Game Framework Project

Submitted To:

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Framework for Making Platformer Games

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Problem Statement:

We want to make a dynamic level generation mechanism that user can use to add and define custom level backgrounds from word files.

Previous Solution:

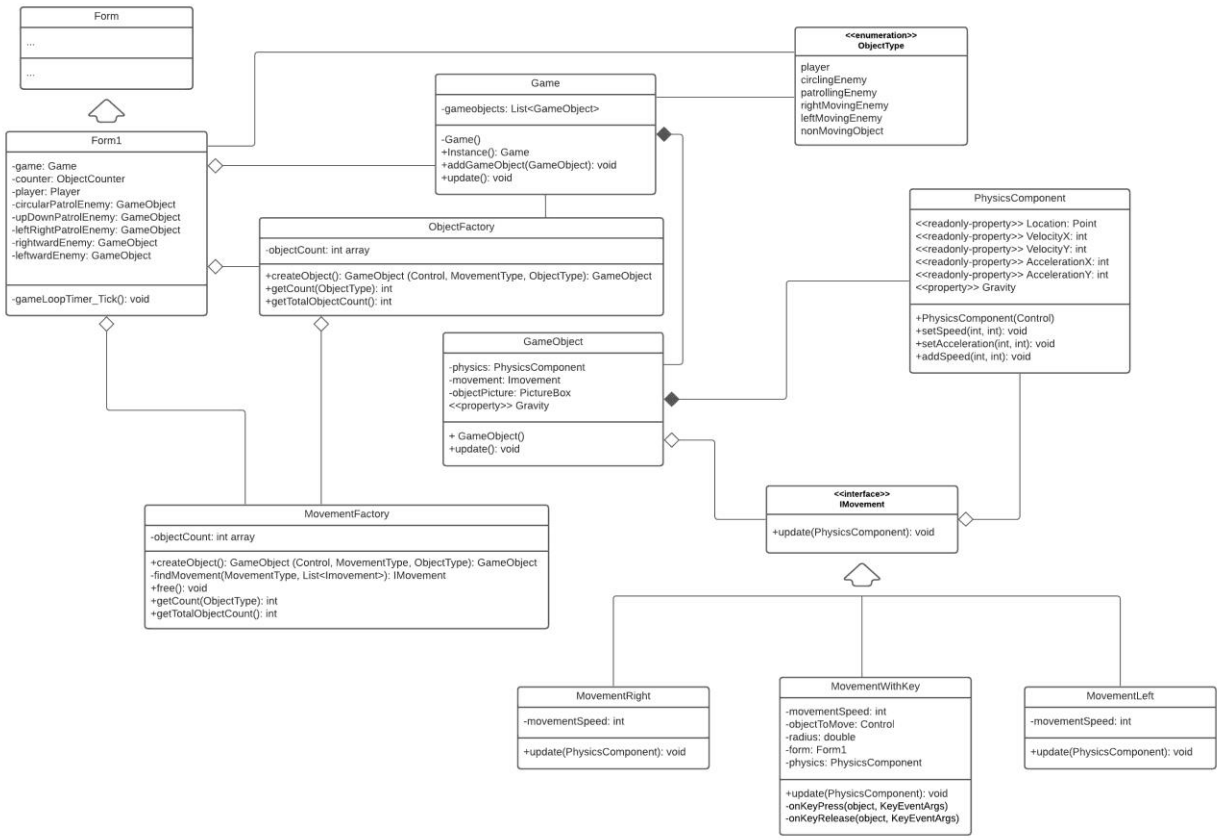
No previous attempt to solve this problem.

Solution/Current Approach:

Design Decision:

We used a file to read the level istead of defining everything in our program

UML Diagram:



Code:

Form1:

```
public partial class Form1 : Form
    {
        Game game;
        ObjectFactory factory;
        MovementFactory movementFactory;
        public Form1()
        {
            InitializeComponent();
            game = Game.Instance();
            factory = ObjectFactory.Instance();
            movementFactory = MovementFactory.Instance();
            game.addGameObject(factory.createObject(playerPictureBox,
MovementType.keyBoard, ObjectType.player, 0));
            game.addGameObject(factory.createObject(CircularPictureBox,
MovementType.left, ObjectType.circlingEnemy));
            game.addGameObject(factory.createObject(UDPatrolPictureBox,
MovementType.left, ObjectType.patrollingEnemy));
            game.addGameObject(factory.createObject(LRPatrolPictureBox,
MovementType.right, ObjectType.patrollingEnemy));
            game.addGameObject(factory.createObject(rightwardPictureBox,
MovementType.right, ObjectType.rightMovingEnemy));
            game.addGameObject(factory.createObject(leftwardPictureBox,
MovementType.left, ObjectType.leftMovingEnemy));
        }

        private void gameLoopTimer_Tick(object sender, EventArgs e)
        {
            game.update();
            objectCountLabel.Text = $"Objects: {factory.getTotalObjectsCount()},
Movements: Left:{movementFactory.getCount(MovementType.left)}
Right:{movementFactory.getCount(MovementType.right)}
KeyBoard:{movementFactory.getCount(MovementType.keyBoard)}";
        }
  }
```

Game:

```
public class Game
    {
        List<GameObject> gameObjects = new List<GameObject>();
        private static Game gameInstance;
        private static readonly object locker = new object();
        private Game() { }
        public static Game Instance()
        {
            lock (locker)
            {
                if (gameInstance == null) gameInstance = new Game();
```

```
                return gameInstance;
            }
        }
        public void addGameObject(GameObject gameObject)
        {
            gameObjects.Add(gameObject);
        }
        public void update()
        {
            foreach (GameObject gameObject in gameObjects)
            {
                gameObject.update();
            }

        }
    }
```

GameObject:

```
public class GameObject
    {
        protected PhysicsComponent physics;
        protected IMovement objectMovement;
        MovementFactory movementFactory;
        public float Gravity { get => physics.Gravity; set => physics.Gravity = value; }
        internal GameObject(Control objectPicture, IMovement objectMovement, float
objectGravity = 1)
        {
            //for creating object from a component
            physics = new PhysicsComponent(objectPicture, objectGravity);
            this.objectMovement = objectMovement;
            movementFactory = MovementFactory.Instance();
        }
        public virtual void update()
        {
            objectMovement.update(physics);
            physics.update();
            //Refresh();
        }
        ~GameObject() => movementFactory.free(objectMovement);
  }
```

IMovement:

```
// Interface for using in game objects
    public interface IMovement
    {
        public MovementType MovementType { get; }
        public bool IsExclusive { get; }
        void update(PhysicsComponent physics);
    }
```

MovementWithKey:

```
public class MovementWithKey : Movement, IMovement
    {
```

```
        PhysicsComponent physics;
        int movementSpeed = 5;
        bool firstTimeCheck;
        public MovementWithKey():base(MovementType.keyBoard, true) { }
        public void update(PhysicsComponent physics)
        {
            physics.Gravity = -1;
            if (!firstTimeCheck)
            {
                this.physics = physics;
                physics.ObjectForm.KeyDown += new KeyEventHandler(keyDownHandler);
                physics.ObjectForm.KeyUp += new KeyEventHandler(keyUpHandler);
                firstTimeCheck = true;
            }

        }
        private void keyDownHandler(object sender, KeyEventArgs e)
        {
            if(physics.VelocityX + physics.VelocityY < movementSpeed)
            {
                if (e.KeyCode == Keys.Up) physics.setSpeed(0, -movementSpeed);
                if (e.KeyCode == Keys.Down) physics.setSpeed(0, movementSpeed);
                if (e.KeyCode == Keys.Left) physics.setSpeed(-movementSpeed, 0);
                if (e.KeyCode == Keys.Right) physics.setSpeed(movementSpeed, 0);
            }
        }
        private void keyUpHandler(object sender, KeyEventArgs e)
        {
            if (e.KeyCode == Keys.Up) physics.setSpeed(physics.VelocityX, 0);
            if (e.KeyCode == Keys.Down) physics.setSpeed(physics.VelocityX, 0);
            if (e.KeyCode == Keys.Left) physics.setSpeed(0, physics.VelocityY);
            if (e.KeyCode == Keys.Right) physics.setSpeed(0, physics.VelocityY);
        }
    }
```

MovementRight:

```
public class MovementRight : Movement, IMovement
    {
        int movementSpeed = 5;
        public MovementRight() : base(MovementType.right, false) { }
        public void update(PhysicsComponent physics)
        {
            physics.Gravity = 0;
            physics.setSpeed(movementSpeed, 0);
        }
    }
```

MovementLeft:

```
public class MovementLeft : Movement, IMovement
    {
        int movementSpeed = 5;
        public MovementLeft():base(MovementType.left, false) { }
        public void update(PhysicsComponent physics)
        {
```

```
            physics.Gravity = 0;
            physics.setSpeed(-movementSpeed, 0);
        }
    }
```

ObjectFactory:

```
public class ObjectFactory
    {
        int[] objectCount = new int[10];
        MovementFactory movementFactory = MovementFactory.Instance();
        private static ObjectFactory factoryInstance;
        private static readonly object locker = new object();
        private ObjectFactory() { }
        public static ObjectFactory Instance()
        {
            lock (locker)
            {
                if (factoryInstance == null)
                    factoryInstance = new ObjectFactory();

                return factoryInstance;

            }
        }
        public GameObject createObject(Control objectPicture, MovementType movementType,
ObjectType objectType, float objectGravity = 1)
        {
            objectCount[(int)objectType]++;
            return new GameObject(objectPicture,
movementFactory.createMovement(movementType), objectGravity);
        }
        public int getCount(ObjectType objectType) => objectCount[(int)objectType];
        public int getTotalObjectsCount()
        {
            int count = 0;
            foreach (int objCount in objectCount) count += objCount;
            return count;
        }
    }
public class MovementFactory
    {
        static MovementFactory factoryInstance;
        private static readonly object locker = new object();
        List<IMovement> available = new List<IMovement>();
        List<IMovement> occupied = new List<IMovement>();
        int[] movementCount = new int[3];
        private MovementFactory() { }
        public static MovementFactory Instance()
        {
            lock (locker)
            {
                if (factoryInstance == null) factoryInstance = new MovementFactory();
                return factoryInstance;
            }
```

```
        }
        public IMovement createMovement(MovementType movementType)
        {
            IMovement movement = findMovement(movementType, available);
            if (movement != null)
            {
                if (movement.IsExclusive)
                {
                    available.Remove(movement);
                    occupied.Add(movement);
                }
                return movement;
            }

            else
            {
                lock (locker)
                {
                    IMovement newMovement;
                    if (movementType == MovementType.right) newMovement = new
MovementRight();
                    else if (movementType == MovementType.left) newMovement = new
MovementLeft();
                    else newMovement = new MovementWithKey();

                    if (newMovement.IsExclusive) occupied.Add(newMovement);
                    else available.Add(newMovement);

                    movementCount[(int)newMovement.MovementType]++;
                    return newMovement;
                }
            }
        }
        public int getCount(MovementType movementType) =>
movementCount[(int)movementType];
        public int getTotalMovementCount()
        {
            int count = 0;
            foreach (int movCount in movementCount) count += movCount;
            return count;
        }
        IMovement findMovement(MovementType typeToLookFor, List<IMovement> listToSearch)
        {
            foreach(IMovement movement in listToSearch)
                if (movement.MovementType == typeToLookFor) return movement;
            return null;
        }
        public void release(IMovement movement)
        {
            if (movement.IsExclusive)
            {
                occupied.Remove(movement);
                available.Add(movement);
            }
        }
```

```
    }
```

CollisionDetector:

```
using System;
using System.Collections.Generic;
using System.Text;

namespace SectionA2020CS13Framework
{
    public class CollisionDetector
    {
        ObjectType first, second;
        ICollisionBehavior behavior;
        public CollisionDetector(ObjectType first, ObjectType second, ICollisionBehavior
behavior)
        {
            this.first = first;
            this.second = second;
            this.behavior = behavior;
        }
        public void check(List<GameObject> objects)
        {
            for (int i = 0; i < objects.Count - 1; i++)
                for (int j = i + 1; j < objects.Count; j++)
                {
                    GameObject firstObject = objects[i];
                    GameObject secondObject = objects[j];

                    if (firstObject.Type == first && secondObject.Type == second
                        && firstObject.collidesWith(secondObject))
                    {
                        behavior.apply(firstObject, secondObject);
                    }
                }
        }
    }
}
```

ICollisionBehavior:

```
public interface ICollisionBehavior
    {
        public void apply(GameObject first, GameObject second);
    }
```

DeleteObject:

```
using System;
using System.Collections.Generic;
using System.Windows.Forms;

namespace SectionA2020CS13Framework
{
    public class DeleteObject : ICollisionBehavior
    {
        Game game;
```

```
        ObjectType typeToDelete;
        public DeleteObject(Game game, ObjectType typeToDelete)
        {
            this.game = game;
            this.typeToDelete = typeToDelete;
        }
        public void apply(GameObject first, GameObject second)
        {
            if(first.Type == typeToDelete)
            {
                first.removeSelf();
                game.removeGameObject(first);
                GC.Collect();
            }
            else if (second.Type == typeToDelete)
            {
                second.removeSelf();
                game.removeGameObject(second);
                GC.Collect();
            }
        }
    }
}
```

ObjectType:

```
public enum ObjectType
    {
        player,
        circlingEnemy,
        patrollingEnemy,
        rightMovingEnemy,
        leftMovingEnemy,
        nonMovingObject
    }
public enum MovementType
{
    keyBoard,
    right,
    left
}
```