

# 3D体感交互应用



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# 人机交互



One of the most important current trends in digital technology is the emergence of natural user interface, or NUI.

—— Bill Gates



- *Direct!*
- *Intuitive!*



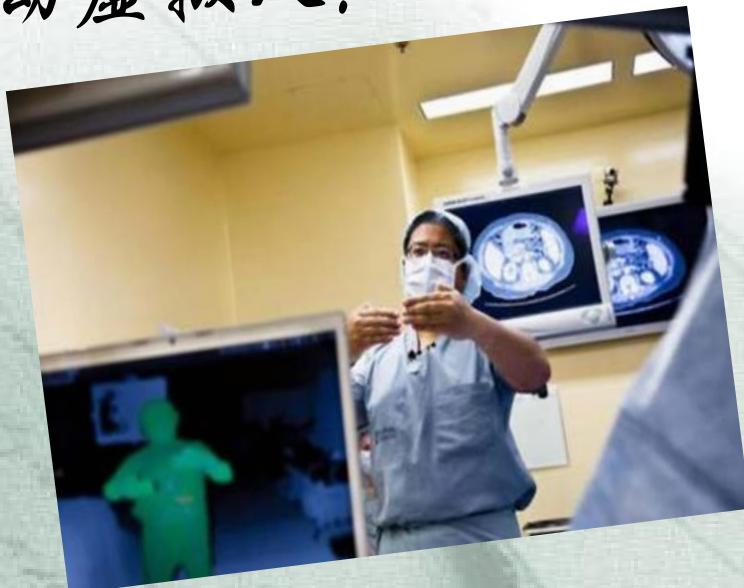
# 体感应用



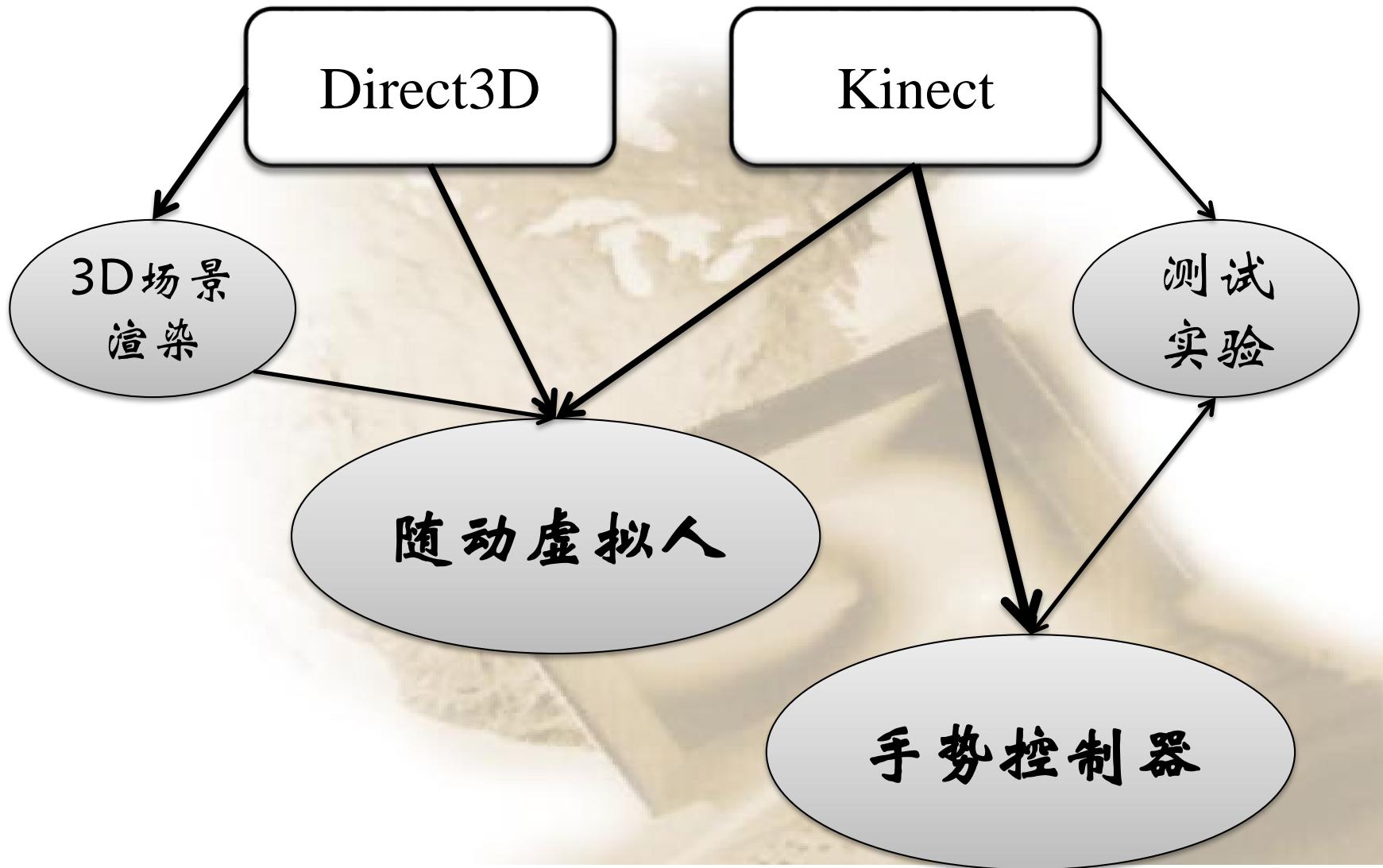
随动虚拟人！



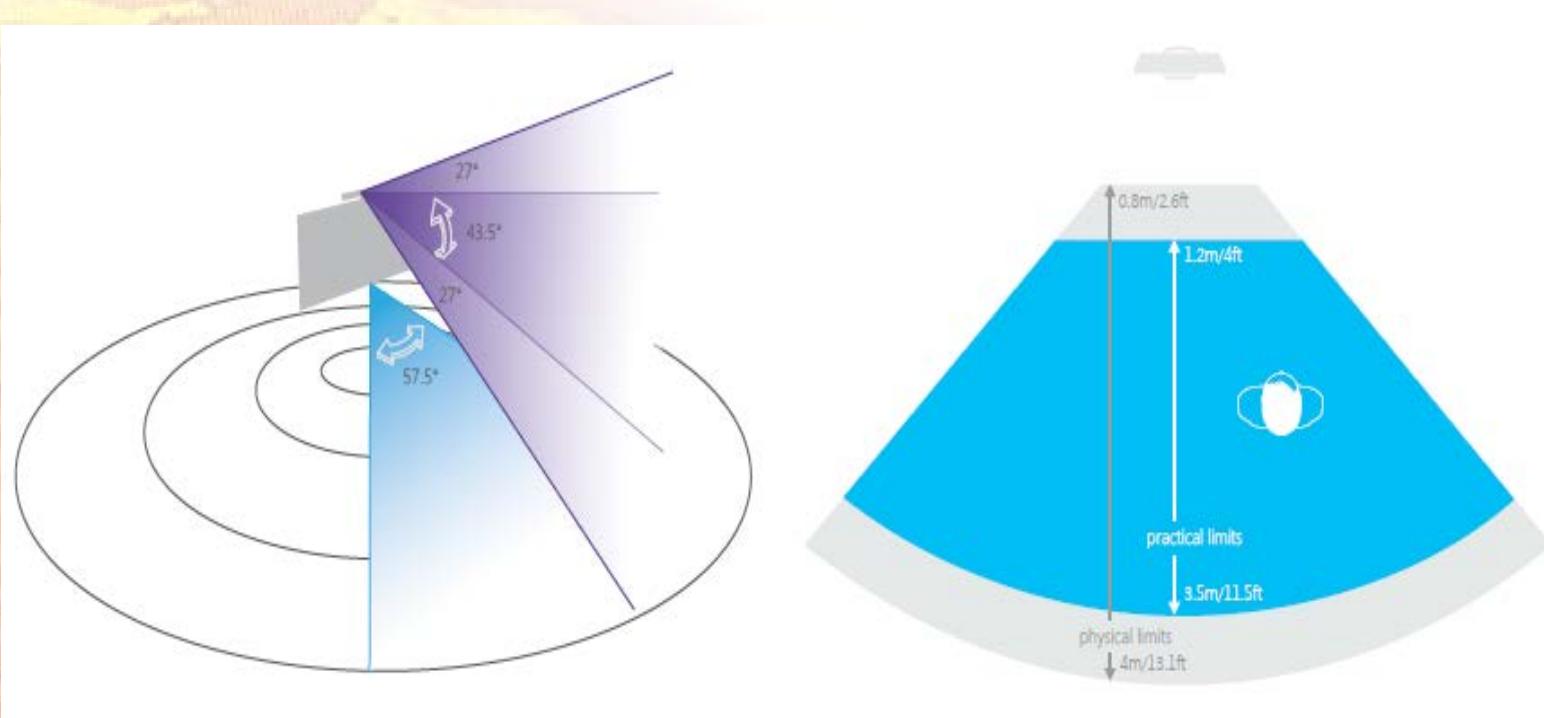
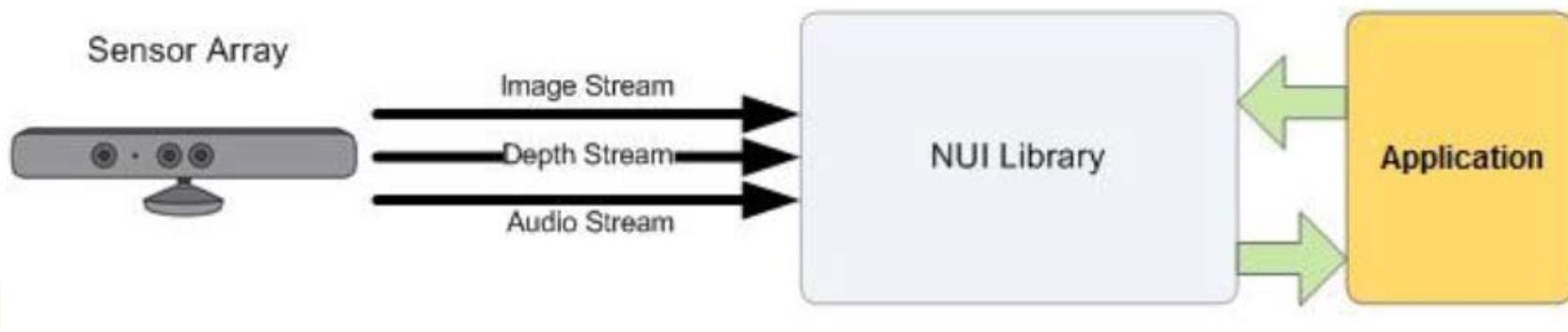
手势控制器！



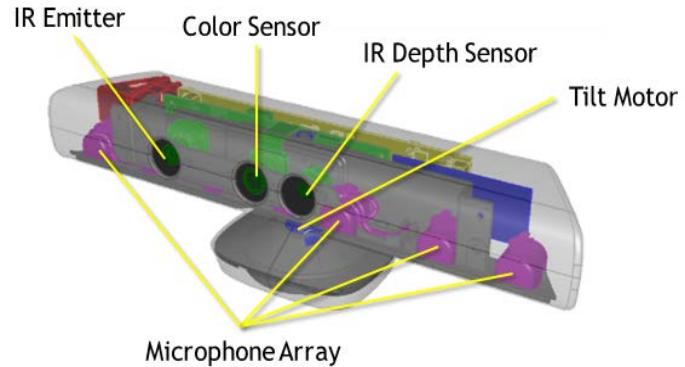
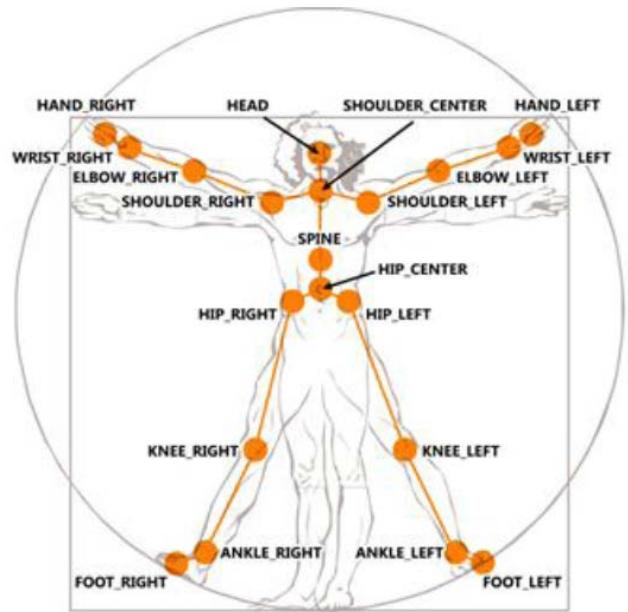
# 工作内容



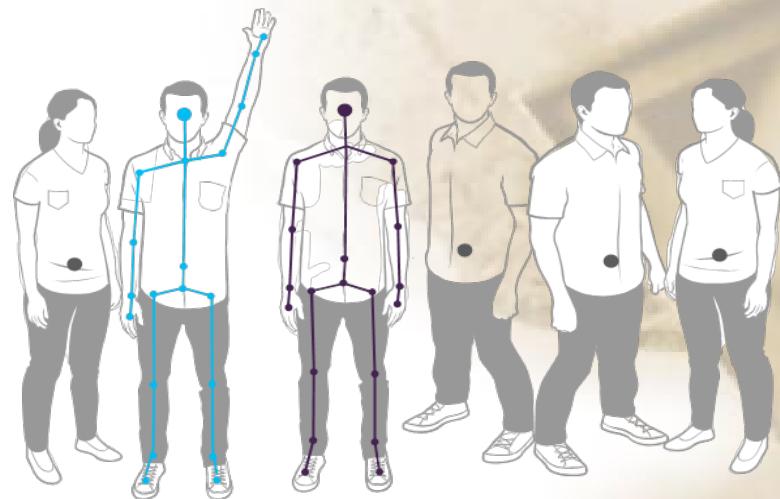
# Kinect



# Kinect



Light coding

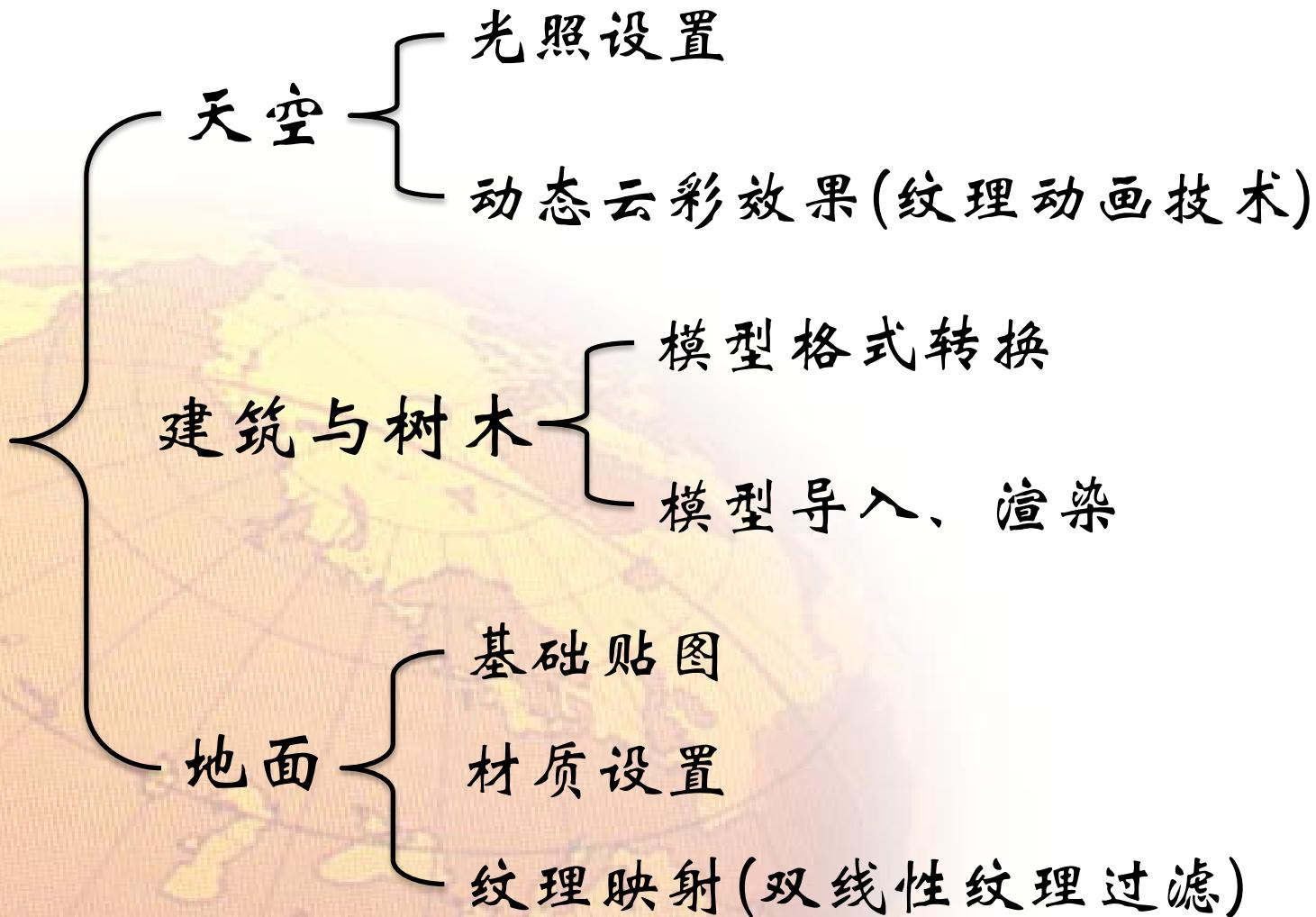


- 6个人
- 20处关节点

# DirectX 3D

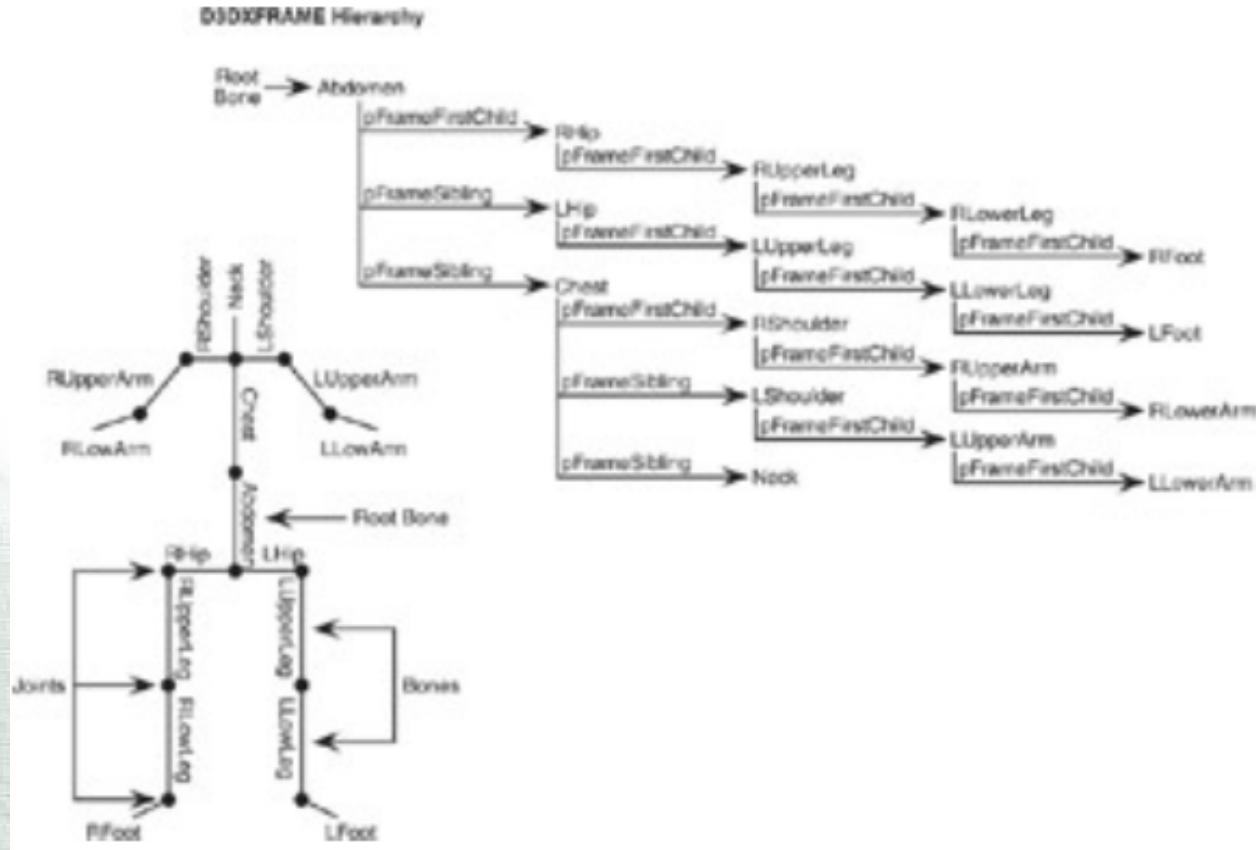


# 环境场景渲染



# 递归实现

# 蒙皮骨骼动画



子骨骼的组合变换矩阵=子骨骼的初始变换矩阵×父骨骼的组合变换矩阵

# 坐标变换

Step1

实际物理空间  $\Rightarrow$  虚拟人父关节坐标系

$$[u_1 \quad u_2 \quad u_3] = [d_1 \quad d_2 \quad d_3] \Lambda^{-1}$$

$\vec{d}$  和  $\vec{u}$  分别为待解骨骼向量在世界坐标系和局部坐标系中的坐标  
 $\Lambda$  是父骨骼的组合变换矩阵，为已知量

Step2

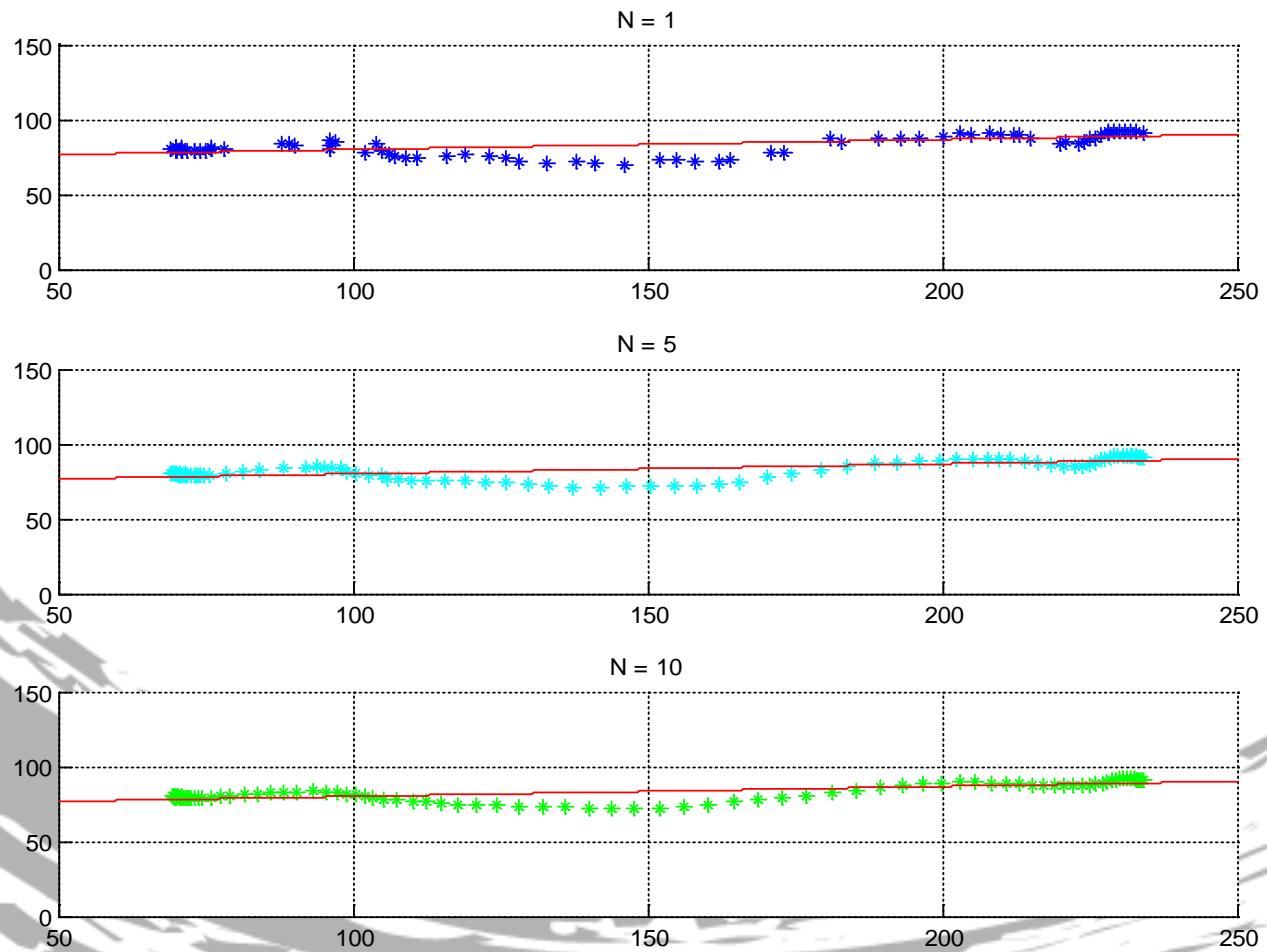
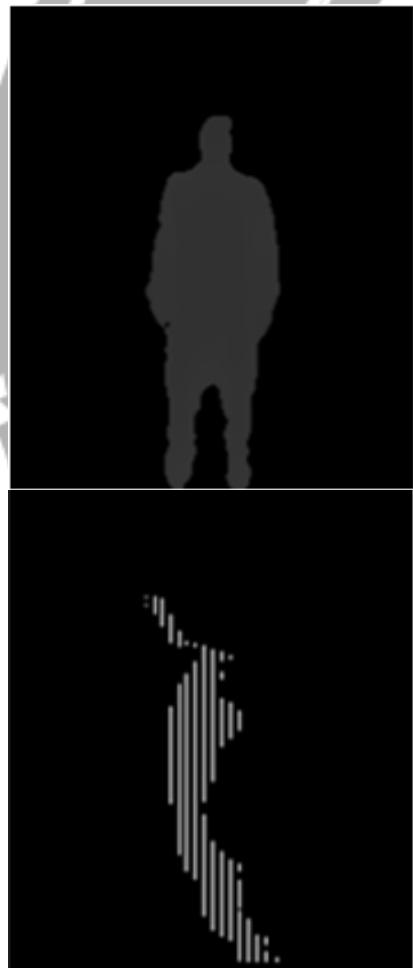
xyz向量  $\Rightarrow$  旋转矩阵

$$\text{绕 } y \text{ 轴旋转 } \theta = \sin^{-1}(-u_3), \quad \text{绕 } z \text{ 轴旋转 } \varphi = \tan^{-1}\left(\frac{u_2}{u_1}\right)$$

# 虚拟人实现结果



# 输入数据误差



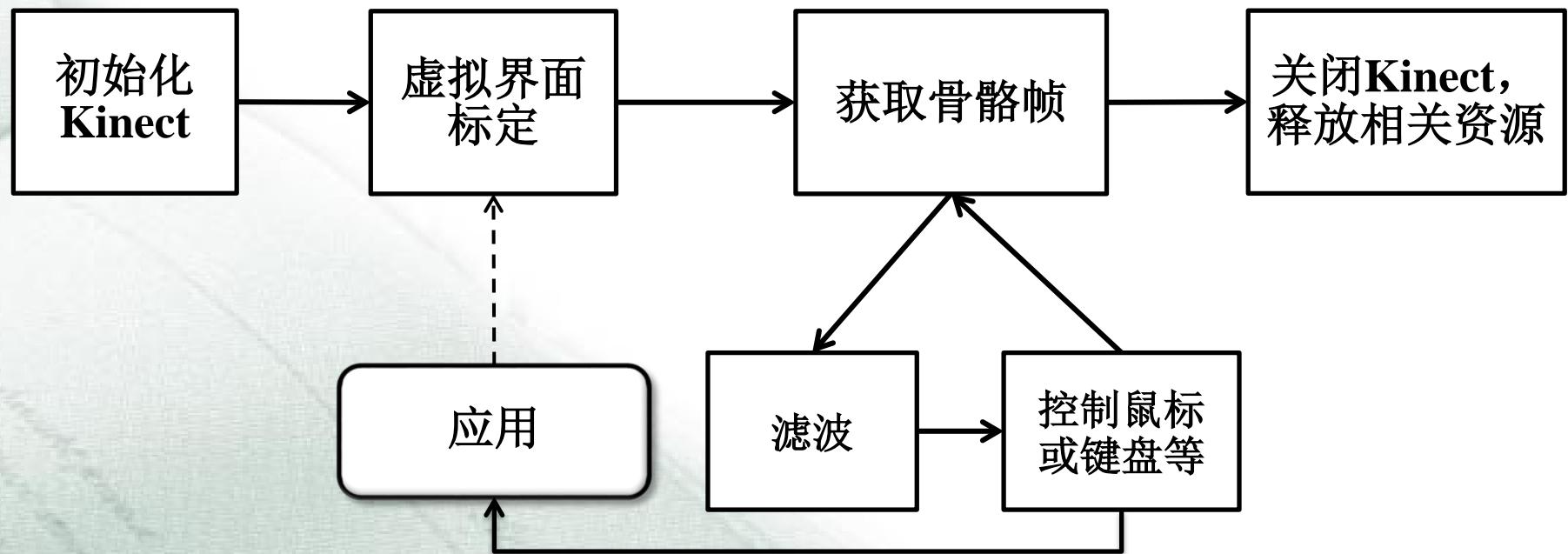
\*MSR Action3D Dataset

# 输入数据误差



- 平滑窗越宽，标准差越小；
- 手处于身体前侧时，数据有明显的偏差与跳变
- 握拳状态反而不如五指伸开的检测结果稳定；
- 远身组的数据明显不如近身组稳定

# 手势控制器流程

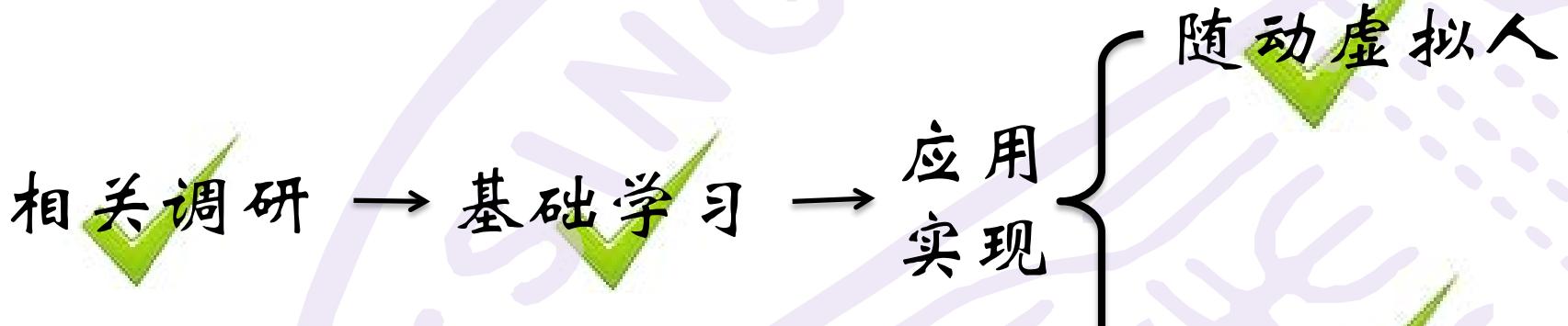


# 手势控制器实例

虚拟  
鼠标

虚拟  
键盘

# 工作总结



- 领域调研与设备测试
- 两大关键模块的研发
- 三维体感交互平台的搭建
- 基于微软官方 SDK 的实现

Thank you !

I'm very happy