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Lab Assignment 05

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class GameManager : MonoBehaviour {

    // inspector settings
    public GameObject asteroidPrefab;
    public  GameObject spaceship;
    public static GameObject staticSpaceship;

    // class-level statics
    public static GameManager instance;
    public static int currentGameLevel;
    public static Vector3 screenBottomLeft, screenTopRight;
    public static float screenWidth, screenHeight;
    //

    void Awake() {
        staticSpaceship = spaceship;
    }

    // Use this for initialization
    void Start() {
        instance = this;
        Camera.main.transform.position = new Vector3 (0f, 30f, 0f);
        Camera.main.transform.LookAt (Vector3.zero, new Vector3 (0f, 0f, 1f));
        currentGameLevel = 0;
        // find screen corners and size, in world coordinates
        // for ViewportToWorldPoint, the z value specified is in world units from the camera
        screenBottomLeft = Camera.main.ViewportToWorldPoint(new Vector3(0f,0f,30f));
        screenTopRight = Camera.main.ViewportToWorldPoint (new Vector3(1f,1f,30f));
        screenWidth = screenTopRight.x - screenBottomLeft.x;
        screenHeight = screenTopRight.z - screenBottomLeft.z;

        CreatePlayerSpaceship();
        StartNextLevel();
    }

    public static void CreatePlayerSpaceship() {
        Instantiate(staticSpaceship);
        staticSpaceship.transform.position = new Vector3(0, 0, 0);
    }

    public static void StartNextLevel() {
        currentGameLevel++;
        // create some asteroids near the edges of the screen
```

```
        for (int i = 0; i < currentGameLevel * 2 + 3; i++) {
            GameObject go = Instantiate (instance.asteroidPrefab) as GameObject;
            float x, z;
            if (Random.Range (0f, 1f) < 0.5f)
                x = screenBottomLeft.x + Random.Range (0f, 0.15f) * screenWidth; // near the left
                ↪ edge
            else
                x = screenTopRight.x - Random.Range (0f, 0.15f) * screenWidth; // near the right
                ↪ edge
            if (Random.Range (0f, 1f) < 0.5f)
                z = screenBottomLeft.z + Random.Range (0f, 0.15f) * screenHeight; // near the
                ↪ bottom edge
            else
                z = screenTopRight.z - Random.Range (0f, 0.15f) * screenHeight; // near the top
                ↪ edge
            go.transform.position = new Vector3(x, 0f, z);
        }
    }
}
```

Listing 1: `GameManager.cs`

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class Asteroid : MonoBehaviour {

    // inspector settings
    public Rigidbody rigidBody;
    public GameObject miniAsteroid;
    public GameObject smallAsteroid;    // spawn small asteroids in the place of the large asteroid

    // Use this for initialization
    void Start () {
        // randomise size+mass
        transform.localScale = new Vector3(Random.Range(0.06f,0.09f), Random.Range(0.06f,0.09f),
        ↪ Random.Range
(0.06f,0.09f));
        rigidBody.mass = transform.localScale.x * transform.localScale.y * transform.localScale.z;

        // randomise velocity
        rigidBody.velocity = new Vector3 (Random.Range (-20f, 20f), 0f, Random.Range (-20f, 20f));
        rigidBody.angularVelocity = new Vector3 (Random.Range (-20f, 20f), Random.Range (-
20f, 20f), Random.Range (-20f, 20f));

        // start periodically checking for being off-screen
        InvokeRepeating ("CheckScreenEdges", 0.2f, 0.2f);
    }

    private void CheckScreenEdges() {
        Vector3 pos = transform.position;
        Vector3 vel = rigidBody.velocity;
        float xTeleport = 0f, zTeleport = 0f;
```

```
32
33          if (pos.x < GameManager.screenBottomLeft.x && vel.x <= 0f) // velocity check as sanity test
            ↪
34              xTeleport = GameManager.screenWidth;
35          else if (pos.x > GameManager.screenTopRight.x && vel.x >= 0f)
36              xTeleport = -GameManager.screenWidth;
37
38          if (pos.z < GameManager.screenBottomLeft.z && vel.z <= 0f)
39              zTeleport = GameManager.screenHeight;
40          else if (pos.z > GameManager.screenTopRight.z && vel.z >= 0f)
41              zTeleport = -GameManager.screenHeight;
42
43          if (xTeleport != 0f || zTeleport != 0f)
44              transform.position = new Vector3 (pos.x + xTeleport, 0f, pos.z + zTeleport);
45
46      }
47
48      // method to spawn mini-asteroid fragments at the contact point(s) of a collision
49      private void OnCollisionEnter(Collision collision) {
50          // if collided with the spaceship, destroy it and recreate it at 0,0,0
51          if (collision.gameObject.CompareTag("spaceship")) {
52              Destroy(collision.gameObject);
53              GameManager.CreatePlayerSpaceship();
54          }
55
56          // if collided with the bullet, destroy it and asteroid and spawn small asteroids
57          if (collision.gameObject.CompareTag("bullet")) {
58              Destroy(collision.gameObject);
59              Destroy(this);
60
61              for (int i = 0; i <= numF4ragments; i++) {
62                  GameObject fragment = Instantiate(miniAsteroid);
63                  Instantiate(smallAsteroid, transform.position, transform.rotation);
64              }
65          }
66
67          // Arraylist to keep track of the mini asteroids created for a collision
68          ArrayList fragments = new ArrayList();
69
70          foreach (ContactPoint contact in collision.contacts) {
71              // instantiating a random number of mini asteroid between 1 and 5 inclusive
72              int numFragments = Random.Range(1, 5);
73
74              for (int i = 1; i <= numFragments; i++) {
75                  GameObject fragment = Instantiate(miniAsteroid);
76                  fragment.transform.position = contact.point;
77                  fragments.Add(fragment);
78              }
79          }
80
81          StartCoroutine(DestroyFragments(fragments));
82      }
83
84      // coroutine to destroy all the fragments from a collision
```

```
    IEnumerator DestroyFragments(ArrayList fragments) {
        yield return new WaitForSeconds(3);

        foreach (GameObject fragment in fragments) {
            Destroy(fragment);
        }
    }
}
```

Listing 2: `Asteroid.cs`

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class Asteroid : MonoBehaviour {

    // inspector settings
    public Rigidbody rigidBody;
    public GameObject miniAsteroid;

    // Use this for initialization
    void Start () {
        // randomise size+mass
        transform.localScale = new Vector3(Random.Range(0.06f,0.09f), Random.Range(0.06f,0.09f),
        ↪  Random.Range
(0.06f,0.09f));
        rigidBody.mass = transform.localScale.x * transform.localScale.y * transform.localScale.z;

        // randomise velocity
        rigidBody.velocity = new Vector3 (Random.Range (-20f, 20f), 0f, Random.Range (-20f, 20f));
        rigidBody.angularVelocity = new Vector3 (Random.Range (-20f, 20f), Random.Range (-
20f, 20f), Random.Range (-20f, 20f));

        // start periodically checking for being off-screen
        InvokeRepeating ("CheckScreenEdges", 0.2f, 0.2f);
    }

    private void CheckScreenEdges() {
        Vector3 pos = transform.position;
        Vector3 vel = rigidBody.velocity;
        float xTeleport = 0f, zTeleport = 0f;

        if (pos.x < GameManager.screenBottomLeft.x && vel.x <= 0f) // velocity check as sanity test
        ↪
            xTeleport = GameManager.screenWidth;
        else if (pos.x > GameManager.screenTopRight.x && vel.x >= 0f)
            xTeleport = -GameManager.screenWidth;

        if (pos.z < GameManager.screenBottomLeft.z && vel.z <= 0f)
            zTeleport = GameManager.screenHeight;
        else if (pos.z > GameManager.screenTopRight.z && vel.z >= 0f)
            zTeleport = -GameManager.screenHeight;

```

```
        if (xTeleport != 0f || zTeleport != 0f)
            transform.position = new Vector3 (pos.x + xTeleport, 0f, pos.z + zTeleport);

    }

    // method to spawn mini-asteroid fragments at the contact point(s) of a collision
    private void OnCollisionEnter(Collision collision) {
        // if collided with the spaceship, destroy it and recreate it at 0,0,0
        if (collision.gameObject.CompareTag("spaceship")) {
            Destroy(collision.gameObject);
            GameManager.CreatePlayerSpaceship();
        }

        // if collided with the bullet, destroy it and asteroid and spawn small asteroids
        if (collision.gameObject.CompareTag("bullet")) {
            Destroy(collision.gameObject);
            Destroy(this);  // just destroying the small asteroid on collision
        }

        // Arraylist to keep track of the mini asteroids created for a collision
        ArrayList fragments = new ArrayList();

        foreach (ContactPoint contact in collision.contacts) {
            // instantiating a random number of mini asteroid between 1 and 5 inclusive
            int numFragments = Random.Range(1, 5);

            for (int i = 1; i <= numFragments; i++) {
                GameObject fragment = Instantiate(miniAsteroid);
                fragment.transform.position = contact.point;
                fragments.Add(fragment);
            }
        }

        StartCoroutine(DestroyFragments(fragments));
    }

    // coroutine to destroy all the fragments from a collision
    IEnumerator DestroyFragments(ArrayList fragments) {
        yield return new WaitForSeconds(3);

        foreach (GameObject fragment in fragments) {
            Destroy(fragment);
        }
    }
}
```

Listing 3: `SmallAsteroid.cs`

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class Spaceship : MonoBehaviour
{
```

```
    public GameObject spaceship;
    public GameObject bullet;   // spawning bullets from the Spaceship class as they "belong" to the spaceship

    public float speed = 5.0f;
    public float rotationalSpeed = 2.0f;

    public float timeOfLastBullet;

    // Start is called before the first frame update
    void Start()
    {
        // start periodically checking for being off-screen
        InvokeRepeating ("CheckScreenEdges", 0.2f, 0.2f);
    }

    // Update is called once per frame
    void Update()
    {
        // move spaceship according to arrow keys
        // applying just a force to the spaceship object creates some unusual handling, but i feel that this is correct as in space there should be 0 drag, and if a force is applied in one direction, it should remain until it's cancelled out
        if (Input.GetKey(KeyCode.LeftArrow)) {
            spaceship.GetComponent<Rigidbody>().AddTorque(new Vector3(0, -rotationalSpeed, 0));
        }
        else if (Input.GetKey(KeyCode.RightArrow)) {
            spaceship.GetComponent<Rigidbody>().AddTorque(new Vector3(0, rotationalSpeed, 0));
        }
        else if (Input.GetKey(KeyCode.UpArrow)) {
            spaceship.GetComponent<Rigidbody>().AddRelativeForce(new Vector3(0, 0, speed));
        }
        else if (Input.GetKey(KeyCode.DownArrow)) {
            spaceship.GetComponent<Rigidbody>().AddRelativeForce(new Vector3(0, 0, -speed));
        }

        // shoot a bullet
        if (Input.GetKeyUp(KeyCode.Space) && Time.time - timeOfLastBullet >= 0.25) {    // only spawning a bullet once the key is released and once 0.25 seconds has elapsed since the last bullet
            // spawning a bullet at the front tip of the spaceship
            Instantiate(bullet, spaceship.transform.position + spaceship.transform.forward * spaceship.transform.localScale.z, spaceship.transform.rotation);
            timeOfLastBullet = Time.time;
        }
    }

    private void CheckScreenEdges() {
        Vector3 pos = spaceship.transform.position;
        Vector3 vel = spaceship.GetComponent<Rigidbody>().velocity;
        float xTeleport = 0f, zTeleport = 0f;

        if (pos.x < GameManager.screenBottomLeft.x && vel.x <= 0f) // velocity check as sanity test
```

```
            xTeleport = GameManager.screenWidth;
        else if (pos.x > GameManager.screenTopRight.x && vel.x >= 0f)
            xTeleport = -GameManager.screenWidth;

        if (pos.z < GameManager.screenBottomLeft.z && vel.z <= 0f)
            zTeleport = GameManager.screenHeight;
        else if (pos.z > GameManager.screenTopRight.z && vel.z >= 0f)
            zTeleport = -GameManager.screenHeight;

        if (xTeleport != 0f || zTeleport != 0f)
            transform.position = new Vector3 (pos.x + xTeleport, 0f, pos.z + zTeleport);

    }
}
```

Listing 4: `Spaceship.cs`

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class Bullet : MonoBehaviour
{
    public GameObject bullet;
    public float speed = 20f;

    // Start is called before the first frame update
    void Start()
    {
        // set the bullet moving
        bullet.GetComponent<Rigidbody>().velocity = bullet.transform.forward * speed;

        // start periodically checking for being off-screen
        InvokeRepeating ("CheckScreenEdges", 0.2f, 0.2f);
    }

    // Update is called once per frame
    void Update()
    {

    }

    private void CheckScreenEdges() {
        Vector3 pos = bullet.transform.position;
        Vector3 vel = bullet.GetComponent<Rigidbody>().velocity;

        if (pos.x < GameManager.screenBottomLeft.x || pos.x > GameManager.screenTopRight.x || pos.z
        ↪  < GameManager.screenBottomLeft.z || pos.z > GameManager.screenTopRight.z) {
            Destroy(bullet);
        }
    }
}
```

Listing 5: `Bullet.cs`