GDC

How To Make Animation Blend More Natural?

A mannequin – Based Mutil – Fragment Animation Blend System

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Outline

1. What is the reason why we need to build such a system?

2. The development process

- Design and production of character animation
- Platform for calculation and visualization of character movement path
- The “natural” blend of character animation

3.Takeaway

What is the reason why we need to build such a system?

Figure skating

Many different types of actions

Any combination can be made

Each movement needs to be connected by sliding

Every action needs to follow the laws of physics

Application scenarios

A huge number of animationClip

Players are free to define a combo animation

Connecting between animations requires some computation depending on the animation before and after

Follow the laws of physics

Problems Solved

Realistic Reality Animation

Automated splicing of animation sequences without manual setup

Calculates the link path between animations

Follow the laws of physics

Design and production of character animation

Design Ideas

Number of animation segments

Support for multiple roles

Uniform animation standards

Restore the real animation

Handle the animation blend

Number of animation segments

The number of fixed ：Spin（20） Jump（24） Step sequence （5 + 1） Normal slide animation （2/4/8）

Quantitatively scalable ： Enter the animation Dance animation End of the animation

Pre-production ：Make a small number of animations, one or two of each kind, to validate the core gameplay

Post-production ： A large amount of investment, first to complete the fixed animation part, according to the time cost of the expansion of the design

Support for multiple roles

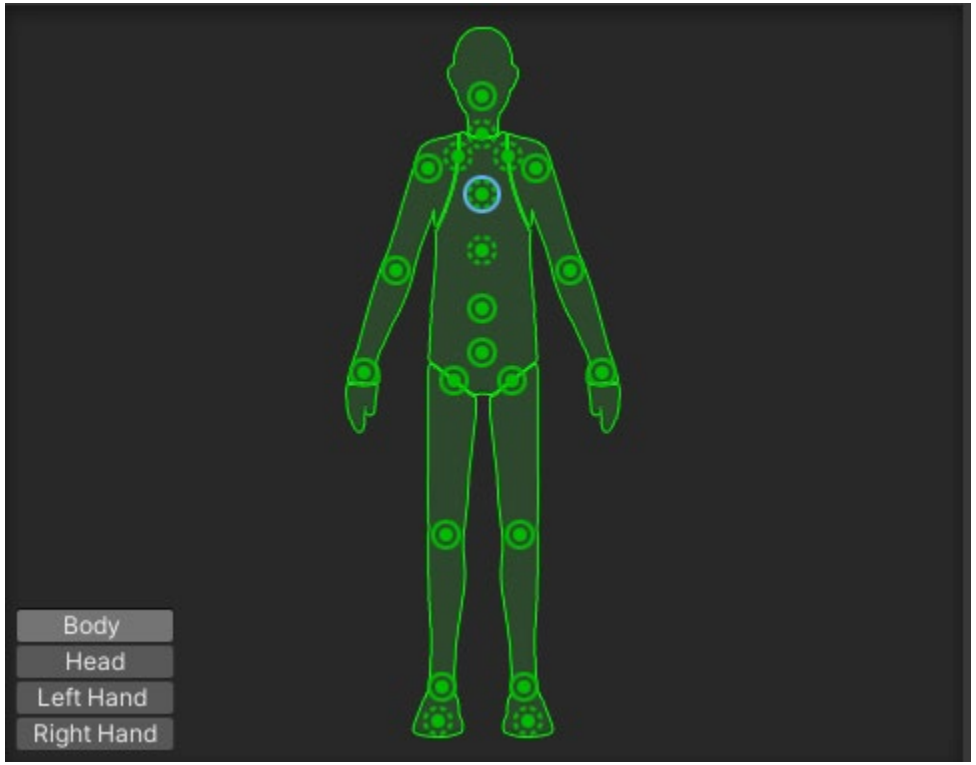
Retargeting

Standard bone

Humanoid

Differentiation ：

- Enter the animation
- Dance animation
- End of the animation



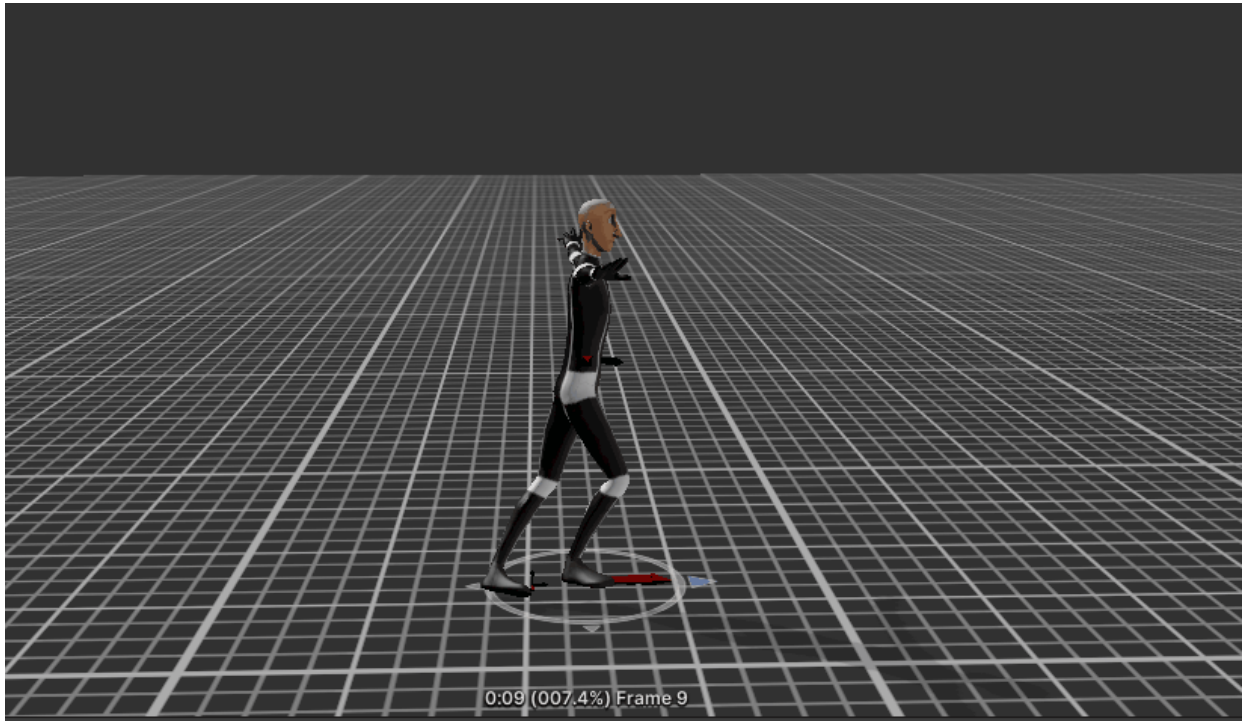
Uniform animation standards

Movement and rotation

Beginning and end

Pay attention to feet

The quality control



Restore the real animation

Reasonable reference choice

Pay attention to the technical details of the animation

Focus on the logic of the animation

Motion capture

Handle the animation blend

Standard beginning and end

4/8 direction

There is no need to manually adjust the transition blend

Platform for calculation

and visualization of character movement path

Advantages of development

Low cost mass testing

More intuitive test path calculation

Analyze rink usage

Check the animation

Test the camera motion scheme

Output the actual data stream

Path calculation

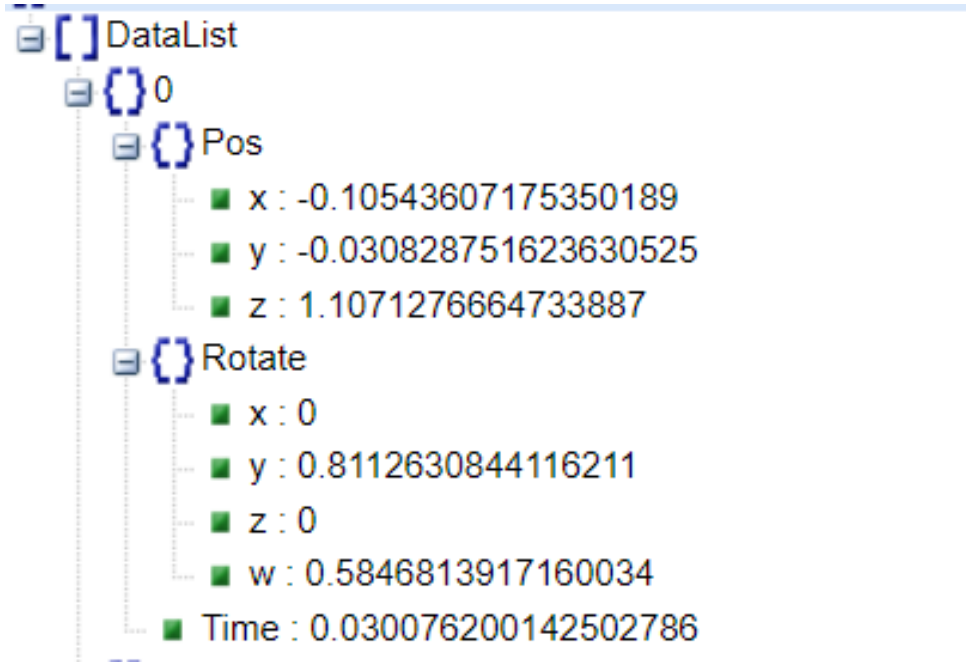
Step1:Data import

Import .fbx animation into engine

Build the animation data export script

Passing to the platform back end

Check animation/Save data



Path calculation

Step2: The link path between two successive animations

Time length calculation ：

- Change in absolute value of speed at the end of the last animation
- Change in absolute value of speed at the start of the next animation
- Change of rotation angle

Path calculation

Step2: The link path between two successive animations

Trace calculation ：

- Calculate the absolute value of the speed at each moment in the connecting action
- In combination with the absolute value of the speed, the direction of the speed is selected to calculate the actual speed in the connection movement
- Accumulate the speed to get the trajectory

Path calculation

Step2: The link path between two successive animations

Rotation direction calculation ：

- Calculate the relative velocity direction of the body at the end of the previous animation
- Calculate the relative velocity direction of the body at the start of the next animation
- Interpolation calculates the reverse relative velocity of the body at each moment
- According to the direction of the velocity at each moment calculated by the trajectory, combined with the velocity of the body direction, the rotation direction of the body at each moment was calculated.

Path calculation

Step3: Use the backtracking method to select the appropriate cohesive action

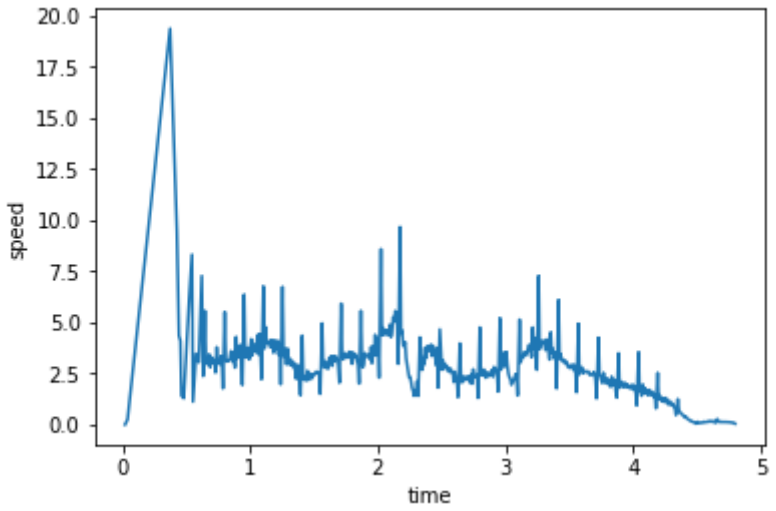
Limit the trajectory of movement

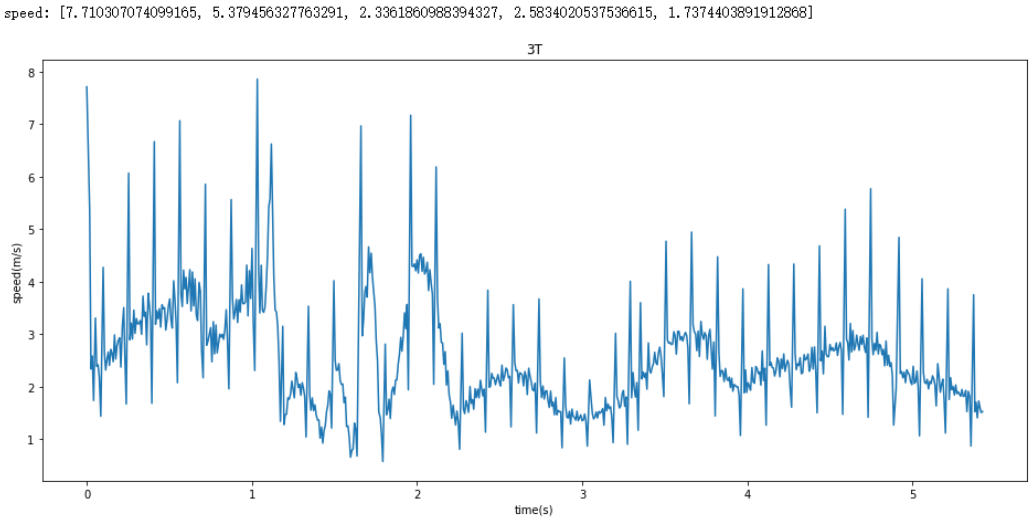
Use backtracking method for action search

The search results are calculated randomly

Verification of animation rationality

Through the production of animation import data for analysis

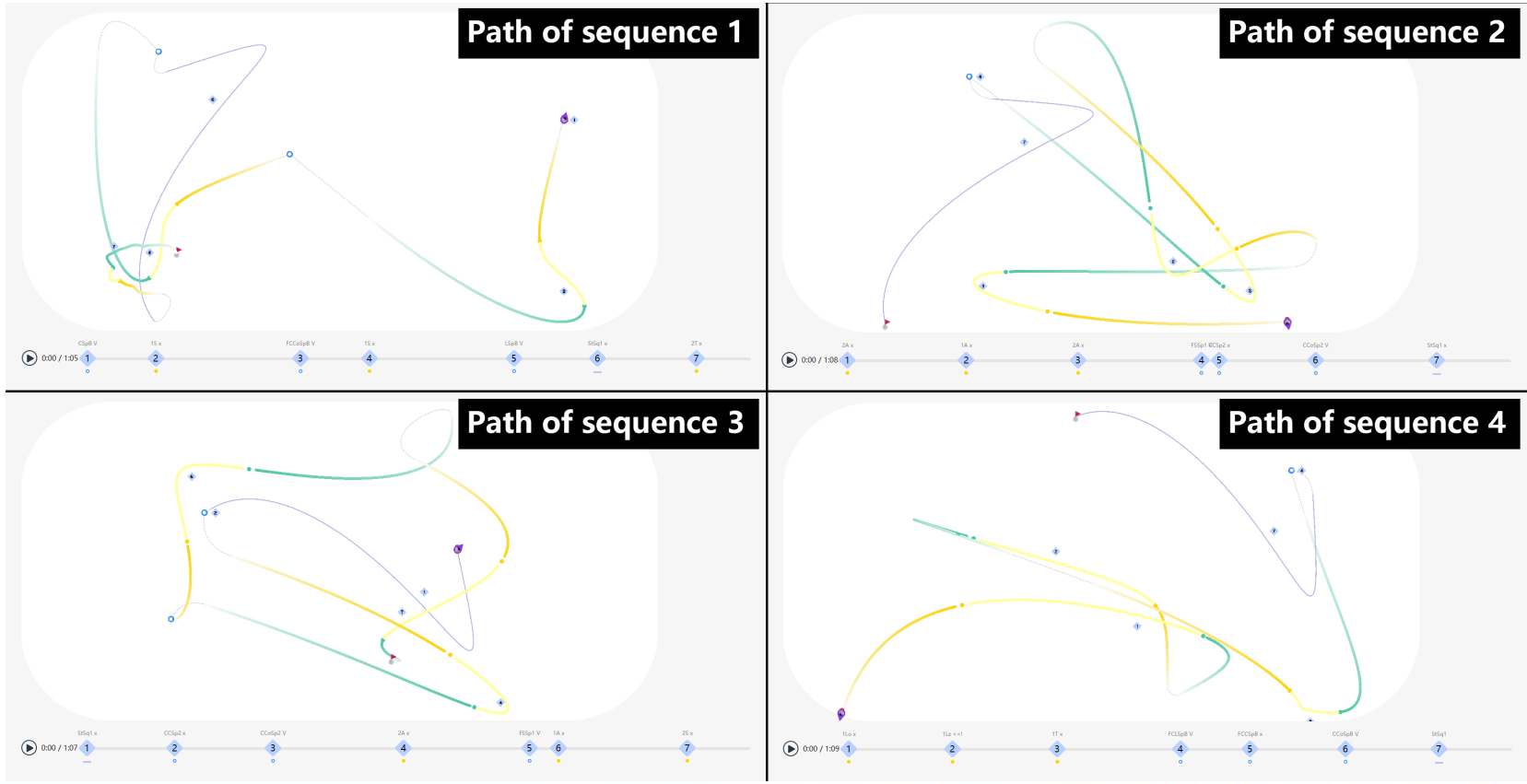




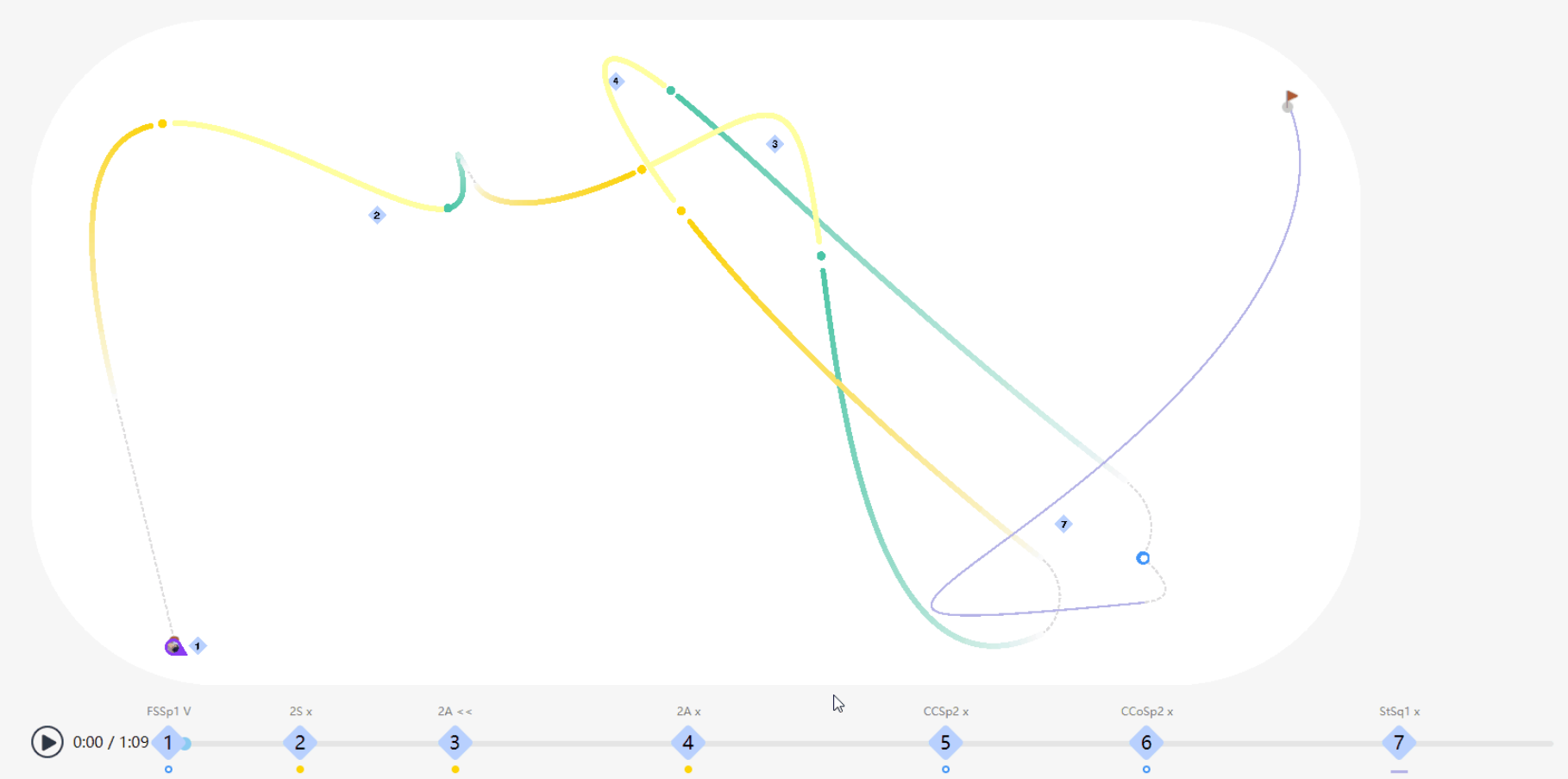
Generating visual paths

Select the animation sequence

Generating visual paths



Dynamic display



Data export

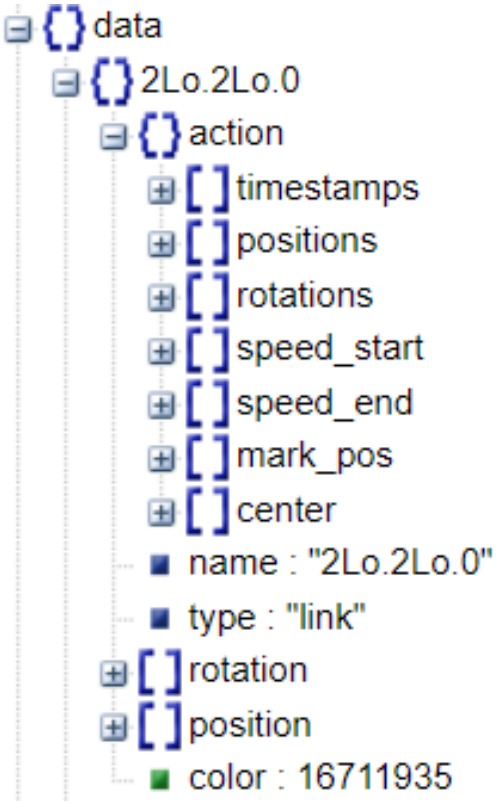
The displacement and rotation data of the entire animation

Offline export ：The client does the validation

Online access to ：

Each time the player completes the choreography,

access the back end to obtain animation data



The “natural” blend of character animation

State Machine Or TimeLine

Advantages of state machine:

Resources are fixed and do not need to be modified at runtime

More convenient control, and completely separate from other modules

Disadvantages of state machine ：

When there are many fragments, the build can be quite complex

Inconvenient update

State Machine Or TimeLine

Advantage of the TimeLine ：

Fewer resources

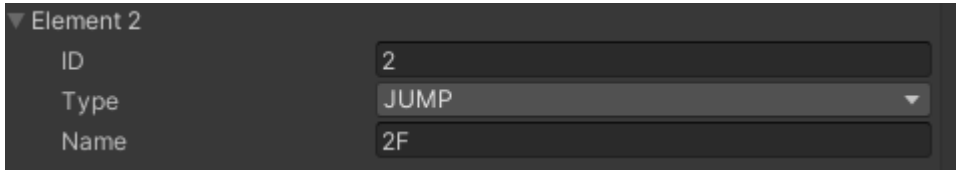
Convenient resource update

Disadvantage of the TimeLine ：

The assets need to be modified at run time

Based on the State Machine

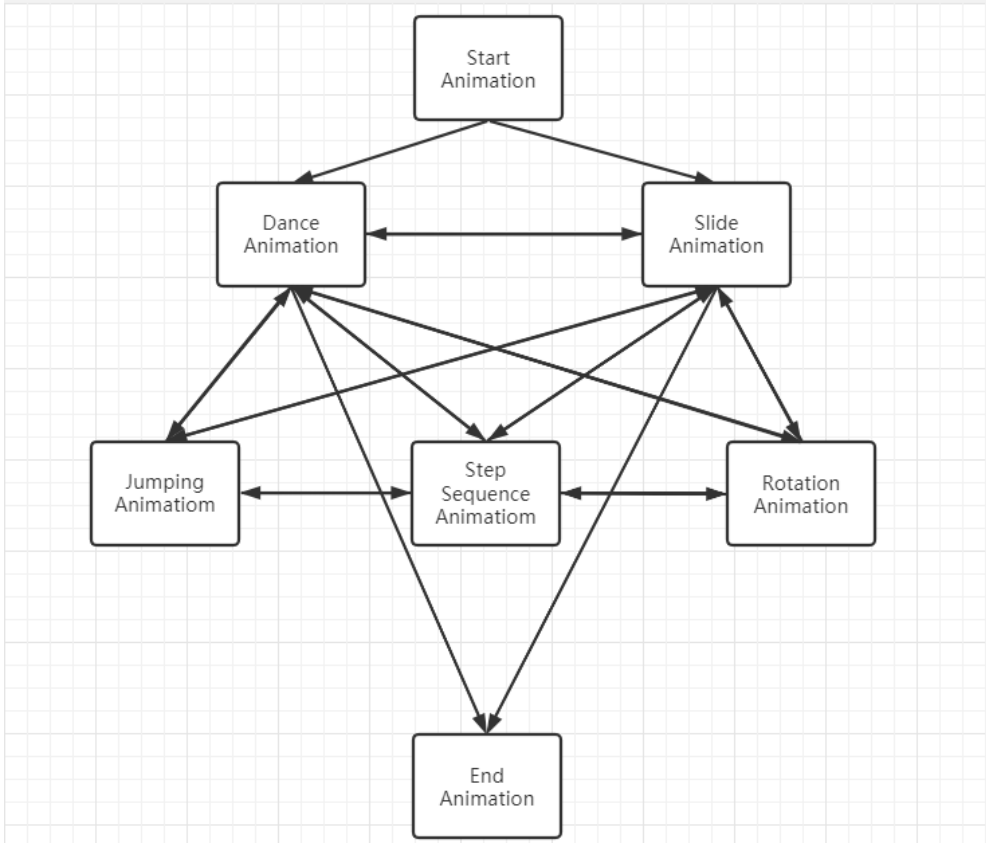
Automated state mechanism construction



State of the abstract ：Multiple fragments are abstracted from the upper level state according to the animation properties.

Marks the animation state according to the abstract state transition relationship

The script iterates through the setup state machine and transitions the state through the animation ID as a condition.



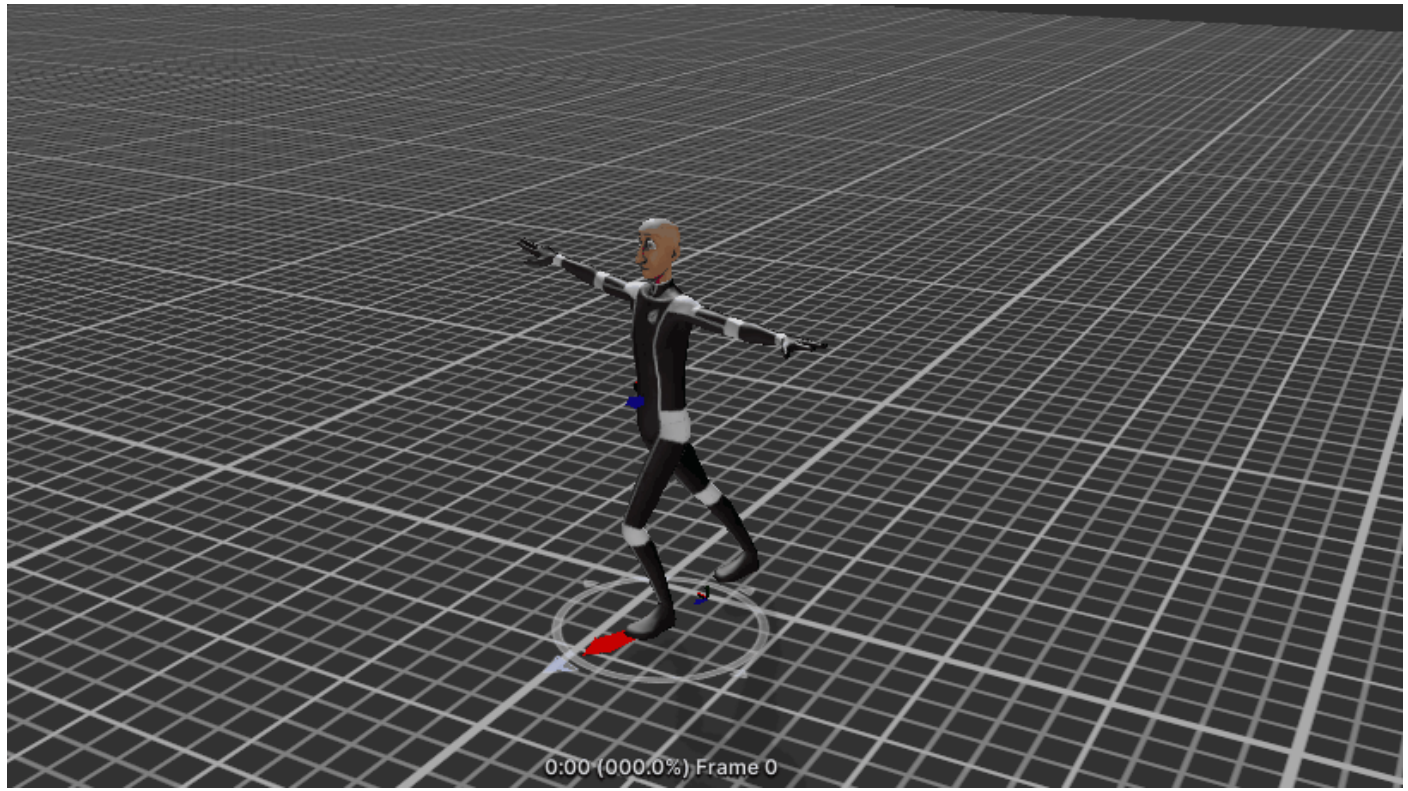
Animation processing

Non-cohesive animations

Animation contains displacement

Affected only by before

and after animations



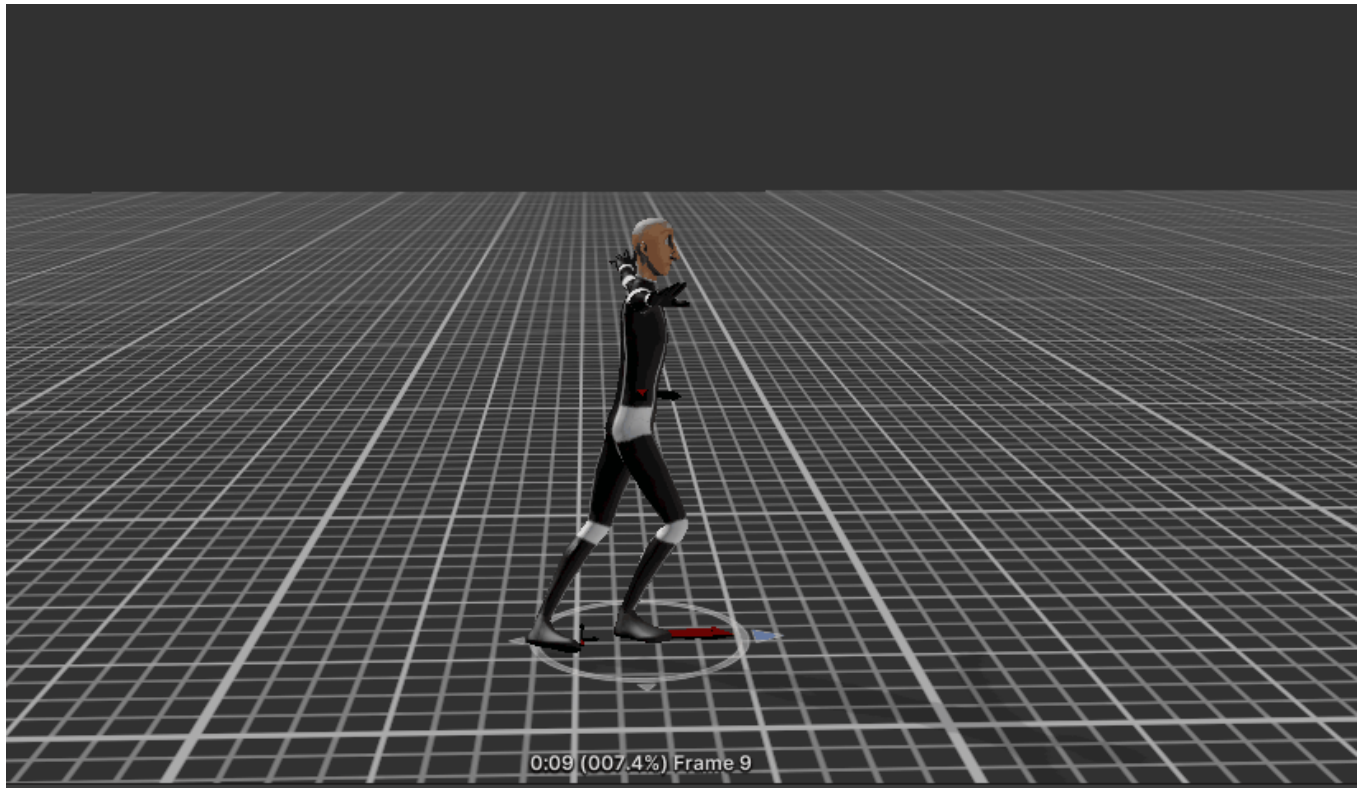
Animation processing

Bridging animation

LOOP

4Direction Or 8Direction

Direction of computing



Animation processing

The animation of the wrong action

Fall：Make several different kinds of fall animations, make sure there are certain differences, mount on the state machine

Weeks less than ： Calculate the animation normal hovering time, dynamically adjust the hovering time

Blend Between Animation Clips

Step1:Automate blend

Select reference factor

Calculate blending interval

Pre-animation/Sliding animation: foot orientation and the left and right feet in front and back

Transition proportion calculation: traverse to the same position of the relation frame of the bridging animation according to the front and back relation of the left and right feet of the preceding animation

Blend Between Animation Clips

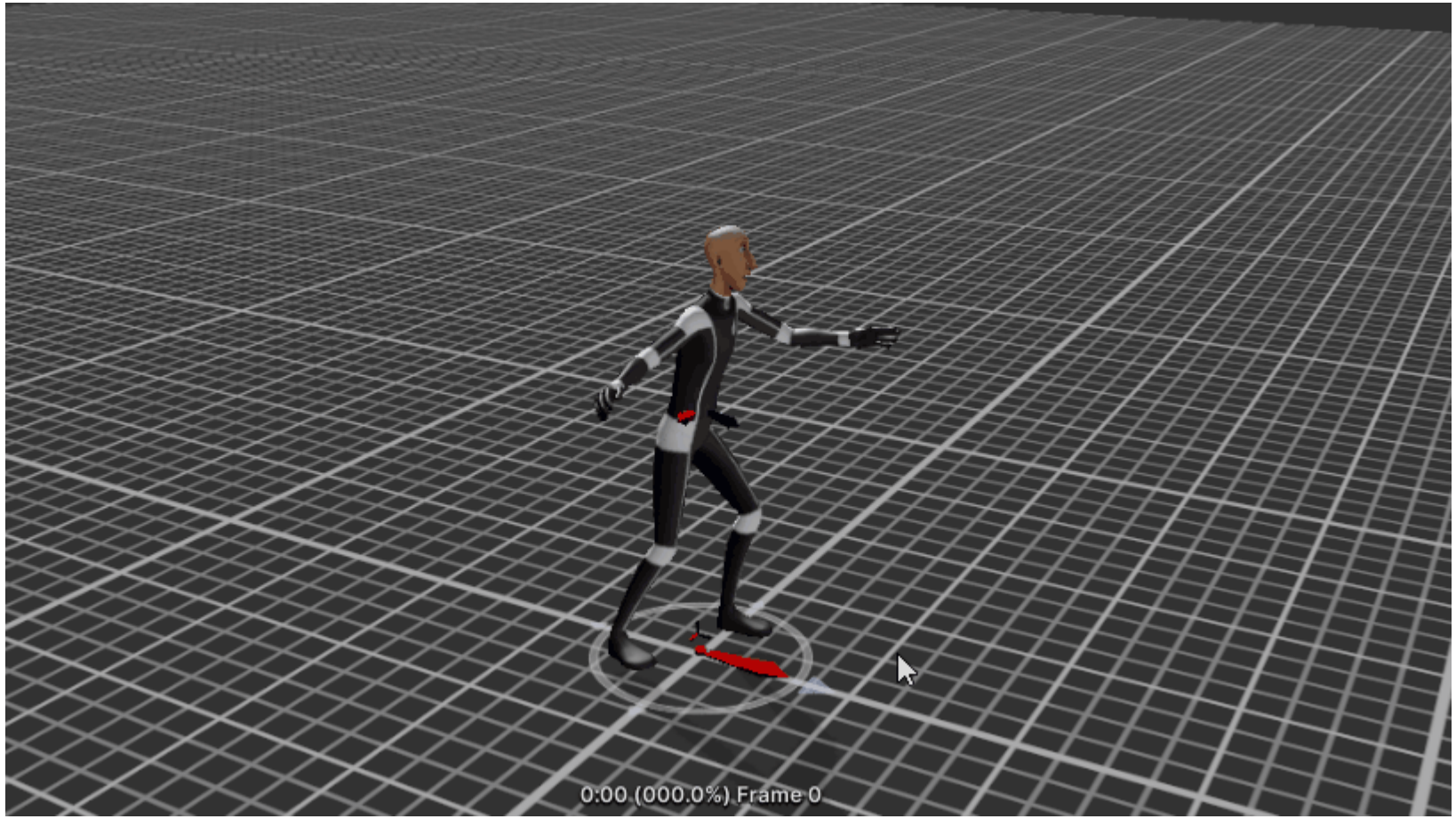
Step2:Add natural limits -- physical limits

Physical rationality: speed of transformation of the limbs, smoothness of movement of the limbs, rotation limits of the limbs.

Threshold detection: set the threshold range to detect the physical value.

Processing scheme: dynamic frame filling, sub-parameter Blend, dynamic frame repair

Blend Between Animation Clips



Takeaway

Problems Solved

Multi-fragment animation blend

Difference Demo Animation

Reduced creative restrictions for animators

Automate the animation transition blending process

Players have deeper creative fun

Takeaway

Establish a big picture and avoid rushing into production

Create visual path tools

From simple to deep, fast construction

Physical and objective logic is natural

Thank you!

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