Lecture #11. 게임 월드

2D 게임 프로그래밍

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학습 내용

- 캐릭터 상태의 추가
- 특수 이벤트 처리
- 게임 월드 구성

실습

캐릭터 컨트롤러 구현 (IDLE & RUN & SLEEP)

boy.py – SLEEP_TIMER 이벤트 추가


```
# Boy Event
RIGHT_DOWN, LEFT_DOWN, RIGHT_UP, LEFT_UP, SLEEP_TIMER = range(5)

key_event_table = {
    (SDL_KEYDOWN, SDLK_RIGHT): RIGHT_DOWN,
    (SDL_KEYDOWN, SDLK_LEFT): LEFT_DOWN,
    (SDL_KEYUP, SDLK_RIGHT): RIGHT_UP,
    (SDL_KEYUP, SDLK_LEFT): LEFT_UP
}
```

boy.py – SLEEP 상태 함수 추가


```
class SleepState:

    @staticmethod
    def enter(boy, event):
        boy.frame = 0

    @staticmethod
    def exit(boy, event):
        pass

    @staticmethod
    def do(boy):
        boy.frame = (boy.frame + 1) % 8

    @staticmethod
    def draw(boy):
        if boy.dir == 1:
            boy.image.clip_composite_draw(boy.frame * 100, 300, 100, 100,
                      3.141592 / 2, '', boy.x - 25, boy.y - 25, 100, 100)
        else:
            boy.image.clip_composite_draw(boy.frame * 100, 200, 100, 100,
                     -3.141592 / 2, '', boy.x + 25, boy.y - 25, 100, 100)
```

boy.py – Sleep 상태 변화 추가


```
next_state_table = {
    IdleState:  {RIGHT_UP: RunState, LEFT_UP: RunState,
                 RIGHT_DOWN: RunState, LEFT_DOWN: RunState,
                 SLEEP_TIMER: SleepState},
    RunState:   {RIGHT_UP: IdleState, LEFT_UP: IdleState,
                 LEFT_DOWN: IdleState, RIGHT_DOWN: IdleState},
    SleepState: {LEFT_DOWN: RunState, RIGHT_DOWN: RunState,
                 LEFT_UP: RunState, RIGHT_UP: RunState}
}
```

boy.py – IdleState SLEEP_TIMER 이벤트 처리


```
class IdleState:



    @staticmethod
    def do(boy):
        boy.frame = (boy.frame + 1) % 8
        boy.timer -= 1
        if boy.timer == 0:
            boy.add_event(SLEEP_TIMER)
```

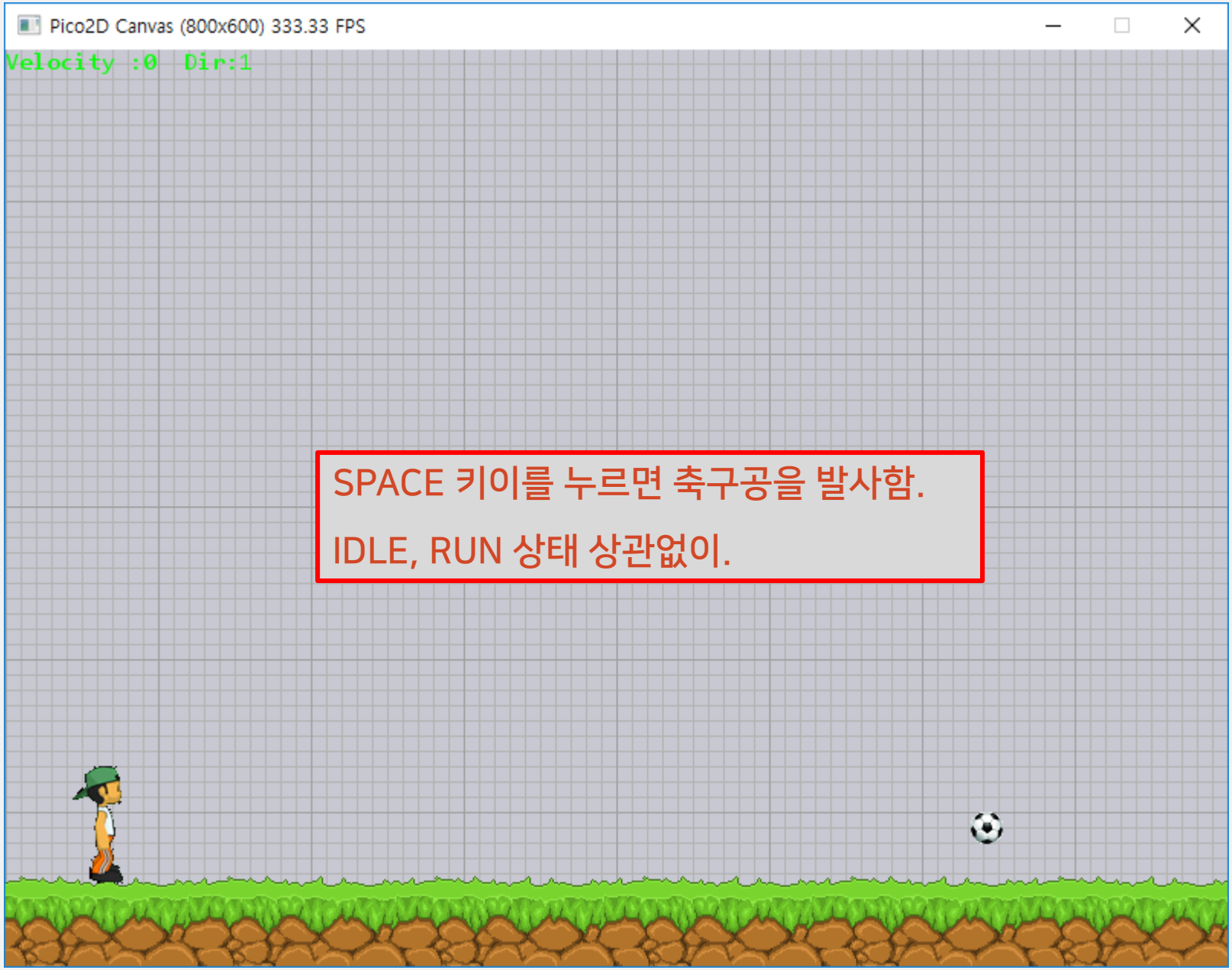
clip_composite_draw(left, bottom, width, height, rad, flip, x, y, w,h)

rad: 회전각도(라디안값)

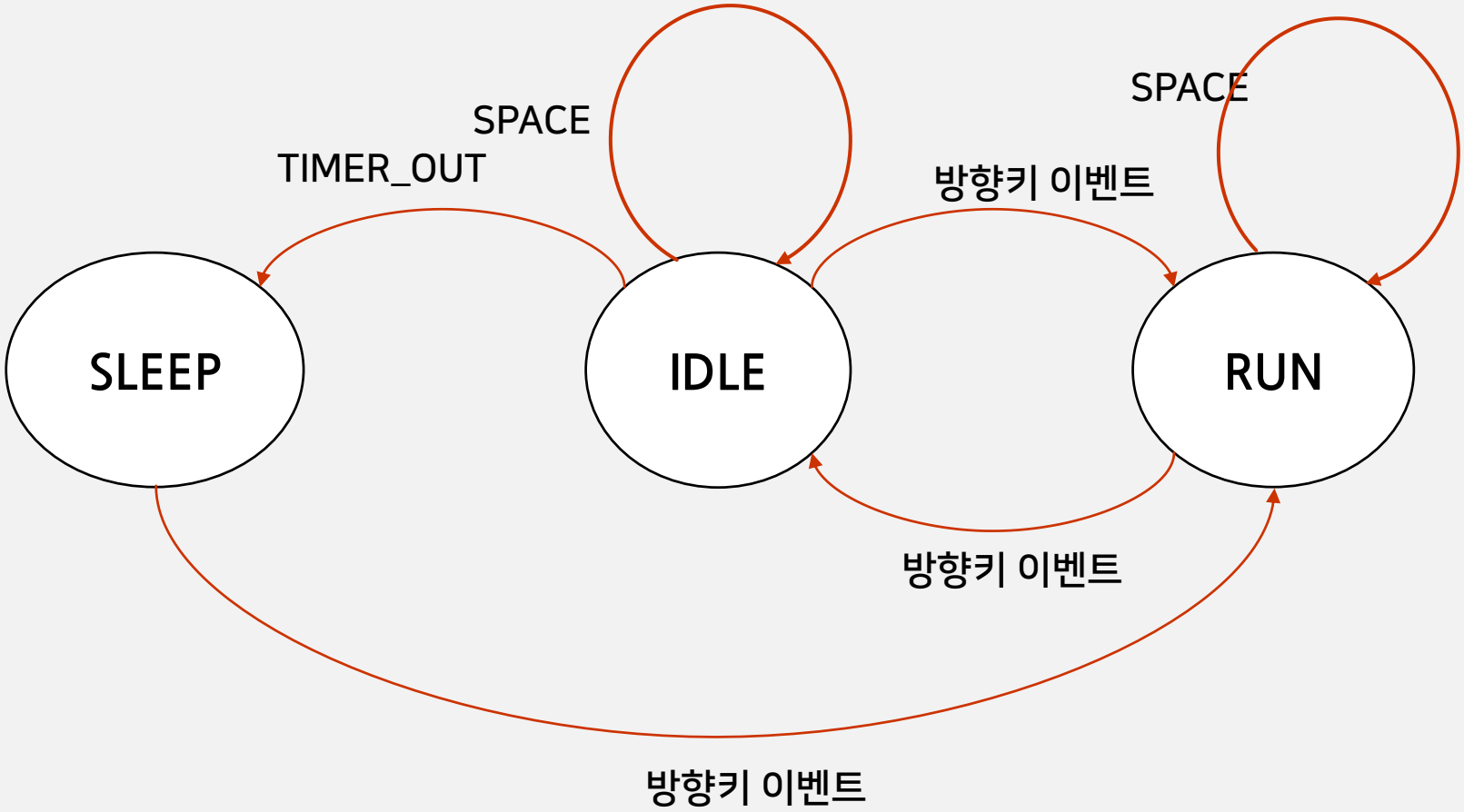
flip: 반전여부('h': 상하반전, 'v':좌우반전, 'hv': 상하좌우반전

실습

소년의 축구공 발사



상태 다이어그램



boy.py – SPACE 이벤트 추가


```
# Boy Event
RIGHT_DOWN, LEFT_DOWN, RIGHT_UP, LEFT_UP, SLEEP_TIMER, SPACE = range(6)

key_event_table = {
    (SDL_KEYDOWN, SDLK_RIGHT): RIGHT_DOWN,
    (SDL_KEYDOWN, SDLK_LEFT): LEFT_DOWN,
    (SDL_KEYUP, SDLK_RIGHT): RIGHT_UP,
    (SDL_KEYUP, SDLK_LEFT): LEFT_UP,
    (SDL_KEYDOWN, SDLK_SPACE): SPACE
}
```

boy.py – 상태 변화 추가


```
next_state_table = {
    IdleState:  {RIGHT_UP: RunState, LEFT_UP: RunState,
                 RIGHT_DOWN: RunState, LEFT_DOWN: RunState,
                 SLEEP_TIMER: SleepState, SPACE: IdleState},
    RunState:   {RIGHT_UP: IdleState, LEFT_UP: IdleState,
                 LEFT_DOWN: IdleState, RIGHT_DOWN: IdleState,
                 SPACE: RunState},
    SleepState: {LEFT_DOWN: RunState, RIGHT_DOWN: RunState,
                 LEFT_UP: RunState, RIGHT_UP: RunState}
}
```

boy.py – boy 의 fire_ball 함수 추가


```
def fire_ball(self):
    print('FIRE BALL')
```

boy.py – RunState, IdleState의 exit() 함수 조정


```
class IdleState:

    @staticmethod
    def exit(boy, event):
        if event == SPACE:
            boy.fire_ball()
```

```
class RunState:

    @staticmethod
    def exit(boy, event):
        if event == SPACE:
            boy.fire_ball()
```

실행하고 SPACE 를 눌러보자?

boy.py – 상태 변화 추가


```
next_state_table = {
    IdleState:  {RIGHT_UP: RunState, LEFT_UP: RunState,
                 RIGHT_DOWN: RunState, LEFT_DOWN: RunState,
                 SLEEP_TIMER: SleepState, SPACE: IdleState},
    RunState:   {RIGHT_UP: IdleState, LEFT_UP: IdleState,
                 LEFT_DOWN: IdleState, RIGHT_DOWN: IdleState,
                 SPACE: RunState},
    SleepState: {LEFT_DOWN: RunState, RIGHT_DOWN: RunState,
                 LEFT_UP: RunState, RIGHT_UP: RunState,
                 SPACE: IdleState}
}
```

ball.py

```
from pico2d import *
import game_world

class Ball:
    image = None

    def __init__(self, x = 800, y = 300, velocity = 1):
        if Ball.image == None:
            Ball.image = load_image('ball21x21.png')
        self.x, self.y, self.velocity = x, y, velocity

    def draw(self):
        self.image.draw(self.x, self.y)

    def update(self):
        self.x += self.velocity
```

게임 월드 game_world.py

```
# layer 0: Background Objects
# layer 1: Foreground Objects
objects = [[],[]]

def add_object(o, layer):
    objects[layer].append(o)

def remove_object(o):
    for i in range(len(objects)):
        if o in objects[i]:
            objects[i].remove(o)
            del o

def clear():
    for o in all_objects():
        del o
    objects.clear()

def all_objects():
    for i in range(len(objects)):
        for o in objects[i]:
            yield o
```

게임 월드에 담겨있는 모든 객체들을 담고 있는 리스트.

Drawing Layer 에 따라서 분류.

게임 월드에 객체 추가

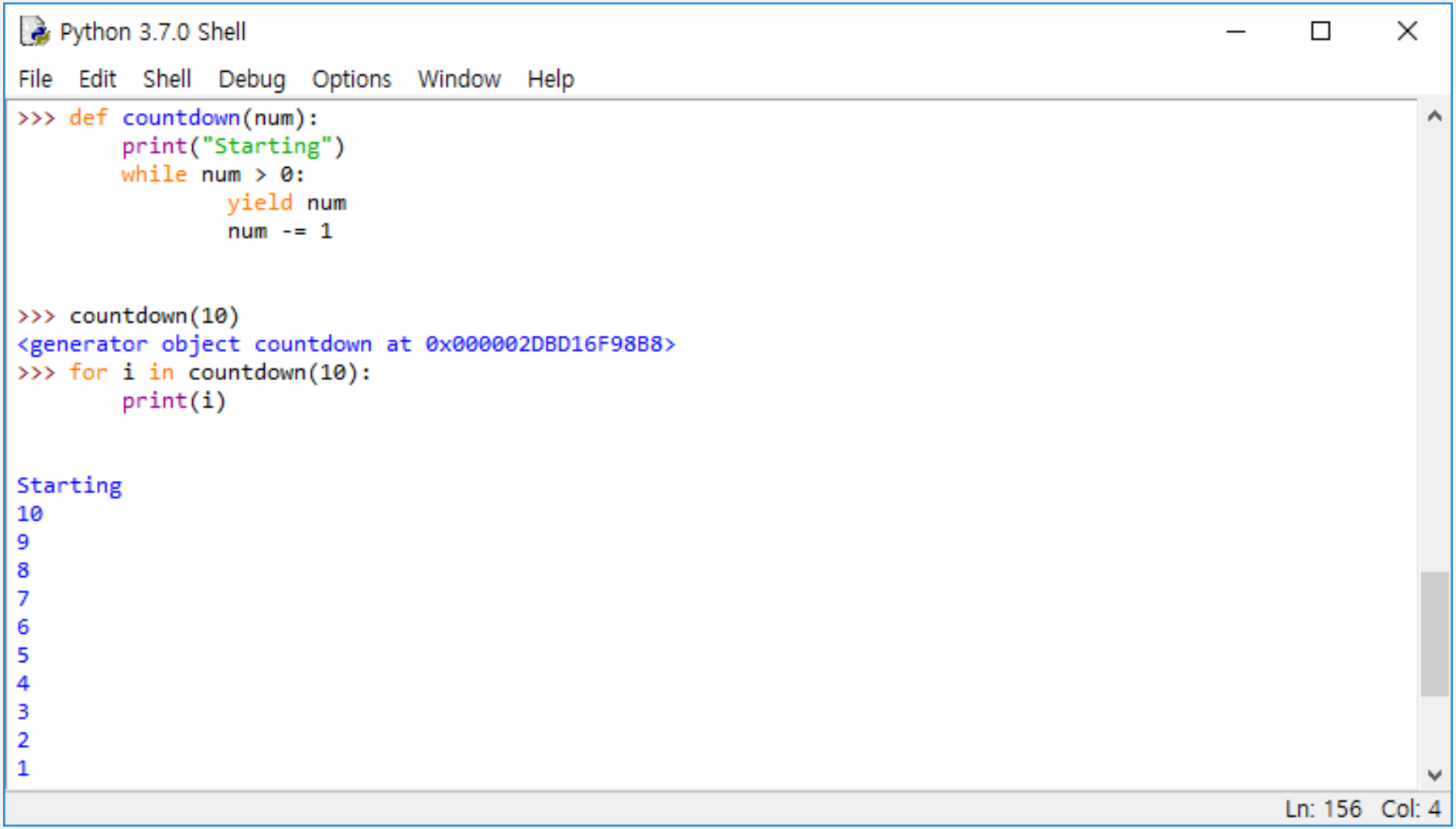
게임 월드에서 객체 제거

게임 월드의 모든 객체 제거

게임 월드의 모든 객체들을 하나씩 꺼내오기

Python Generator

- 객체들을 하나씩 만들어서(발전) 넘겨주는 기능
- for 문 등에서 효과적으로 사용.



boy.py


```
import game_world
```

```
def fire_ball(self):
    ball = Ball(self.x, self.y, self.dir*3)
    game_world.add_object(ball, 1)
```

main_state.py – 게임 월드를 이용하도록 조정

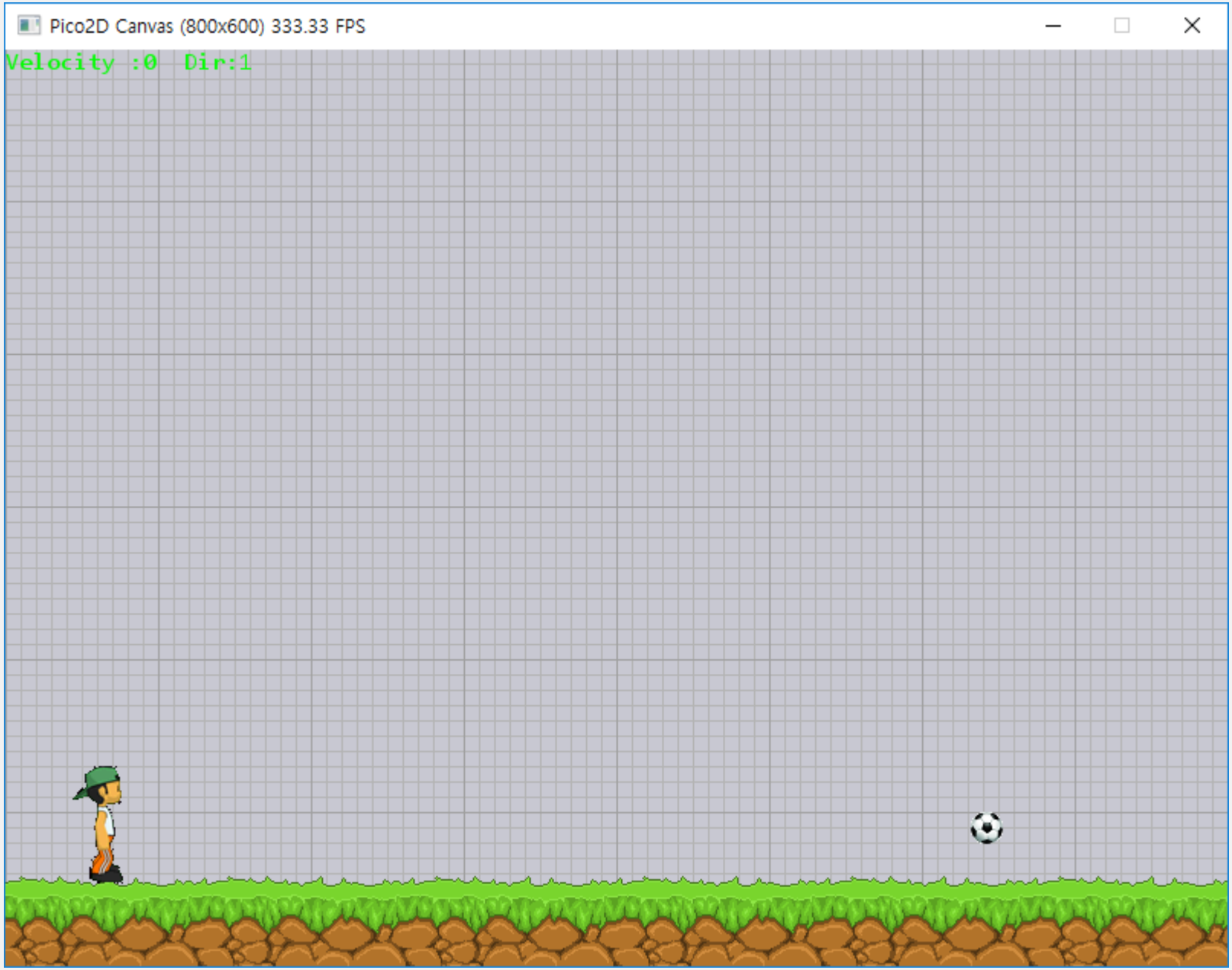

```
boy = None

def enter():
    global boy
    boy = Boy()
    grass = Grass()
    game_world.add_object(grass, 0)
    game_world.add_object(boy, 1)

def exit():
    game_world.clear()
```


```
def update():
    for game_object in game_world.all_objects():
        game_object.update()

def draw():
    clear_canvas()
    for game_object in game_world.all_objects():
        game_object.draw()
    update_canvas()
```



ball.py – ball의 제거


```
from pico2d import *
import game_world

class Ball:
    image = None

    def __init__(self, x = 800, y = 300, velocity = 1):
        if Ball.image == None:
            Ball.image = load_image('ball21x21.png')
        self.x, self.y, self.velocity = x, y, velocity

    def draw(self):
        self.image.draw(self.x, self.y)

    def update(self):
        self.x += self.velocity

        if self.x < 25 or self.x > 1600 - 25:
            game_world.remove_object(self)
```