Kinect Based Magic Dressing Mirror

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When you walk into...
Have you got that kind of feeling?
Don’t Worry…

Kinect Dressing Mirror

- Virtual Fitting Room
- “Try” clothes on
Agenda

Introduction

Implement

Discussion
What is Kinect?

Kinect

- Motion Sensing Input
- Produced by Microsoft
- “You’re the controller”
- Wide range of applications: Gaming, Augmented Reality, Education, Medical, etc.
Introduction

IR Emitter

Color Camera

IR Camera
Introduction (Cont.)

Sensor → On-Chip → SDK

After Process
- Image Stream
- Depth Stream
- Audio Stream

After Process
- Image Frame
- Depth Frame
- Audio Frame
  + Skeleton Frame
Implementation

Objective:
- To make the “clothes model” fit user’s body

Basic idea:
- Skeletal Animation Technology
  - Uses skeleton built (i.e. rigged) under the model (i.e. mesh) to animate the model (i.e. mesh deformation).
- Simulate the motion of user
Problems

• How to deform the meshes? (i.e. motion simulation)
• How to position the model?
• How to scale the model? (i.e. clothes’ size)
How to deform meshes?

Skeletal Animation

- **Rigging**
- **Retargeting** the joint orientations to the skeleton
• **Retargeting** the joint orientations to the skeleton

• Using joint position instead will **stretch** the model
How to position the model?

Z axis

Mapping

HIP_CENTER
How to scale the model?

Body Estimation

X axis = ScaleX \times \frac{Z_0}{Z}

Y axis = ScaleY \times \frac{Z_0}{Z}
Implementation

Kinect For Windows SDK

OpenGL Skeletal Animation

3D Modeling
Evaluation

1. Sleeves rise higher
Evaluation

2. While entering the scene, User should face **straight** towards the camera
Further Work

Clothes

Screenshot

Chat
Conclusion

• Realize Virtual Fitting Functionality
• Potential Improvements
Appendix
**Implementation**

**Kinect SDK**

- NuiImageStreamGetNextFrame()
- NuiSkeletonCalculateBoneOrientations()
- NUI_SKELETON_DATA {
  ...
  Vector4 SkeletonPositions [NUI_SKELETON_POSITION_COUNT];
  }
- NuiSkeletonGetNextFrame()
  NUI_SKELETON_FRAME

**SDK**

- Signaling
- Signaling

**Skeleton Frame**

- Joint Positions
- Joint Orientation

**Color Frame**
Implementation (Cont.)

Kinect SDK  Modeling

After Rigging

SHOULDER_CENTER

SPINE

HIP_CENTER
Take a closer Look…

Kinect SDK  Modeling

Y-axis

X-axis

Z-axis
Weight System

Weight = 0

Weight > 0
Kinect SDK  Modeling  OpenGL

**aiScene**
- aiMesh[];
- RootNode;

**aiMesh**
- aiBone[];
- aiVector3D mVertices[];
- aiVector3D mNormals[];
- aiVector3D mTextureCoords[];

**aiBone**
- String Name;
- aiVertexWeight[];
- OffsetMatrix;

**Vertex Position**
- Normal
- Texture Coordination
- Bone ID0 | Weight
- Bone ID1 | Weight
- Bone ID2 | Weight
- Bone ID3 | Weight

**aiVertexWeight**
- uint mVertexID;
- float mWeight;
Kinect SDK  Modeling  OpenGL

aiScene
aiMesh[]; RootNode;

aiNode
String Name;
mat4x4 Transformation;
aiNode* ParentNode
aiNode* Children[]

NodeTransformation = TranslationM * RotationM * ScalingM

GlobalTransformation = ParentTransform * NodeTransform

m_BoneInfo[index]. FinalTransformation =
m_GlobalInverseTransform * GlobalTransformation *
m_BoneInfo[index].BoneOffset

Traverse the Tree
Thank you…

Dr. Lai Man Po
HE Yanqing
Etay Meiri
Lucy Liang
Xia Bichang

THANKS!
from the bottom of our hearts