FBX数据的修改和Maya可视化

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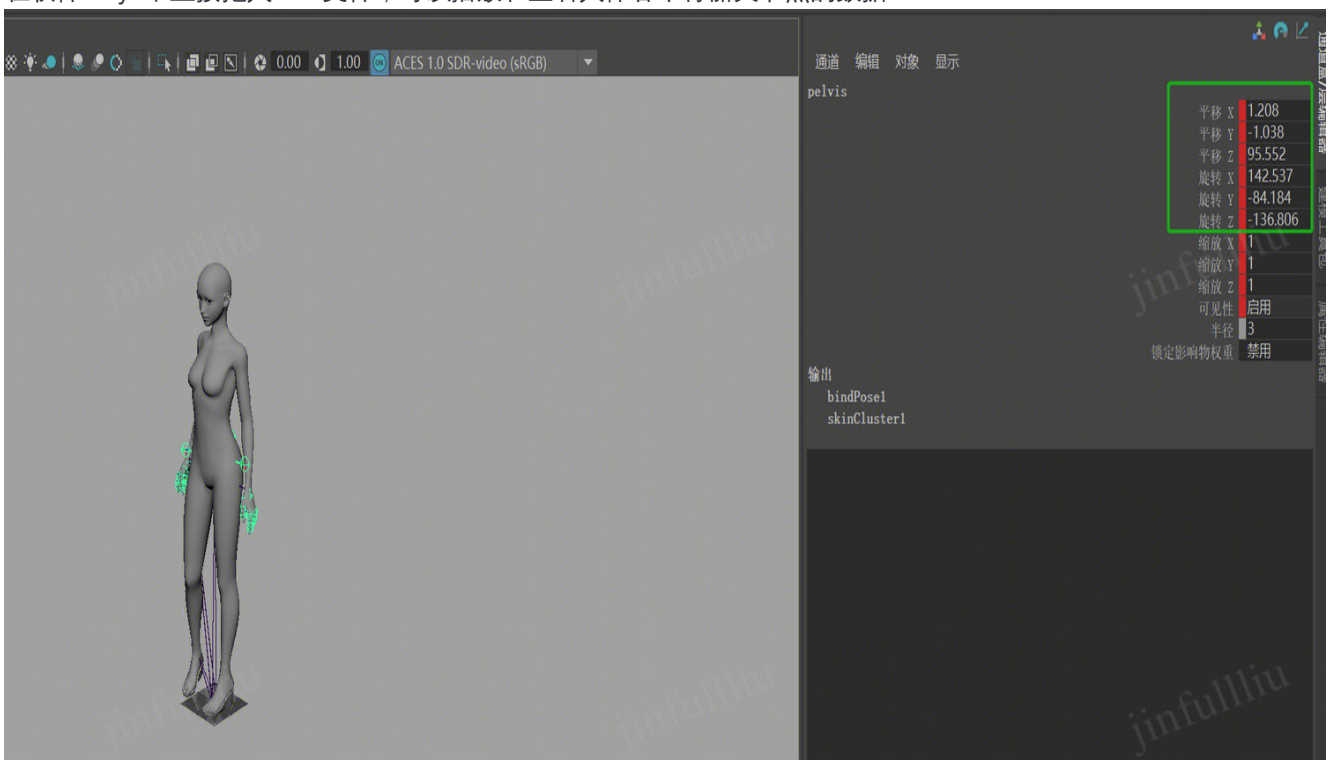
1--Maya数据解析

在软件Maya中直接拖入FBX文件，可以播放和查看人体各个骨骼关节点的数据：



对于上图来说，平移X、平移Y和平移Z表示关节点的Local Transaction的坐标，而旋转X、旋转Y、旋转Z表示关节点的Euler旋转坐标；对于一个固定的人体模型，修改每一帧中各个关节点的上述六个坐标，即可改变人体表现的动作；在Maya中，可以通过以下脚本在Python编辑器（窗口→常规编辑器→脚本编辑器）中打印所有帧所有关节的上述6D坐标数据：

```python
'''
@File    :   print_joint_6Ddata_maya.py
@Time    :   2024/03/07 20:05:00
@Author  :   Jinfu Liu
@Version :   1.0
@Desc    :   print 6D data of joint in FBX file
'''

import maya.cmds as cmds

joint_names = ["root", "pelvis", "spine_00", "spine_01", "spine_02", "spine_03", "clavicle_l", "upperarm_l", "lowerarm_l", "hand_l", "index_01_l",
        "index_02_l", "index_03_l", "middle_01_l", "middle_02_l", "middle_03_l", "pinky_01_l", "pinky_02_l", "pinky_03_l", "ring_01_l", "ring_02_l",
        "ring_03_l", "thumb_01_l", "thumb_02_l", "thumb_03_l", "Slot_hand_L_bone", "clavicle_r", "upperarm_r", "lowerarm_r", "hand_r", "index_01_r",
        "index_02_r", "index_03_r", "middle_01_r", "middle_02_r", "middle_03_r", "pinky_01_r", "pinky_02_r", "pinky_03_r", "ring_01_r", "ring_02_r",
        "ring_03_r", "thumb_01_r", "thumb_02_r", "thumb_03_r", "Slot_hand_R_bone", "Slot_spine_bone", "neck_01", "head", "thigh_l", "calf_l","foot_l",
        "ball_l", "thigh_r", "calf_r", "foot_r", "ball_r", "Slot_waist_L_bone", "Slot_waist_R_bone", "Slot_pelvis_bone", "ik_foot_root", "ik_foot_l",
        "ik_foot_r", "ik_hand_root", "ik_hand_gun", "ik_hand_l", "ik_hand_r"]

for joint in joint_names:
    obj = cmds.ls(joint)
    print("process ", obj)
    keyframes = cmds.keyframe(obj, query=True)
    for frame in keyframes:
        local_trans_X = cmds.getAttr(joint + ".translateX", time = frame)
        local_trans_Y = cmds.getAttr(joint + ".translateY", time = frame)
        local_trans_Z = cmds.getAttr(joint + ".translateZ", time = frame)
        local_rotate_X = cmds.getAttr(joint + ".rotateX", time = frame)
        local_rotate_Y = cmds.getAttr(joint + ".rotateY", time = frame)
        local_rotate_Z = cmds.getAttr(joint + ".rotateZ", time = frame)
        print(local_trans_X, local_trans_Y, local_trans_Z)
        print(local_rotate_X, local_rotate_Y, local_rotate_Z)
```

2--FBX SDK导出6D数据

通过Python FBX SDK（安装过程参考之前的文档），我们可以提取和保存在一个原始FBX文件中对应于Maya可视化的6D坐标，具体的脚本如下：
Extract_local_TR.py

3--6D数据映射和Maya可视化

通过第2步的脚本可以提取人体运动的关键6D坐标数据，这些6D坐标数据可以进行一些动作生成任务，生成相同意义的坐标数据。原始6D或生成的6D坐标数据可以使用以下脚本，并在Maya中进行可视化：

```python
'''
@File    :   set_joint_6Ddata_maya.py
@Time    :   2024/03/07 20:10:00
@Author  :   Jinfu Liu
@Version :   1.0
@Desc    :   set 6D data of joint in FBX file
'''

# you must install numpy by: mayapy.exe -m pip install numpy
import numpy as np
import maya.cmds as cmds

Joint_to_idx = {
    "root": 0,
    "pelvis": 1,
    "spine_00": 2,
    "spine_01": 3,
    "spine_02": 4,
    "spine_03": 5,
    "clavicle_l": 6,
    "upperarm_l": 7,
    "lowerarm_l": 8,
    "hand_l": 9,
    "index_01_l": 10,
    "index_02_l": 11,
    "index_03_l": 12,
    "middle_01_l": 13,
    "middle_02_l": 14,
    "middle_03_l": 15,
    "pinky_01_l": 16,
    "pinky_02_l": 17,
    "pinky_03_l": 18,
    "ring_01_l": 19,
    "ring_02_l": 20,
    "ring_03_l": 21,
    "thumb_01_l": 22,
    "thumb_02_l": 23,
    "thumb_03_l": 24,
    "Slot_hand_L_bone": 25,
    "clavicle_r": 26,
    "upperarm_r": 27,
    "lowerarm_r": 28,
    "hand_r": 29,
    "index_01_r": 30,
```

```
    "index_02_r": 31,
    "index_03_r": 32,
    "middle_01_r": 33,
    "middle_02_r": 34,
    "middle_03_r": 35,
    "pinky_01_r": 36,
    "pinky_02_r": 37,
    "pinky_03_r": 38,
    "ring_01_r": 39,
    "ring_02_r": 40,
    "ring_03_r": 41,
    "thumb_01_r": 42,
    "thumb_02_r": 43,
    "thumb_03_r": 44,
    "Slot_hand_R_bone": 45,
    "Slot_spine_bone": 46,
    "neck_01": 47,
    "head": 48,
    "thigh_l": 49,
    "calf_l": 50,
    "foot_l": 51,
    "ball_l": 52,
    "thigh_r": 53,
    "calf_r": 54,
    "foot_r": 55,
    "ball_r": 56,
    "Slot_waist_L_bone": 57,
    "Slot_waist_R_bone": 58,
    "Slot_pelvis_bone": 59,
    "ik_foot_root": 60,
    "ik_foot_l": 61,
    "ik_foot_r": 62,
    "ik_hand_root": 63,
    "ik_hand_gun": 64,
    "ik_hand_l": 65,
    "ik_hand_r": 66
}

Local_Trans_data =
np.load("C:/Users/jinfullliu/Desktop/test_maya/Local_Trans.npy", allow_pickle
= True)
local_Rotate_data =
np.load("C:/Users/jinfullliu/Desktop/test_maya/local_Rotate.npy",
allow_pickle = True)
```

```
85
86  for joint in Joint_to_idx:
87      joint_idx = Joint_to_idx[joint]
88      obj = cmds.ls(joint)
89      print("process ", obj)
90      for frame in range(Local_Trans_data.shape[0]):
91          cmds.setKeyframe(joint + '.translateX', value =
    Local_Trans_data[frame, joint_idx, 0], time=frame)
92          cmds.setKeyframe(joint + '.translateY', value =
    Local_Trans_data[frame, joint_idx, 1], time=frame)
93          cmds.setKeyframe(joint + '.translateZ', value =
    Local_Trans_data[frame, joint_idx, 2], time=frame)
94          cmds.setKeyframe(joint + '.rotateX', value = local_Rotate_data[frame,
    joint_idx, 0], time=frame)
95          cmds.setKeyframe(joint + '.rotateY', value = local_Rotate_data[frame,
    joint_idx, 1], time=frame)
96          cmds.setKeyframe(joint + '.rotateZ', value = local_Rotate_data[frame,
    joint_idx, 2], time=frame)
```

4--效果验证

第一个视频是原始fbx文件直接拖入Maya软件中进行可视化的效果；
第二个视频是先利用FBX SDK解析人体关节6D数据，再将解析的数据retarget回Maya中进行可视化的效果；