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Expanded Virtual Puppeteering

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VISGRAF Lab - IMPA

Overview

- Overview
- Movement Paradigms
- System Architecture
- Presentation and Networking
- Media Project Authoring
- Proof-of-Concept



Video

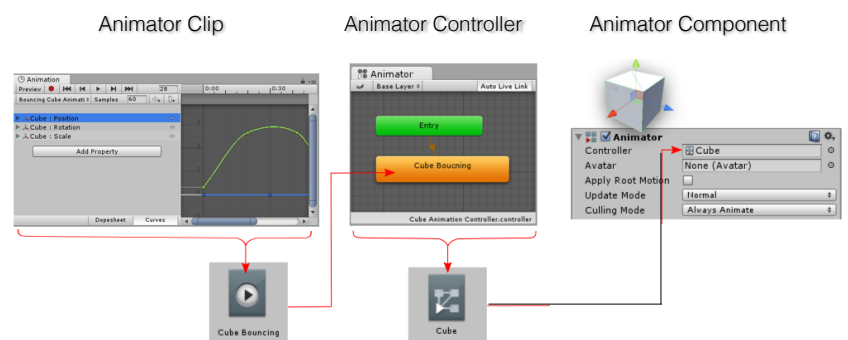


Movement Paradigms

- Animations
- Inverse Kinematics
- Physics-Based Simulation

Animations

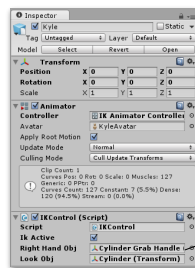
- Animation Clips (*pre-recorded*)
- Blend Trees (*transitions*)
- Interactive Control (*selection*)



Inverse Kinematics

- Articulated Structures
(*human skeleton*)
- Control of End Effectors
(*hands, feet*)

• IK Pass

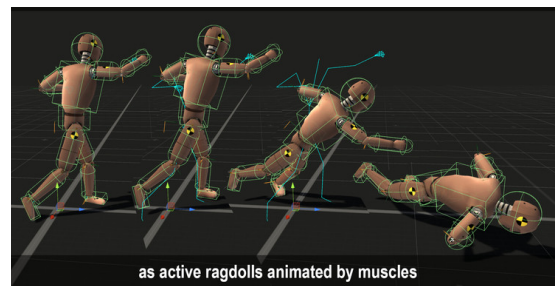


```
//If the IK is active, set the position and rotation directly to the goal.  
if(ikActive) {  
  
    // Set the look target position, if one has been assigned  
    if(lookObj != null) {  
        animator.SetLookAtWeight(1);  
        animator.SetLookAtPosition(lookObj.position);  
    }  
  
    // Set the right hand target position and rotation, if one has been assigned  
    if(rightHandObj != null) {  
        animator.SetIKPositionWeight(AvatarIKGoal.RightHand, 1);  
        animator.SetIKRotationWeight(AvatarIKGoal.RightHand, 1);  
        animator.SetIKPosition(AvatarIKGoal.RightHand, rightHandObj.position);  
        animator.SetIKRotation(AvatarIKGoal.RightHand, rightHandObj.rotation);  
    }  
}
```



Physically Based Simulation

- Interaction with Environment
(*collision detection*)
- Forces and Torques
(*gravity, etc..*)



as active ragdolls animated by muscles

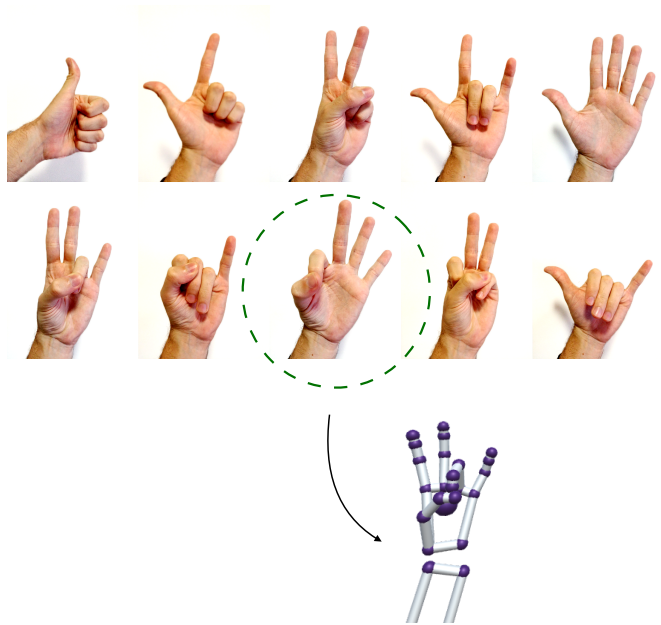
X-Puppet

Architecture

- Gesture Recognizer
- Movement Modes
- Presentation and Network

Gesture Recognizer

Mode Selection



- Input: *Leap Motion*
- Detection: SVM
(ML Library)

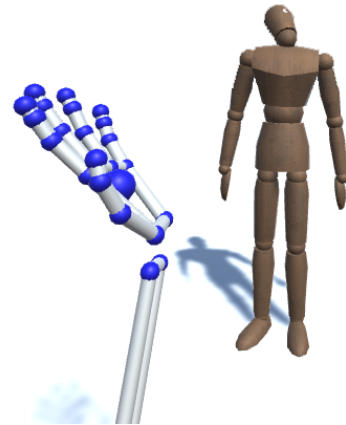
Movement Modes

- Head
- Hands and Arms
- Jump
- Locomotion

Head

Simple Inverse Kinematics

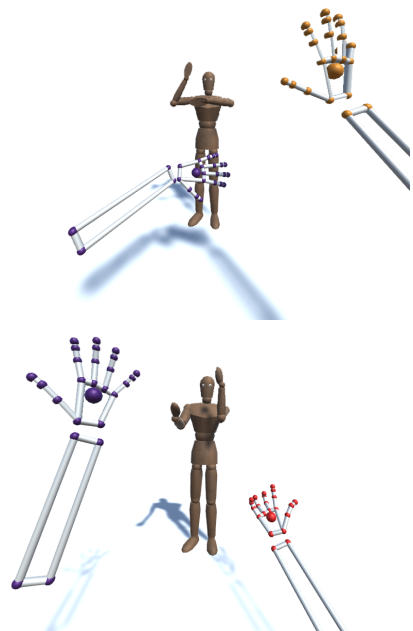
- Palm of Hand Direction



Hands and Arms

Complex Inverse Kinematics

- Hand Position and Rotation
- Head follows Hands

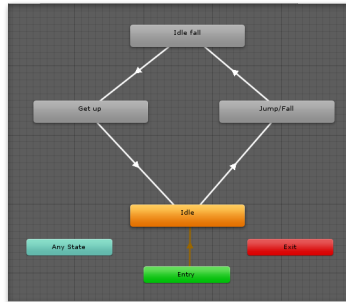


Jump

Simple Animation

- Cycles btw Animations

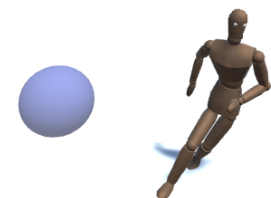
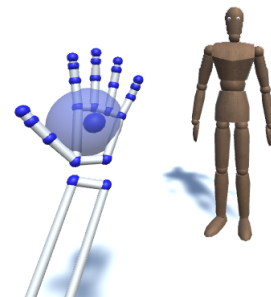
- *Idle Standing*
- *Jump / Fall* : Hands Up Velocity
- *Idle Ground*
- *Get Up* : Palm Facing Upwards



Locomotion

Complex Animation (Blend Tree)

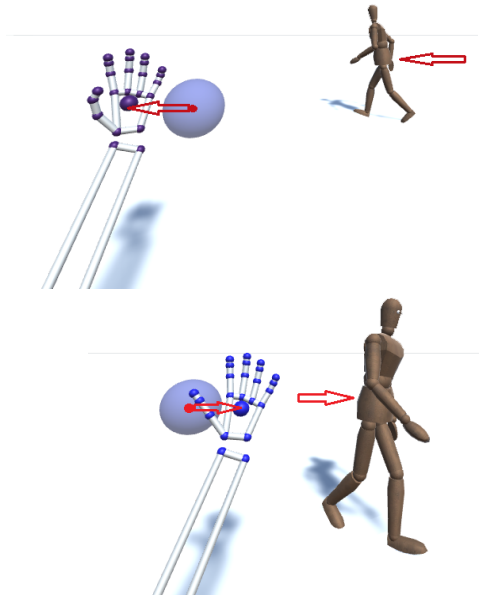
- Walking and Running
- Control Widget



Locomotion - Control

- Joystick Paradigm

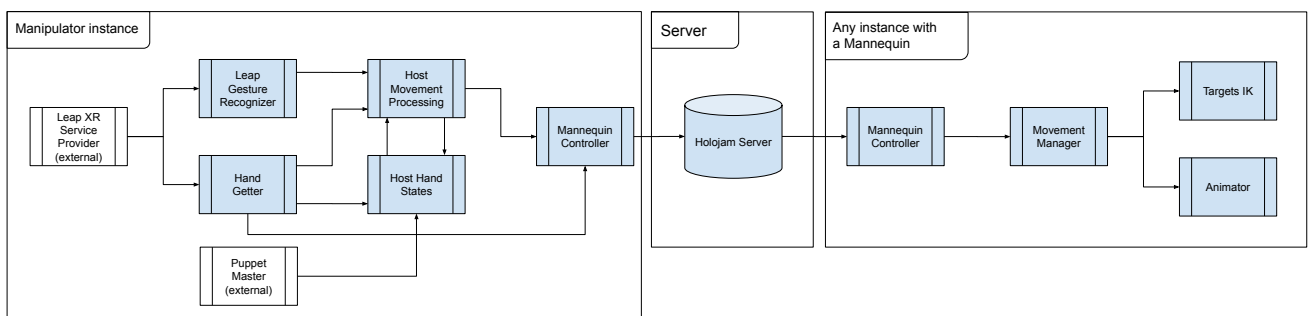
- Reference Sphere : *Dead Spot*
- Hand Position Vector : *Velocity / Direction*
- Locomotion Animation : *Speed*



Presentation & Network

Synchronization of Objects : Holojam SDK

• Class Structure

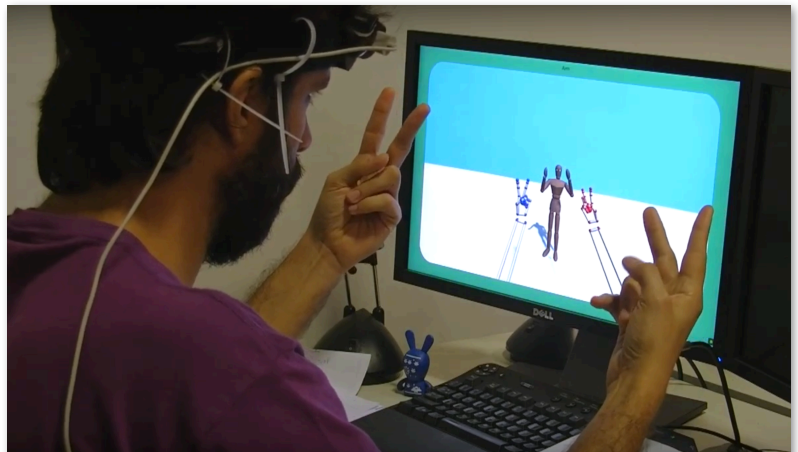


Presence / Visualization

- Performers
- Play Interaction
- Audience

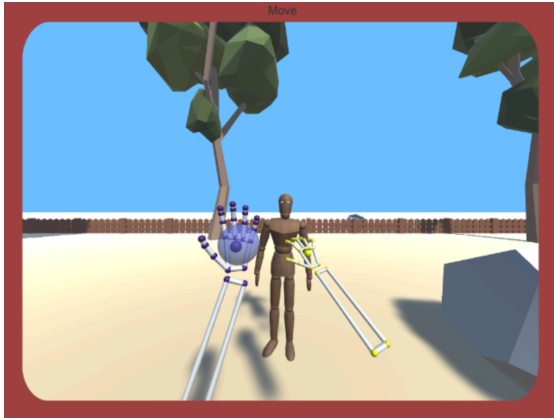
Performers

- Leap Motion
 - Attached to User's Forehead
- Feedback
 - Hands
 - Mode
 - Etc..



HUD

- Screen Feedback (Heads-Up Display)



Bezel + Text



Minimap

Play Interaction

- Director
 - Live Cinema
- Other Characters
 - Avatars
- VR Mode



Audience

- Theatre Screen
- Virtual Reality
- Augmented Reality



Media Project Authoring

- Gesture Sets
- Puppets

Gesture Sets

- Built-In Gesture Recognizer
 - Default : 10 Gestures
- Changing / Adding Gestures
 - Training / Compiling
- Robustness and Reliability
 - Distinct Hand Poses
 - Redundancy (use two hands)

Puppets

- Humanoid
(compatible rigged model)
 - Enforce T-Pose
 - Add Animator Component
 - Add Targets IK
 - Add Leap Control
- General
(custom skeleton)
 - Adapt Everything!

Applications

Proof of Concept

- The Framework in Action
 - “O Boneco”
- Test and Refine Expressiveness
 - Short Piece
- Collaboration with Professional Puppeteers
 - Bando Criação Cegonha

O Boneco

- Creative Team
 - Screenplay and Direction : *Vida de Oliveira*
 - Puppeteering Animation : *Miguel Araujo*
- *Agile* Methodology
 - Iterative Workflow
 - Test / Improve
- Weekly Rehearsals
 - Feedback
 - Development

O Boneco

aparição final

Web Portal

Puppeteering

About

The objective of this project is to develop an application that lets puppeteers make performances with nothing but their hands. It aims to preserve the expressiveness and know-how of classic puppeteering, but at the same time, to look at it with a different perspective with the help of augmented reality.

- <https://www.visgraf.impa.br/projects/puppet/>

The Show



“See you soon!”

– o Boneco