    lugarDestino = txtdestino.get()

    res = algoritmo.algprofundidad(nombreOrigen,lugarOrigen,nombreDestino, lugarDestino
)
    messagebox.showinfo(message=res, title="Sms")

def aestrella():
    lugar = txtorigen.get()
    res = algoritmo.algaestrella(lugar)
    messagebox.showinfo(message=res, title="Sms")

def ruta():
    origen = txtorigen.get()
    destino = txtdestino.get()
    res = algoritmo.rutamascorta(origen, destino)
    messagebox.showinfo(message=res, title="Sms")

def amp():
    nombreNodo = origen.get().lower().strip()
    lugar = origen.get()
    res = algoritno.algaplitud(nombreNodo,lugar)
    messagebox.showinfo(message=res, title="Sms")



lblcorreo=Label(ventana,text="Algorimos a correr",background="white").place(x=110,y=210
)

cFuncion=Button(ventana, command = prof , text="Profundidad",width=10,height=2).place(x
=10, y=240)
cFuncion=Button(ventana, command = amp , text="Ampitud",width=10,height=2).place(x=110,
y=240)
cFuncion=Button(ventana, command = aestrella , text="A*",width=10,height=2).place(x=210
, y=240)
cFuncion=Button(ventana, command = ruta , text="Ruta mas corta",width=11,height=2).plac
e(x=310, y=240)
```

```
ventana.mainloop()
```

Interfaz grafica



In [ ]:

Proyecto de prueba

Instalar gym

In [1]:

```
1 pip install gym
```

```
Collecting gym
  Downloading gym-0.18.0.tar.gz (1.6 MB)
Requirement already satisfied: scipy in c:\users\estangelmesiasjadanc\anacon
da3\lib\site-packages (from gym) (1.5.0)
Requirement already satisfied: numpy>=1.10.4 in c:\users\estangelmesiasjadan
c\anaconda3\lib\site-packages (from gym) (1.18.5)
Collecting pyglet<=1.5.0,>=1.4.0
  Downloading pyglet-1.5.0-py2.py3-none-any.whl (1.0 MB)
Requirement already satisfied: Pillow<=7.2.0 in c:\users\estangelmesiasjadan
c\anaconda3\lib\site-packages (from gym) (7.2.0)
Requirement already satisfied: cloudpickle<1.7.0,>=1.2.0 in c:\users\estange
lmesiasjadanc\anaconda3\lib\site-packages (from gym) (1.5.0)
Note: you may need to restart the kernel to use updated packages.Requirement
already satisfied: future in c:\users\estangelmesiasjadanc\anaconda3\lib\sit
e-packages (from pyglet<=1.5.0,>=1.4.0->gym) (0.18.2)

Building wheels for collected packages: gym
  Building wheel for gym (setup.py): started
  Building wheel for gym (setup.py): finished with status 'done'
  Created wheel for gym: filename=gym-0.18.0-py3-none-any.whl size=1656451 s
ha256=50afcef2518bba3b8644e572195fb735f6283334ca42cf34fa0acc597c30f504
  Stored in directory: c:\users\estangelmesiasjadanc\appdata\local\pip\cache
\wheels\d8\e7\68\a3f0f1b5831c9321d7523f6fd4e0d3f83f2705a1cbd5daaa79
Successfully built gym
Installing collected packages: pyglet, gym
Successfully installed gym-0.18.0 pyglet-1.5.0


####
```

In [8]:

```
import gym
env = gym.make('CartPole-v0')
for i_episode in range(20):
    observation = env.reset()
    for t in range(100):
        env.render()
        print(observation)
        action = env.action_space.sample()
        observation, reward, done, info = env.step(action)
        if done:
            print("Episode finished after {} timesteps".format(t+1))
            break
env.close()
```

```
[ 0.04635387 -0.04404987  0.04622127  0.02315673]
[ 0.04547287  0.15037979  0.04668441 -0.25459207]
[ 0.04848047  0.34480516  0.04159257 -0.53219215]
[ 0.05537657  0.53931819  0.03094872 -0.81148465]
[ 0.06616293  0.73400281  0.01471903 -1.09427427]
[ 0.08084299  0.53869009 -0.00716645 -0.79700969]
[ 0.09161679  0.3436672  -0.02310665 -0.50658979]
[ 0.09849014  0.539107   -0.03323844 -0.80646398]
[ 0.10927228  0.34445603 -0.04936772 -0.5244191 ]
[ 0.1161614   0.54023671 -0.0598561  -0.83224054]
[ 0.12696613  0.73612332 -0.07650092 -1.14313145]
[ 0.1416886   0.93215692 -0.09936354 -1.45879115]
[ 0.16033174  0.73838419 -0.12853937 -1.19873057]
[ 0.17509942  0.93491336 -0.15251398 -1.52877892]
[ 0.19379769  0.74192443 -0.18308956 -1.28732126]
[ 0.20863618  0.54954223 -0.20883598 -1.0570993 ]
Episode finished after 16 timesteps
[-0.03542691 -0.02574892  0.02648652  0.00881119]
[-0.03594189  0.16898336  0.02666274 -0.27539866]
```

In [3]:

```
import gym
env = gym.make('CartPole-v0')
print(env.action_space)
#> Discrete(2)
print(env.observation_space)
#> Box(4,)
```

```
Discrete(2)
Box(-3.4028234663852886e+38, 3.4028234663852886e+38, (4,), float32)
```

In [5]:

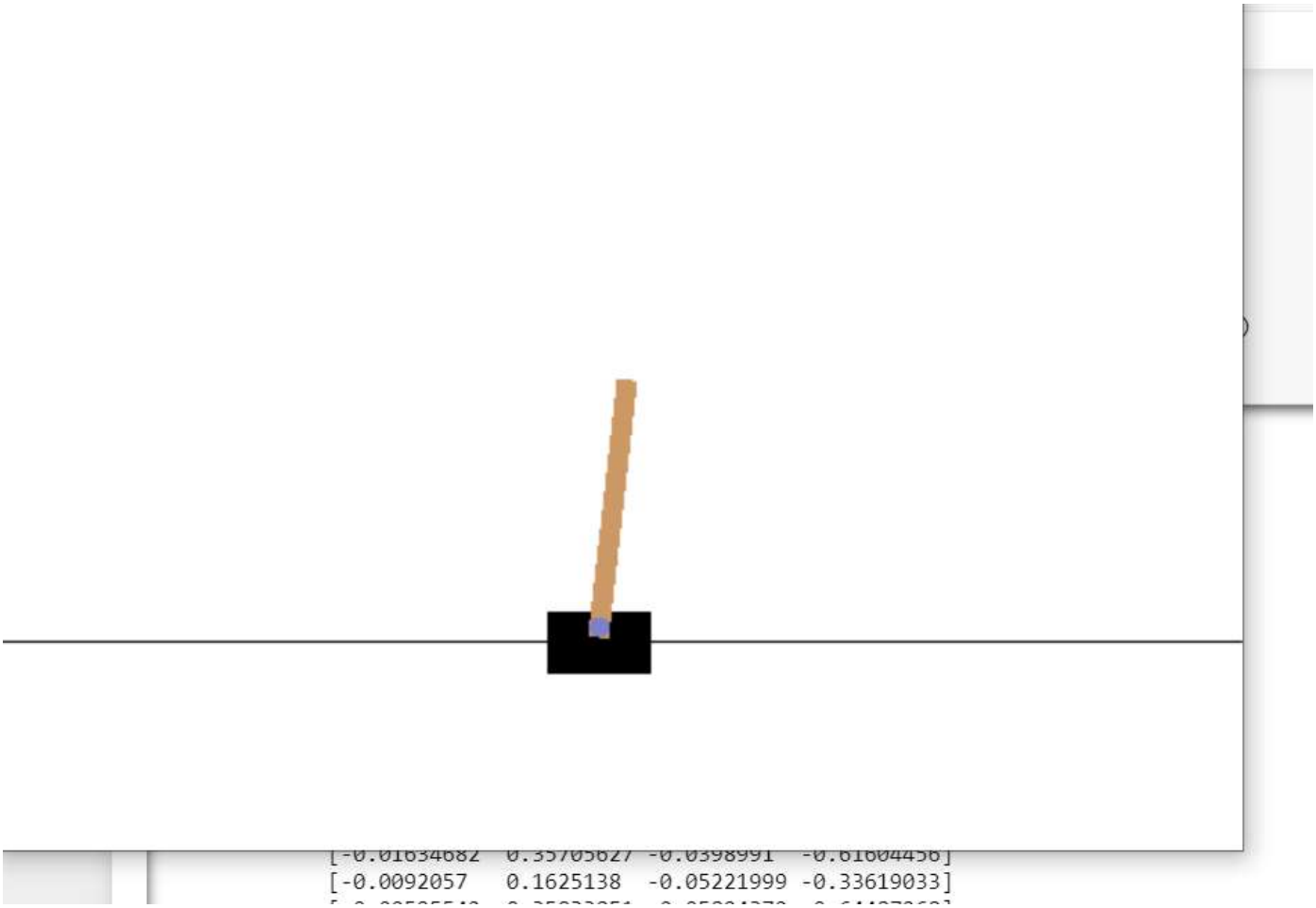
```
from gym import spaces
space = spaces.Discrete(8) # Set with 8 elements {0, 1, 2, ..., 7}
x = space.sample()
assert space.contains(x)
assert space.n == 8
```

In [6]:

```
1 from gym import envs
2 print(envs.registry.all())
```

```
dict_values([EnvSpec(Copy-v0), EnvSpec(RepeatCopy-v0), EnvSpec(ReversedAd
dition-v0), EnvSpec(ReversedAddition3-v0), EnvSpec(DuplicatedInput-v0), E
nvSpec(Reverse-v0), EnvSpec(CartPole-v0), EnvSpec(CartPole-v1), EnvSpec(M
ountainCar-v0), EnvSpec(MountainCarContinuous-v0), EnvSpec(Pendulum-v0),
EnvSpec(Acrobot-v1), EnvSpec(LunarLander-v2), EnvSpec(LunarLanderContinuo
us-v2), EnvSpec(BipedalWalker-v3), EnvSpec(BipedalWalkerHardcore-v3), Env
Spec(CarRacing-v0), EnvSpec(Blackjack-v0), EnvSpec(KellyCoinflip-v0), Env
Spec(KellyCoinflipGeneralized-v0), EnvSpec(FrozenLake-v0), EnvSpec(Frozen
Lake8x8-v0), EnvSpec(CliffWalking-v0), EnvSpec(NChain-v0), EnvSpec(Roulet
te-v0), EnvSpec(Taxi-v3), EnvSpec(GuessingGame-v0), EnvSpec(HotterColder-
v0), EnvSpec(Reacher-v2), EnvSpec(Pusher-v2), EnvSpec(Thrower-v2), EnvSpe
c(Striker-v2), EnvSpec(InvertedPendulum-v2), EnvSpec(InvertedDoublePendul
um-v2), EnvSpec(HalfCheetah-v2), EnvSpec(HalfCheetah-v3), EnvSpec(Hopper-
v2), EnvSpec(Hopper-v3), EnvSpec(Swimmer-v2), EnvSpec(Swimmer-v3), EnvSpe
c(Walker2d-v2), EnvSpec(Walker2d-v3), EnvSpec(Ant-v2), EnvSpec(Ant-v3), E
nvSpec(Humanoid-v2), EnvSpec(Humanoid-v3), EnvSpec(HumanoidStandup-v2), E
nvSpec(FetchSlide-v1), EnvSpec(FetchPickAndPlace-v1), EnvSpec(FetchReach-
v1), EnvSpec(FetchPush-v1), EnvSpec(HandReach-v0), EnvSpec(HandManipulate
BlockRotateZ-v0), EnvSpec(HandManipulateBlockRotateZTouchSensors-v0), Env
```

Juego de prueba



In [ ]:

```
1
```