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知乎

First published in the
Game Development Getting Started Guide-Unity +


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Let's do a barrage

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Bustling...

Game developers on the road



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Foreword:

The "Oriental" series has given us a deep impression with its magnificent barrage and master's operation of flowing clouds and flowing water.

So in Unity, how do we implement this content? Please see below.

Basic articles:

1. Shotgun Barrage

Most STG games have a barrage style called shotgun. The essence is that the left and right sides of the launch direction are offset by the same angle, and multiple bullets in different directions are launched in the same frame, causing a feeling of scattering (the random shot mode is not discussed here). The principle is as follows:



Schematic diagram of shotgun barrage

As long as the launch direction can be rotated according to our ideas, the desired effect can be achieved. This is done using coroutines. The implementation code is as follows:

```
IEnumerator FirShotgun()
{
    Vector3 bulletDir = firPoint.transform.up; //由于资源的原因，我们这边的发射方向为4
    Quaternion leftRota = Quaternion.AngleAxis(-30, Vector3.forward);
    Quaternion RightRota = Quaternion.AngleAxis(30, Vector3.forward); //使用四元数
    for (int i=0;i<10;i++) //散弹发射次数
    {
        for (int j=0;j<3;j++) //一次发射3颗子弹
        {
            switch (j)
            {
                case 0:
                    CreateBullet(bulletDir, firPoint.transform.position); //发射第
            }
        }
    }
}
```

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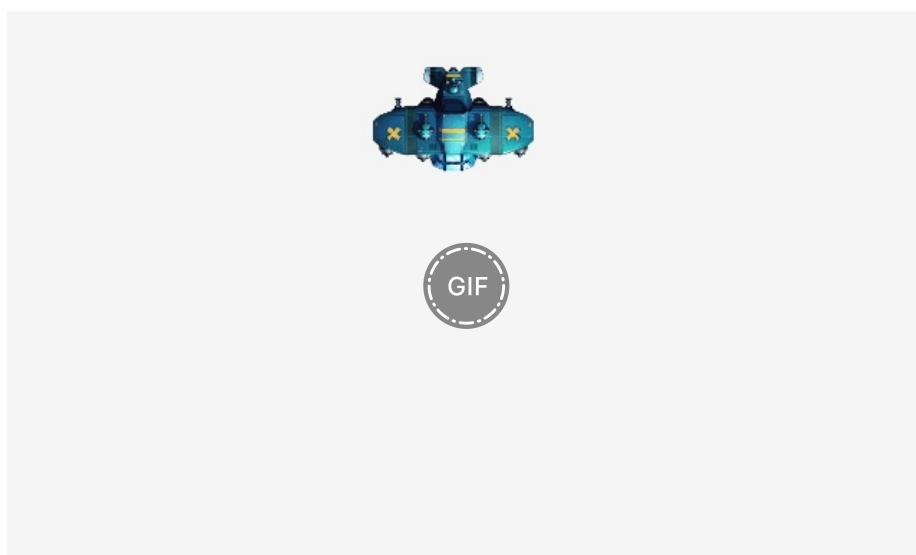


```

case 1:
    bulletDir = RightRota * bulletDir; // 第一个方向子弹发射完毕, 旋转
    CreatBullet(bulletDir, firPoint.transform.position); // 调用生成
    break;
case 2:
    bulletDir = leftRota*(leftRota * bulletDir); // 右边方向发射完毕,
    CreatBullet(bulletDir, firPoint.transform.position);
    bulletDir = RightRota * bulletDir; // 一轮发射完毕, 重新向右边旋转
    break;
}
}
yield return new WaitForSeconds(0.5f); // 协程延时0.5秒进行下一波发射
}
}

```

After completion, the effect is as follows:



Shotgun barrage effect icon

2. Round barrage

Circle-shaped barrage is also the most frequent in various games. Many gorgeous barrage are also composed of basic round barrage. The principle is as follows:



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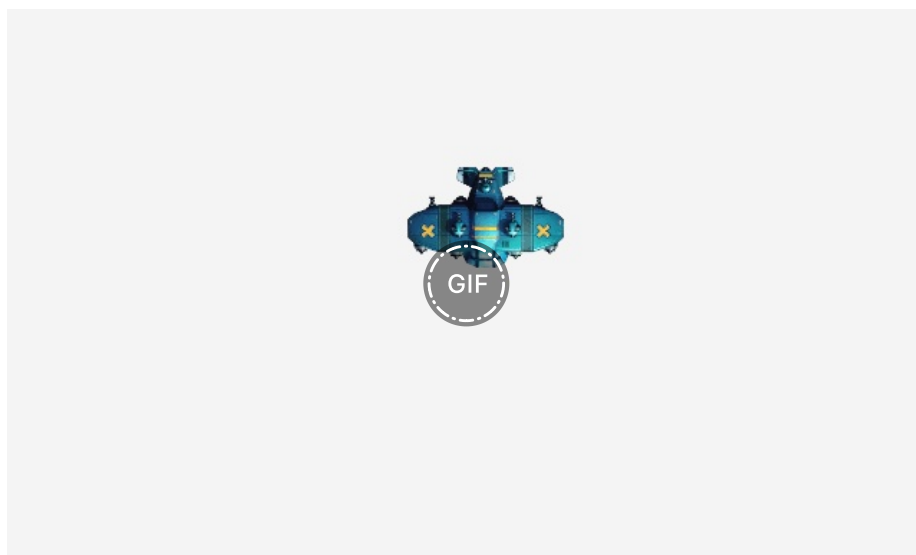


The implementation method is similar to the bullet barrage, except that the bullets that are fired just form a circle, and the angle between the firing directions of each bullet is equal, and the addition is exactly 360 degrees. The implementation principle is as follows:

```
IEnumerator FirRound(int number, Vector3 creatPoint) // 参数为发射波数与子弹生成点
{
    Vector3 bulletDir = firPoint.transform.up; // 发射方向
    Quaternion rotateQuate = Quaternion.AngleAxis(10, Vector3.forward); // 使用四元数
    for (int i=0; i< number; i++) // 发射波数
    {
        for (int j=0; j<36; j++)
        {
            CreatBullet(bulletDir, creatPoint); // 生成子弹
            bulletDir = rotateQuate * bulletDir; // 让发射方向旋转10度，到达下一个发射
        }
        yield return new WaitForSeconds(0.5f); // 协程延时，0.5秒进行下一波发射
    }
    yield return null;
}
```



After completion, the effect is as follows:

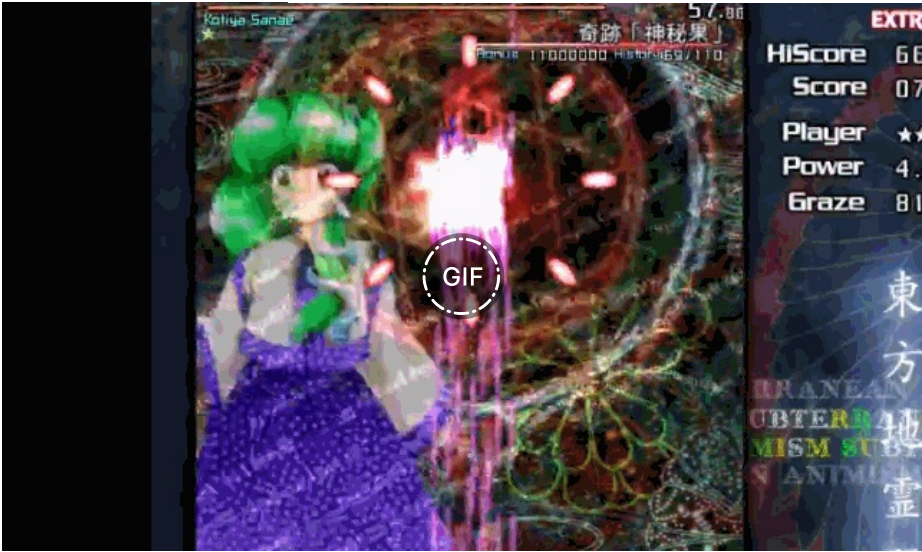


Round barrage effect icon

Advanced articles:

Next are some complex examples that are closer to commercial games on the market. Lets come look:

1. Intensive Barrage



Screenshot of the game-the dense barrage in the Oriental Earth Spirit Palace

Barrage analysis:

In the above picture, first is an 8-direction round barrage. After the bullet reaches the target point, an N-wave multi-directional round barrage is generated at each current point, filling up half of the screen. The realization principle is as follows:



Illustration of the principle of dense barrage

Through the above analysis, we can quickly conclude that the barrage is actually a combination of circular barrage with different angles and different positions. The implementation code is as follows:

```
IEnumerator FirRoundGroup()  
{  
    Vector3 bulletDir = firPoint.transform.up;  
    Quaternion rotateQu  
    List<BulletCharacte
```

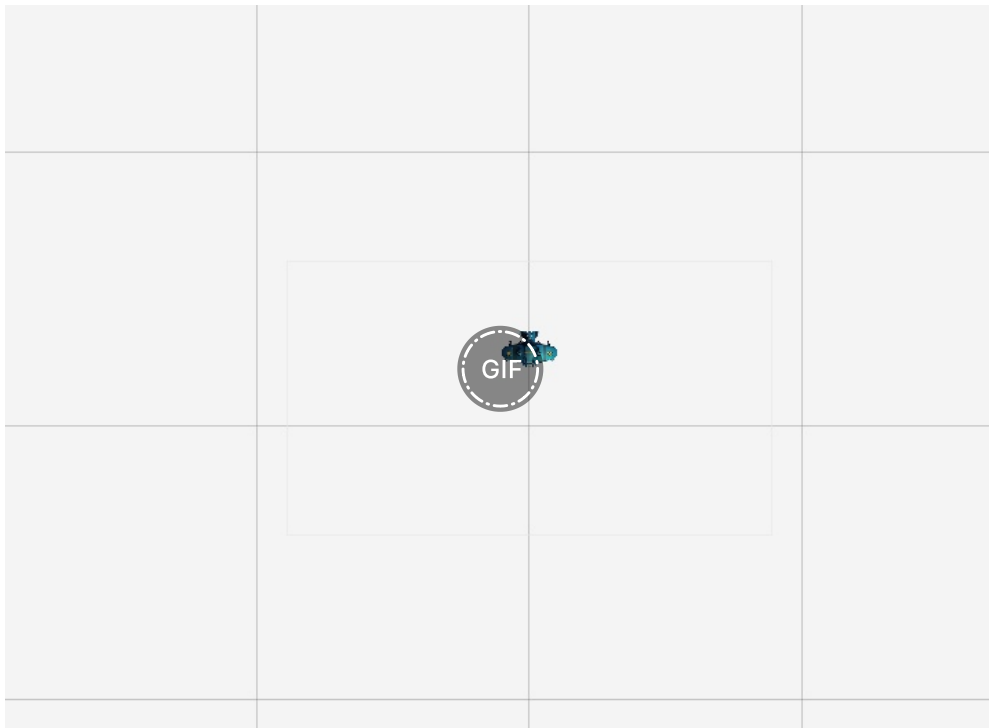
```

for (int i=0;i<8;i++)
{
    var tempBullet = CreatBullet(bulletDir, firPoint.transform.position);
    bulletDir = rotateQuate * bulletDir; //生成新的子弹后，让发射方向旋转45度，到达
    bullets.Add(tempBullet);
}
yield return new WaitForSeconds(1.0f); //1秒后在生成多波弹幕
for (int i = 0; i < bullets.Count; i++)
{
    bullets[i].speed = 0; //弹幕停止移动
    StartCoroutine(FirRound(6, bullets[i].transform.position)); //通过之前弹幕的
}
}

```



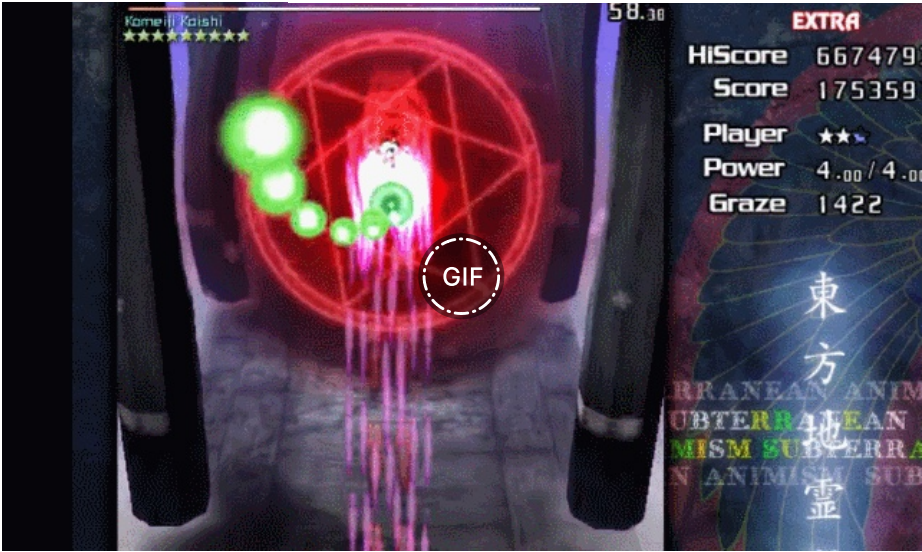
After completion, the effect is as follows:



Intensive barrage effect icon

The barrage here has not been completely re-engraved. The spaced bullets after the final launch are automatically combined into a small detail in a straight line, which is beyond the scope of this article. Interested students can try to analyze the principles themselves.

2. Turbo Barrage



Screenshot of the game-Turbo Barrage in the Oriental Earth Spirit Palace

The essence of the turbo-type barrage is a circular barrage with a growing radius, and then a feature of the dense barrage above is mixed to generate a multi-directional circular barrage again at the generated position. The implementation principle is as follows:



Turbine barrage principle diagram

The main difficulty of this barrage is to find the next barrage generation point (in fact, it is not difficult, it has been implemented above). The implementation code is as follows:

```
IEnumerator FireTurbine()
{
    Vector3 bulletDir = firPoint.transform.up; //发射方向
    Quaternion rotateQu
    float radius = 0.6f
```

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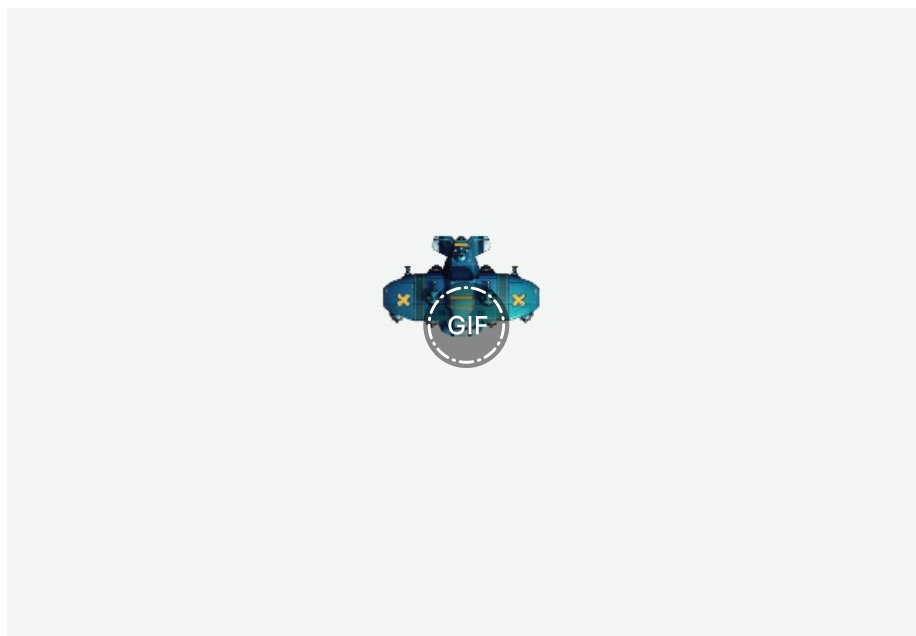
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```
float distance = 0.2f;    //每生成一次增加的距离
for (int i=0;i<18;i++)
{
    Vector3 firePoint = firPoint.transform.position + bulletDir * radius; //
    StartCoroutine(FirRound(1, firePoint));    //在算好的位置生成一波圆形弹幕
    yield return new WaitForSeconds(0.05f);    //延时较小的时间（为了表现效果），
    bulletDir = rotateQuate * bulletDir;    //发射方向改变
    radius += distance;    //生成半径增加
}
}
```



After completion, the effect is as follows:



Turbine barrage effect icon

Expand articles:

Spherical barrage

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Ball-shaped barrage effect icon

The above spherical barrage is for expansion use only. Children's shoes who are interested can observe the effect chart by themselves, analyze the principle and realize it by themselves. The principle and code diagram will not be posted here. I will package the implementation code into the project together for reference.

Optimization articles:

This article aims to teach you to make a simple barrage without any optimization. In actual games, the appearance of a large number of bullets on the same screen will consume a lot of memory resources, which must be optimized. Here are some optimization suggestions, interested students can study one or two.

1. Use object pool optimization to reuse game objects. The principle of the object pool will not be elaborated, please refer to the following link for details: [\[Unity\] Tool series tutorial-object pool!](#)
2. Custom mesh. The bullets in the scene are all drawn through the code, and the game object mode is not used for interaction. At the same time, collision detection of bullets and surrounding objects is also implemented by their own code, so that the effect will be better.
3. When the bullets in the scene all have separate logic and want to perform multi-core optimization, you can use Unity's ECS mode for optimization. For details, see the following link: [Unity Entity Component System \(ECS\)-Preview and Experience](#)

Conclusion:

Most of this article is to carry out mathematical operations, and has certain requirements for the mathematical foundation. Well, it's time to make up for it.

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Project address: [pan.baidu.com/s/1liR0Zs ...](https://pan.baidu.com/s/1liR0Zs...)



Extraction code: raa5

Friendly reminder: The version of Unity3D used in the reference project is 2018.3.0b7. If the download cannot be run or an error is reported, remember to switch the target version and try again.

Other content:

Thinking of children's boots for offline game development, poke here: levelpp.com/

Another professional development communication (gao) stream (ji) group is waiting for everyone to strongly insert: 869551769

Published on 2018-12-10

[game development](#) [Unity \(Game Engine\)](#) [game](#)

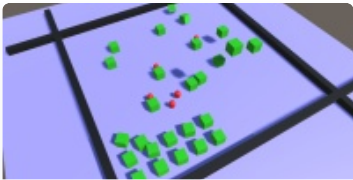
The article is included in the following column



Game Development Getting Started Guide-Unity +
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learned!!!
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1 year ago

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Know user

1 year ago

Seeing the barrage, the first thing to think about is damage settlement, then the bullet's own script, then the bullet is placed as a projectile in the buffer pool for optimization, and then the Update function of all projectiles is scheduled with a manager ...

2



繁华如梦 (Author) replied to know the user

1 year ago

You are the idea of making game logic. This article is only for the idea of game shape. The combination of our two is a barrage game. Sao Nian, it's still coming now!



1



suraita

1 year ago

The world in the east is terrible, such a dense barrage is not irritated by people 😞

Praise



alt255

1 year ago

It's not the kind of barrage I thought

3



有木桑

1 year ago

I just did this in the first two days of work and solved it with UniRX

Praise



Goal xx Northrend

1 year ago

Great writing

Praise



Illsss

1 year ago

I caught one Dalin, haha got my recommendation

Praise



繁华如梦 (author) replied to Illsss

1 year ago

This will do! Slip, slip!

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大伟 加油

1 year ago

Learned

Praise



Macyrate

2 months ago

Exactly what i need



Praise

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