



DIVISION OF
DIGITAL CONTENTS
DONGSEO UNIVERSITY

Unity Physics

Add Force to Rigidbody

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- ✓ **Linear momentum, translational momentum**, or simply **momentum**(pl. momenta) is the product of the mass and velocity of an object.
- ✓ It is a vector quantity, possessing a magnitude and a direction in three-dimensional space.
- ✓ If m is an object's mass and \mathbf{v} is the velocity (also a vector), then the momentum is

$$\mathbf{p} = m\mathbf{v}$$

Many particles

- ✓ The momentum of a system of particles is the vector sum of their momenta. If two particles have respective masses m_1 and m_2 , and velocities v_1 and v_2 , the total momentum is

$$\begin{aligned} p &= p_1 + p_2 \\ &= m_1 v_1 + m_2 v_2 . \end{aligned}$$

- ✓ The momenta of more than two particles can be added more generally with the following:

$$p = \sum_i m_i v_i .$$

- ✓ If the net force F applied to a particle is constant, and is applied for a time interval Δt , the momentum of the particle changes by an amount

$$\Delta p = F \Delta t .$$

- ✓ In differential form, this is [Newton's second law](#); the rate of change of the momentum of a particle is equal to the instantaneous force F acting on it,

$$F = \frac{dp}{dt} .$$

- ✓ If the net force experienced by a particle changes as a function of time, $F(t)$, the change in momentum (or impulse J) between times t_1 and t_2 is

$$\Delta p = J = \int_{t_1}^{t_2} F(t) dt .$$

Unity Demo

Reset is called in the Editor when the script is attached or reset.

Editor

Reset

Awake

OnEnable

Start is only ever called once for a given script.

Start

Initialization

The physics cycle may happen more than once per frame if the fixed time step is less than the actual frame update time.

FixedUpdate

yield WaitForFixedUpdate

Internal physics update

OnTriggerXXX

OnCollisionXXX

Physics

OnMouseXXX

Input events

Update

yield null

yield WaitForSeconds

yield WWW

yield StartCoroutine

If a coroutine has yielded previously but is now due to resume then execution takes place during this part of the update.

Internal animation update

Game logic

LateUpdate

Version: **2019.1** (switch to [2018.3](#) or [2017.4](#))

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[Unity User Manual \(2019.1\)](#) / [Working in Unity](#) / [Editor Features](#) / [Project Settings](#)



Time

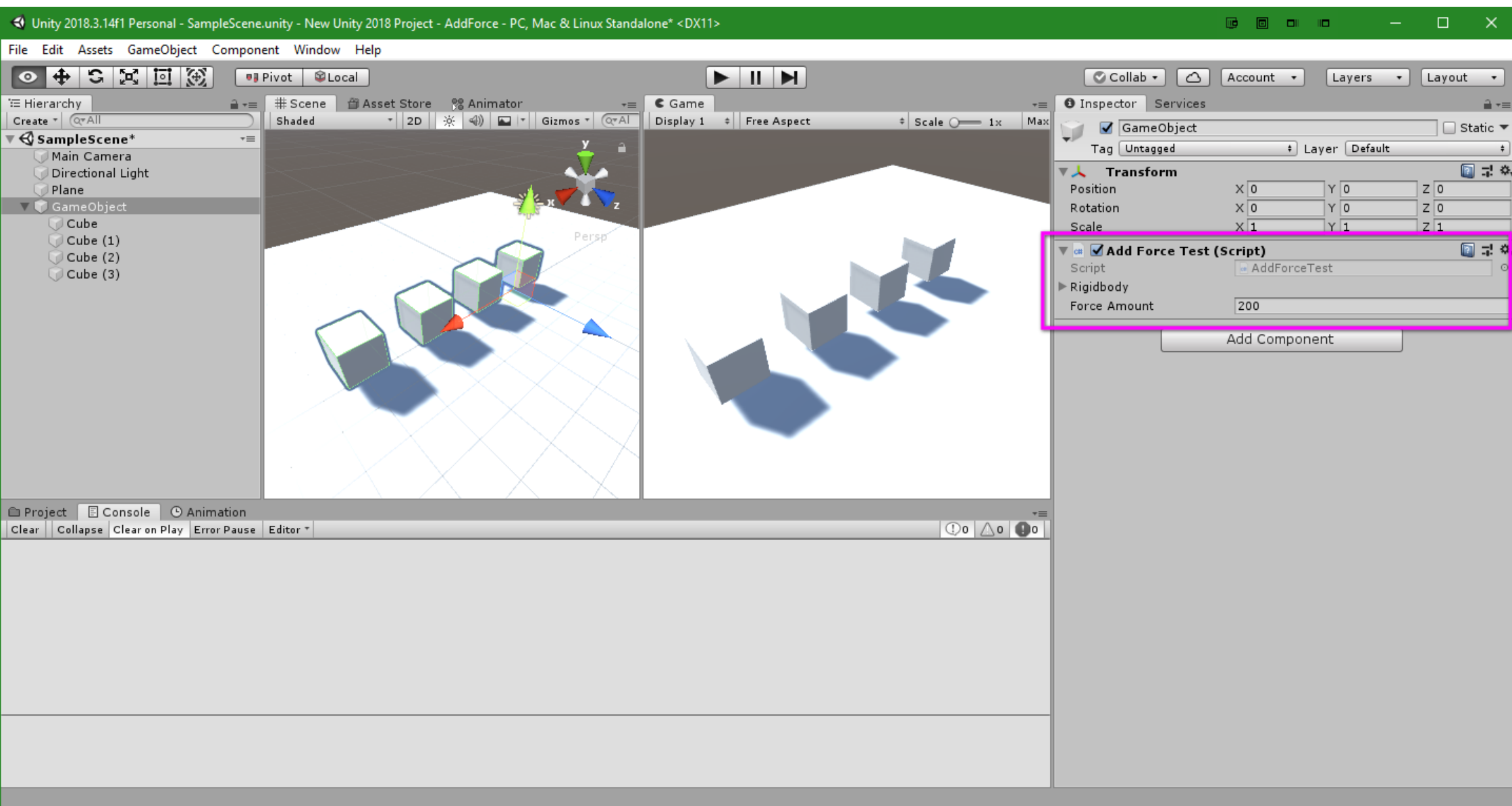
The **Time** settings (menu: **Edit > Project Settings**, then the *Time_* category) lets yo



Properties

Property:	Function:
Fixed Timestep	A framerate-independent interval that dictates when physics
...	...

Demo



```
public class AddForceTest : MonoBehaviour
```

```
{
```

```
    public Rigidbody[] _rigidbody;
```

```
    public float _forceAmount = 100;
```

```
    void Start()
```

```
{
```

```
        _rigidbody = new Rigidbody[4];
```

```
        int childindex = 0;
```

```
        foreach (Transform child in transform)
```

```
{
```

```
            _rigidbody[childindex] = child.gameObject.GetComponent<Rigidbody>();
```

```
            childindex += 1;
```

```
}
```

```
}
```

```
    void _ApplyForce()
```

```
{
```

```
        _rigidbody[0].AddForce(transform.forward * _forceAmount, ForceMode.Force);
```

```
        _rigidbody[1].AddForce(transform.forward * _forceAmount * Time.fixedDeltaTime,  
ForceMode.Impulse);
```

```
        Vector3 v = transform.forward * _forceAmount * Time.fixedDeltaTime / _rigidbody[1].mass;
```

```
        _rigidbody[2].AddForce(v, ForceMode.VelocityChange);
```

```
        _rigidbody[3].AddForce(v / Time.fixedDeltaTime, ForceMode.Acceleration);
```

```
}
```

```
// Update is called once per frame
```

```
void FixedUpdate()
```

```
{
```

```
    if (Input.GetKeyDown(KeyCode.A)) {
```

```
        _ApplyForce();
```

```
    }
```

```
}
```

References

- ✓ <https://en.wikipedia.org/wiki/Momentum>
- ✓ <https://docs.unity3d.com/ScriptReference/ForceMode.Impulse.html>
- ✓ <https://answers.unity.com/questions/713217/exact-difference-between-fixedDeltaTime-and-deltaTime.html>

QnA

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