Sandbox | CMU CS Academy

```
# setting the background color
app.background = 'black'

# creating variables
app.level = 1

app.died = False

app.cooldown = 30

app.warmup = 30

app.playing = False

app.speedCost = 5

app.cooldownCost = 5

app.laserSpeedCost = 5

app.speed = .1

app.laserSpeed = 5

app.multiplier = 1

app.multiplierCost = 5

app.money = 0

# creating the money label
money = Label('MONEY: 0', 200, 10, fill = 'white', visible = False)
moneyBackground = Rect(money.centerX, money.centerY, money.width + 10, money.height + 10, fill = 'black', align = 'center')
money.toFront()


# creating the splash screen
start = Label('START', 200, 300, fill = 'white')
splashScreen = Group(
    Rect(0, 0, 400, 400),
    Label('ASTEROIDS', 200, 100, size = 30, fill = 'white'),
    Label('arrow keys to move, space to destroy the asteroids'.upper(), 200, 200, fill = 'white'),
    start
    )

# creating a group used for the wrap around
extras = Group()

# creating the upgrades screen
back = Label('START', 200, 300, fill = 'white')

speedUpgrade = Group(Label('UPGRADE FOR 5', 125, 150, fill = 'white'))
```

```
53 speedUpgrade.add(Rect(speedUpgrade.centerX, speedUpgrade.centerY, speedUpgrade.width +
   10, speedUpgrade.height + 10, fill = None, border = 'white', align = 'center'))
54 speed = Label('CURRENT SPEED: 0.5', 275, 150, fill = 'white')
55 speed.left = 5
56 speedUpgrade.right = 395
57
58 cooldownUpgrade = Group(Label('UPGRADE FOR 5', 125, 170, fill = 'white'))
   cooldownUpgrade.add(Rect(cooldownUpgrade.centerX, cooldownUpgrade.centerY, cooldownUpgr
59 ade.width + 10, cooldownUpgrade.height + 10, fill = None, border = 'white', align = 'ce
   nter'))
60 cooldown = Label('CURRENT COOLDOWN: 30', 275, 170, fill = 'white')
61 cooldown.left = 5
62 cooldownUpgrade.right = 395
63
64 laserSpeedUpgrade = Group(Label('UPGRADE FOR 5', 125, 190, fill = 'white'))
   laserSpeedUpgrade.add(Rect(laserSpeedUpgrade.centerX, laserSpeedUpgrade.centerY, laserS
65 peedUpgrade.width + 10, laserSpeedUpgrade.height + 10, fill = None, border = 'white', a
   lign = 'center'))
66 laserSpeed = Label('CURRENT LASER SPEED: ' + str(app.laserSpeed), 275, 190, fill = 'whi
   te')
67 laserSpeed.left = 5
68 laserSpeedUpgrade.right = 395
69
70 multiplierUpgrade = Group(Label('UPGRADE FOR 5', 125, 210, fill = 'white'))
   multiplierUpgrade.add(Rect(multiplierUpgrade.centerX, multiplierUpgrade.centerY, multip
71 lierUpgrade.width + 10, multiplierUpgrade.height + 10, fill = None, border = 'white', a
   lign = 'center'))
72 multiplier = Label('CURRENT MULTIPLIER: ' + str(app.multiplier), 275, 210, fill = 'whit
   e')
73 multiplier.left = 5
74 multiplierUpgrade.right = 395
75
76 menu = Group(
77     Rect(0, 0, 400, 400),
78     Label('UPGRADES', 200, 100, size = 30, fill = 'white'),
79     back,
80     speedUpgrade,
81     speed,
82     cooldownUpgrade,
83     cooldown,
84     laserSpeedUpgrade,
85     laserSpeed,
86     multiplierUpgrade,
87     multiplier,
88     visible = False
89     )
90
91 # creating the player and its variables
92 flameShadow = Polygon(207, 207, 200, 190, 193, 207, 200, 212, fill = 'orange', border =
   'gold')
93
94 playerShadow = Group(flameShadow, Polygon(200, 190, 210, 210, 200, 205, 190, 210, fill
   = 'black', border = 'white'))
95
96 flame = Polygon(207, 207, 200, 190, 193, 207, 200, 212, fill = 'orange', border = 'gol
   d')
97
98 player = Group(flame, Polygon(200, 190, 210, 210, 200, 205, 190, 210, fill = 'black', b
```

```
    order = 'white'))
99
100
101 player.centerX = 200
102
103 player.centerY = 200
104
105 player.visible = False
106
107 playerShadow.visible = False
108
109 player.cooldown = 0
110
111 player.dx = 0
112
113 player.dy = 0
114
115 player.dr = 0
116
117 flame.fill = None
118 flame.border = None
119
120 # creating the laser group, list, and class
121 bullets = Group()
122
123 bulletList = []
124
125
126 class Bullet:
127     def __init__(self, x, y, direction):
128         self.shape = Rect(x, y, 2, 5, fill = 'white', align = 'center', rotateAngle = d
    irection)
129         bullets.add(self.shape)
130         self.distanceTraveled = 0
131         self.dx, self.dy = getPointInDir(0, 0, self.shape.rotateAngle, app.laserSpeed)
132     def update(self):
133         self.shape.centerX += self.dx
134         self.shape.centerY += self.dy
135         self.distanceTraveled += app.laserSpeed
136         if self.shape.bottom <= 0:
137             self.shape.top = 400
138         elif self.shape.top >= 400:
139             self.shape.bottom = 0
140         if self.shape.right <= 0:
141             self.shape.left = 400
142         elif self.shape.left >= 400:
143             self.shape.right = 0
144         if self.distanceTraveled >= 300 or self.shape.visible == False:
145             self.shape.visible = False
146             self.shape = None
147
148 # creaing the asteroid class and list
149 asteroids = []
150
151 class Asteroid:
152     def __init__(self, x, y, direction, speed):
153         self.shape = Circle(x, y, randrange(20, 40), fill = None, border = 'white')
```

```
        self.direction = direction
        self.speed = speed
    def update(self):
        x, y = getPointInDir(self.shape.centerX, self.shape.centerY, self.direction, self.speed)
        self.shape.centerX = x
        self.shape.centerY = y

        centerX = self.shape.centerX
        centerY = self.shape.centerY

        if self.shape.top < 0:
            self.shape.centerY = 400 + self.shape.centerY
        elif self.shape.bottom > 400:
            self.shape.centerY = self.shape.centerY - 400
        if self.shape.left < 0:
            self.shape.centerX = 400 + self.shape.centerX
        elif self.shape.right > 400:
            self.shape.centerX = self.shape.centerX - 400

        extras.add(Circle(centerX, centerY, self.shape.radius, fill = None, border = 'white'))

        hittingBullet = None
        for bullet in bullets:
            if bullet.hitsShape(self.shape) == True:
                hittingBullet = bullet
        if hittingBullet != None:
            app.money += app.multiplier
            money.value = 'MONEY: ' + str(app.money)
            moneyBackground.width = money.width + 10
            moneyBackground.height = money.height + 10
            moneyBackground.centerX = money.centerX
            moneyBackground.centerY = money.centerY
            hittingBullet.visible = False

            if self.shape.radius > 20:
                angle = randrange(0, 360)

                speed = (randrange(1, 3) + ((app.level - 1) / 4)/4)

                asteroids.append(Asteroid(self.shape.centerX, self.shape.centerY, angle, speed))

                asteroids[-1].shape.radius = self.shape.radius * 0.5

                self.shape.radius *= 0.5

                self.direction = angle + 180

                self.speed = speed
            else:
                self.shape.visible = False
                self.shape = None
        if self.shape != None:
            if player.hitsShape(self.shape) == True:
                for asteroid in asteroids:
```

```
                    asteroid.shape.visible = False
                    asteroid.shape = None
                asteroids.clear()


# creating the dictionary for keys
app.keysPressed = {'up': False, 'down': False, 'left': False, 'right': False, 'space': False, 'a': False, 'd': False, 'w': False, 's': False}

# sensing whether buttons are pressed
def onMousePress(mouseX, mouseY):
    if start.hits(mouseX, mouseY) == True and start.visible == True:
        money.visible = True
        moneyBackground.visible = True
        app.playing = True
        splashScreen.visible = False
        menu.visible = False
        app.warmup = 30

        player.visible = True
        playerShadow.visible = True
        for i in range(5 + app.level):
            topBottom = [True, False][randrange(0, 2)]
            if topBottom == True:
                y = 400 * randrange(0, 2)
                x = randrange(0, 400)
            else:
                x = 400 * randrange(0, 2)
                y = randrange(0, 400)
            asteroids.append(Asteroid(x, y, randrange(0, 360), (randrange(1, 3) + (app.level - 1) / 4)/4))
    if back.hits(mouseX, mouseY) == True and back.visible == True:
        app.playing = True
        splashScreen.visible = False
        menu.visible = False
        app.warmup = 30

        player.visible = True
        for i in range(5 + app.level):
            topBottom = [True, False][randrange(0, 2)]
            if topBottom == True:
                y = 400 * randrange(0, 2)
                x = randrange(0, 400)
            else:
                x = 400 * randrange(0, 2)
                y = randrange(0, 400)
            asteroids.append(Asteroid(x, y, randrange(0, 360), (randrange(1, 3) + (app.level - 1) / 4)/4))
    if speedUpgrade.hits(mouseX, mouseY) == True and speedUpgrade.visible == True and app.money >= app.speedCost:
        app.money -= app.speedCost
        app.speedCost *= 2
        money.value = 'MONEY: ' + str(app.money)
        moneyBackground.width = money.width + 10
        moneyBackground.height = money.height + 10
        moneyBackground.centerX = money.centerX
        moneyBackground.centerY = money.centerY
```

```
        app.speed += .1
        speed.value = 'CURRENT SPEED: ' + str(app.speed)
        speed.left = 5
        speedUpgrade.clear()
        speedUpgrade.add(Label('UPGRADE FOR ' + str(app.speedCost), 125, 150, fill = 'white'))
        speedUpgrade.add(Rect(speedUpgrade.centerX, speedUpgrade.centerY, speedUpgrade.width + 10, speedUpgrade.height + 10, fill = None, border = 'white', align = 'center'))
        speedUpgrade.right = 395

    if cooldownUpgrade.hits(mouseX, mouseY) == True and cooldownUpgrade.visible == True and app.money >= app.cooldownCost and app.cooldown > 1:
        app.money -= app.cooldownCost
        app.cooldownCost *= 2
        money.value = 'MONEY: ' + str(app.money)
        moneyBackground.width = money.width + 10
        moneyBackground.height = money.height + 10
        moneyBackground.centerX = money.centerX
        moneyBackground.centerY = money.centerY

        if app.cooldown > 1:
            app.cooldown -= .5
            cooldown.value = 'CURRENT COOLDOWN: ' + str(app.cooldown)
            cooldown.left = 5

            cooldownUpgrade.clear()
            cooldownUpgrade.add(Label('UPGRADE FOR ' + str(app.cooldownCost), 125, 170, fill = 'white'))
            cooldownUpgrade.add(Rect(cooldownUpgrade.centerX, cooldownUpgrade.centerY, cooldownUpgrade.width + 10, cooldownUpgrade.height + 10, fill = None, border = 'white', align = 'center'))
            cooldownUpgrade.right = 395

        else:
            cooldownUpgrade.visible = False
            cooldownUpgrade.clear()
            cooldownUpgrade.add(Label('UNAVAILABLE', 125, 170, fill = 'white'))
            cooldownUpgrade.add(Rect(125, 170, 90, 15, fill = None, border = 'white', align = 'center'))
    if laserSpeedUpgrade.hits(mouseX, mouseY) == True and laserSpeedUpgrade.visible == True and app.money >= app.laserSpeedCost:
        app.money -= app.laserSpeedCost
        app.laserSpeedCost *= 2
        money.value = 'MONEY: ' + str(app.money)
        moneyBackground.width = money.width + 10
        moneyBackground.height = money.height + 10
        moneyBackground.centerX = money.centerX
        moneyBackground.centerY = money.centerY
        app.laserSpeed += .5
        laserSpeed.value = 'CURRENT LASER SPEED: ' + str(app.laserSpeed)
        laserSpeed.left = 5

        laserSpeedUpgrade.clear()
        laserSpeedUpgrade.add(Label('UPGRADE FOR ' + str(app.laserSpeedCost), 125, 190, fill = 'white'))
        laserSpeedUpgrade.add(Rect(laserSpeedUpgrade.centerX, laserSpeedUpgrade.centerY, laserSpeedUpgrade.width + 10, laserSpeedUpgrade.height + 10, fill = None, border = 'white', align = 'center'))
```

```
308         laserSpeedUpgrade.right = 395
309 
310     if multiplierUpgrade.hits(mouseX, mouseY) == True and multiplierUpgrade.visible == True and app.money >= app.multiplierCost:
311         app.money -= app.multiplierCost
312         app.multiplierCost *= 2
313         money.value = 'MONEY: ' + str(app.money)
314         moneyBackground.width = money.width + 10
315         moneyBackground.height = money.height + 10
316         moneyBackground.centerX = money.centerX
317         moneyBackground.centerY = money.centerY
318         app.multiplier += 1
319         multiplier.value = 'CURRENT MULTIPLIER: ' + str(app.multiplier)
320         multiplier.left = 5
321 
322         multiplierUpgrade.clear()
323         multiplierUpgrade.add(Label('UPGRADE FOR ' + str(app.multiplierCost), 125, 210, fill = 'white'))
324         multiplierUpgrade.add(Rect(multiplierUpgrade.centerX, multiplierUpgrade.centerY, multiplierUpgrade.width + 10, multiplierUpgrade.height + 10, fill = None, border = 'white', align = 'center'))
325         multiplierUpgrade.right = 395
326 
327 # turning on and off the keys when keys are pressed or released
328 def onKeyPress(key):
329     if key == 'a':
330         app.keysPressed['a'] = True
331     if key == 'd':
332         app.keysPressed['d'] = True
333     if key == 'w':
334         app.keysPressed['w'] = True
335     if key == 's':
336         app.keysPressed['s'] = True
337     if key=='up':
338         app.keysPressed['w']=True
339     if key=='down':
340         app.keysPressed['s']=True
341     if key=='left':
342         app.keysPressed['a']=True
343     if key=='right':
344         app.keysPressed['d']=True
345     if key=='q' or key == 'space':
346         app.keysPressed['space']=True
347 
348 def onKeyRelease(key):
349     if key == 'a':
350         app.keysPressed['a'] = False
351     if key == 'd':
352         app.keysPressed['d'] = False
353     if key == 'w':
354         app.keysPressed['w'] = False
355     if key == 's':
356         app.keysPressed['s'] = False
357     if key=='up':
358         app.keysPressed['w']=False
359     if key=='down':
360         app.keysPressed['s']=False
361     if key=='left':
```

```
        app.keysPressed['a']=False
    if key=='right':
        app.keysPressed['d']=False
    if key=='q' or key == 'space':
        app.keysPressed['space']=False


def onStep():
    extras.clear()
    if app.playing == True:
        moneyBackground.toFront()
        money.toFront()
        # gives the player some time to prepare
        if app.warmup > 0:
            if app.warmup % 2 == 0:
                color = 'black'
            else:
                color = 'white'
            app.warmup -= 1

            for asteroid in asteroids:
                asteroid.shape.border = color
        else:
            # shoots the lasers and impliments the cooldown timer
            if app.keysPressed['space'] == True:
                if player.cooldown == 0:
                    bullet = Bullet(player.centerX, player.centerY, player.rotateAngle)
                    bullets.add(bullet.shape)
                    bulletList.append(bullet)
                    player.cooldown = pythonRound(app.cooldown)
            if player.cooldown > 0:
                player.cooldown -= 1

            # changes the player's speed when keys are pressed
            if app.keysPressed['a'] == True:
                player.dr -= app.speed * 1
            if app.keysPressed['d'] == True:
                player.dr += app.speed * 1
            if app.keysPressed['w'] == True:
                flame.fill = 'orange'
                flame.border = 'gold'
                flameShadow.fill = 'orange'
                flameShadow.border = 'gold'
                dx, dy = getPointInDir(0, 0, player.rotateAngle, app.speed * 0.5)
                player.dx += pythonRound(dx, 2)
                player.dy += pythonRound(dy, 2)
            else:
                flame.fill = None
                flame.border = None
                flameShadow.fill = None
                flameShadow.border = None

            # moves the player
            player.centerX += player.dx
            player.centerY += player.dy
            player.rotateAngle += player.dr

```

```
            playerShadow.centerX += player.dx
            playerShadow.centerY += player.dy
            playerShadow.rotateAngle += player.dr

            # makes the player shadow not wrap around
            playerShadow.centerX = player.centerX
            playerShadow.centerY = player.centerY

            if player.top < 0:
                player.centerY = 400 + playerShadow.centerY
            elif player.bottom > 400:
                player.centerY = playerShadow.centerY - 400
            if player.left < 0:
                player.centerX = 400 + playerShadow.centerX
            elif player.right > 400:
                player.centerX = playerShadow.centerX - 400


            # makes the player slow down
            player.dx *= .99
            player.dy *= .99
            player.dr *= .9

            # removes asteroids that have been hit from the asteroids list
            for i in range(len(asteroids)):
                if asteroids[i].shape == None:
                    asteroids.pop(i)
                    break

            # updates the asteroids
            for i in range(len(asteroids)):
                if asteroids[i].shape != None:
                    asteroids[i].update()
                    if len(asteroids) == 0:
                        app.died = True
                        break

            # removes the lasers that have hit something or been around too long
            for bullet in bulletList:
                if bullet.shape != None:
                    bullet.update()

        # resets the game if the player wins
        if len(asteroids) == 0:
            bullets.clear()
            bulletList.clear()
            if app.died == False:
                app.level += 1
            else:
                app.died = False
            app.playing = False
            menu.visible = True
            money.toFront()
            speedUpgrade.clear()
            speedUpgrade.add(Label('UPGRADE FOR ' + str(app.speedCost), 125, 150, fill
= 'white'))
            speedUpgrade.add(Rect(speedUpgrade.centerX, speedUpgrade.centerY, speedUpgr
```

```
ade.width + 10, speedUpgrade.height + 10, fill = None, border = 'white', align = 'cente
r'))
            speedUpgrade.right = 395

            cooldownUpgrade.clear()
            cooldownUpgrade.add(Label('UPGRADE FOR ' + str(app.cooldownCost), 125, 170,
fill = 'white'))
            cooldownUpgrade.add(Rect(cooldownUpgrade.centerX, cooldownUpgrade.centerY,
cooldownUpgrade.width + 10, cooldownUpgrade.height + 10, fill = None, border = 'white',
align = 'center'))
            cooldownUpgrade.right = 395

            laserSpeedUpgrade.clear()
            laserSpeedUpgrade.add(Label('UPGRADE FOR ' + str(app.laserSpeedCost), 125,
190, fill = 'white'))
            laserSpeedUpgrade.add(Rect(laserSpeedUpgrade.centerX, laserSpeedUpgrade.cen
terY, laserSpeedUpgrade.width + 10, laserSpeedUpgrade.height + 10, fill = None, border
= 'white', align = 'center'))
            laserSpeedUpgrade.right = 395

            player.dx = 0
            player.dy = 0
            player.dr = 0
            player.rotateAngle = 0
            player.centerX = 200
            player.centerY = 200
            player.visible = False

            playerShadow.rotateAngle = 0
            playerShadow.centerX = 200
            playerShadow.centerY = 200
            playerShadow.visible = False

# copyright
Label('© 2021/2022 Samuel Whitacre',50,395,size=7,fill='white', bold = True)
```