Modeling and Animation for Hand in X3D

In-Kwon Kim[1] , Jin-Kook Kim[2], Young-Bin Jang[3] and Kwan-Hee Yoo[4]

[1] Chungbuk National University, Digital Informatics and Convergence,
52 Naesudong-ro, Seowon-Gu, Cheongju Chungbuk 362-763, Korea
In-Kwon Kim, leibniz55@chungbuk.ac.kr

[2] Chungbuk National University, Business Data Convergence,
52 Naesudong-ro, Seowon-Gu, Cheongju Chungbuk 362-763, Korea
Jin-Kook Kim, jk22222@naver.com

[3] Chungbuk National University, Computer Education,
52 Naesudong-ro, Seowon-Gu, Cheongju Chungbuk 362-763, Korea
Young-Bin Jang, jyb0823@naver.com

[4] Chungbuk National University, Software Engineering,
52 Naesudong-ro, Seowon-Gu, Cheongju Chungbuk 362-763, Korea
Kwan-Hee Yoo, khyoo@chungbuk.ac.kr

Abstract. First of all, we have to perform accurate skeleton modeling for the motion of human analysis and the animation of 3D avatar in a 3D virtual space. There are various file formats that can be stored based on skeleton the motion of a human. In this paper, we introduce a hierarchical hand model that we have proposed to solve the problems in the existing models of hand. We propose the file format of motion for natural animation expressions.

Keywords: X3D, Hand, Animation, Graphics, Motion.

1   Introduction

We found the problem by studying the hand and foot structure of the existing skeleton. [3] A new hand and foot skeleton structure for solve this problem is proposed. [3] There are a variety file formats that can be stored based on skeleton the motion of a human,[1,2] and in this paper we will propose a motion file format structure for the representation of natural hand animation. Section 2 of this paper, we introduce a hierarchy of proposed hand skeleton model, and In Section 3, we propose a motion file format for performing hand animation in the proposed skeleton. Section 4 concludes, finally, future research is discussed in Section 5.

2   The proposed hand skeleton model hierarchy

In Anatomical Names [6], each finger, a thumb through little finger, is numbered from one to five. In terms of the animation and a medical, the skeleton has been

structured tree type for natural hand animation.[3] Figure 1 is the hierarchy of proposed hand model.
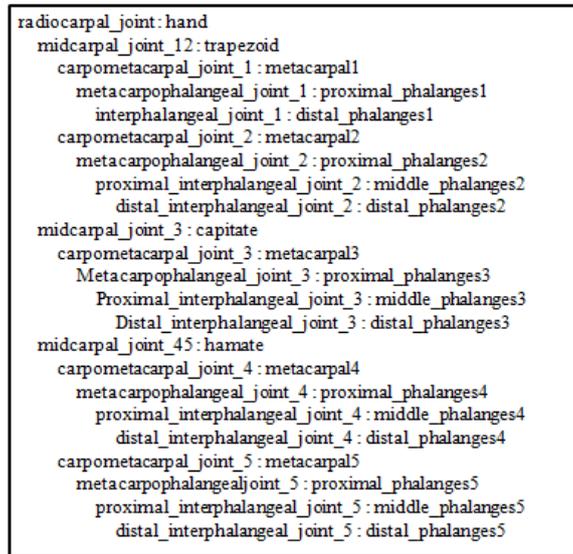
```
radiocarpal_joint: hand
  midcarpal_joint_12: trapezoid
    carpometacarpal_joint_1 : metacarpal1
      metacarpophalangeal_joint_1 : proximal_phalanges1
        interphalangeal_joint_1 : distal_phalanges1
    carpometacarpal_joint_2 : metacarpal2
      metacarpophalangeal_joint_2 : proximal_phalanges2
        proximal_interphalangeal_joint_2 : middle_phalanges2
          distal_interphalangeal_joint_2 : distal_phalanges2
  midcarpal_joint_3 : capitate
    carpometacarpal_joint_3 : metacarpal3
      Metacarpophalangeal_joint_3 : proximal_phalanges3
        Proximal_interphalangeal_joint_3 : middle_phalanges3
          Distal_interphalangeal_joint_3 : distal_phalanges3
  midcarpal_joint_45: hamate
    carpometacarpal_joint_4 : metacarpal4
      metacarpophalangeal_joint_4 : proximal_phalanges4
        proximal_interphalangeal_joint_4 : middle_phalanges4
          distal_interphalangeal_joint_4 : distal_phalanges4
    carpometacarpal_joint_5 : metacarpal5
      metacarpophalangealjoint_5 : proximal_phalanges5
        proximal_interphalangeal_joint_5 : middle_phalanges5
          distal_interphalangeal_joint_5 : distal_phalanges5
```

Fig. 1. The hierarchy of proposed hand model.

3   Motion file format

In Section 2, we want to represent the hand of the animation that we have previously introduced through the hierarchy of the hand model. To cite studies [5] of the architecture and the motion capture of the H-Anim, the hand motion animation defined a joint node and a node for presentation.
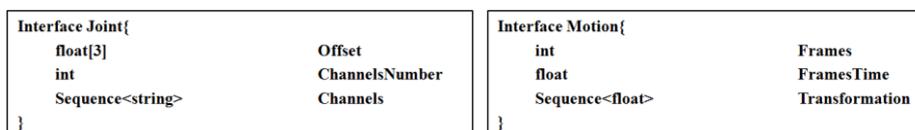
Interface Joint{		Interface Motion{	
float[3]	Offset	int	Frames
int	ChannelsNumber	float	FramesTime
Sequence<string>	Channels	Sequence<float>	Transformation
}		}	

Fig. 2. Joint Node and Motion Node.

First, looking at the joint node, Offset field refers to the distance to the joint, and Channels field represents the position of the joint, the rotation information. Finally ChannelsNumber field means the number of Channels. Next, let's look at the motion node. Frames field means number of frames for an animation sequence, and FramesTime field specifies the sampling rate. Finally, Transformation field represents the transformation value of the joint for each frame.

When using the node as shown in Figure 2 to express the motion file format of the proposed hand model, the hand motion file format is structured as Figure 3 and Figure 4.

```
Joint radiocarpal_joint
{
Offset [0.0, 0.0, 0.0]
ChannelsNumber [6]
Channels  "Xposition Yposition Zposition Zrotation Xrotation Yrotation"
Joint midcarpal_joint_12
{
Offset, [0..xx 0.xx, 0.xx]
ChannelsNumber [3]
Channels  "Zrotation Xrotation Yrotation"
Joint carpometacarpal_joint1
{
Offset, [0.xx 0.xx, 0.xx]
ChannelsNumber [3]
Channels  "Zrotation Xrotation Yrotation"
Joint metacarpophalangeal_joint1
{
Offset, [0.xx 0.xx, 0.xx]
ChannelsNumber [3]
Channels  "Zrotation Xrotation Yrotation"
```

Fig. 3. The Hierarchy of the hand using a joint node.

```
Motion
{
Frames 601
FrameTime 0.03333
Transformation [ 11.623, 31.312, 64.121, -0.700, -4.023, ......]
}
```

Fig. 4. The Animation of the hand using a motion node.

Using motion node can describe the transformation values of the joint according to the time variation. The fields of joint node may describe the conversion such as rotation, transformation takes data from motion node.

4　　Conclusion

In this paper, we use the hierarchical structure of the proposed model, we propose a hand motion file format for expressing the animation. We will develop the software to store the information that receiving a motion of hand over the camera in the real world in real time to in this paper, the proposed format.

References

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