



Performing Music in Virtual / Augmented Space

Post-Desktop User Interfaces
Seminar WS 05/06



Introduction

**Virtual and
Augmented
Reality**

**Music in
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**Analysis &
Evaluation**

Conclusions

Performing Music & Musical Interfaces

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The Theremin

- One of first electronic instruments
- Invented by Léon Theremin
- Box with two radio antennae
- Right hand: pitch
- Left hand: amplitude



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The Theremin





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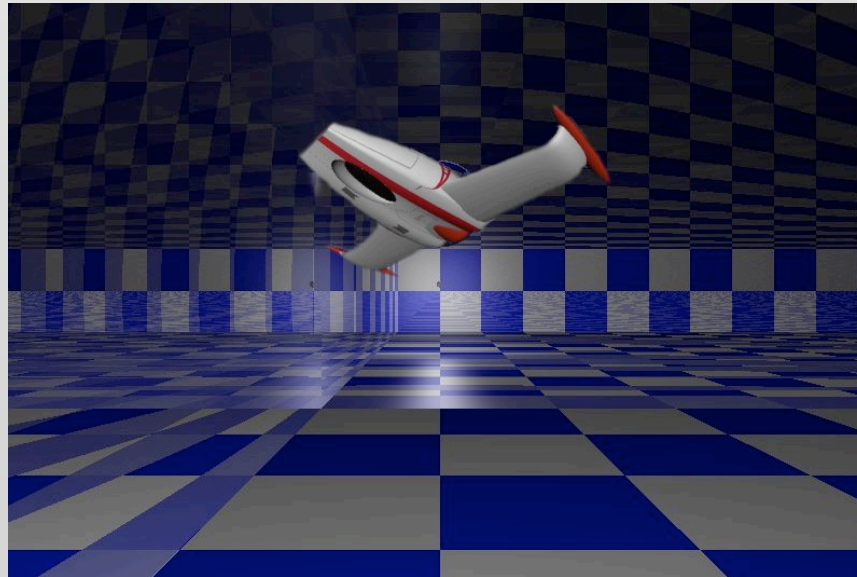
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Virtual and Augmented Reality

Virtual Reality

- Interaction with a synthetic or virtual environment
- May include visual aspects, sound or tactile feedback



Virtual Reality

Head-mounted display (HMD)



- Wearable
- Stereoscopic

Virtual Reality

Cave Automatic Virtual Environment (CAVE)

- Display on walls, ceiling and floor
- Back-projected screen
- Shutter glasses worn by user



Virtual Reality

Tracking systems



- Sense user location & orientation
- Methods:
 - Electro-magnetic
 - Optical
 - Vision-based

Virtual Reality

Input devices (6-DOF)

space mouse

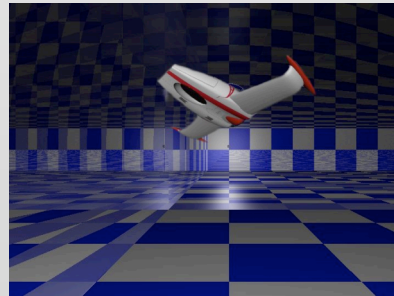


data glove



Augmented Reality

- Combines 3D virtual objects with objects of real world
- Does not replace the real world



Augmented Reality

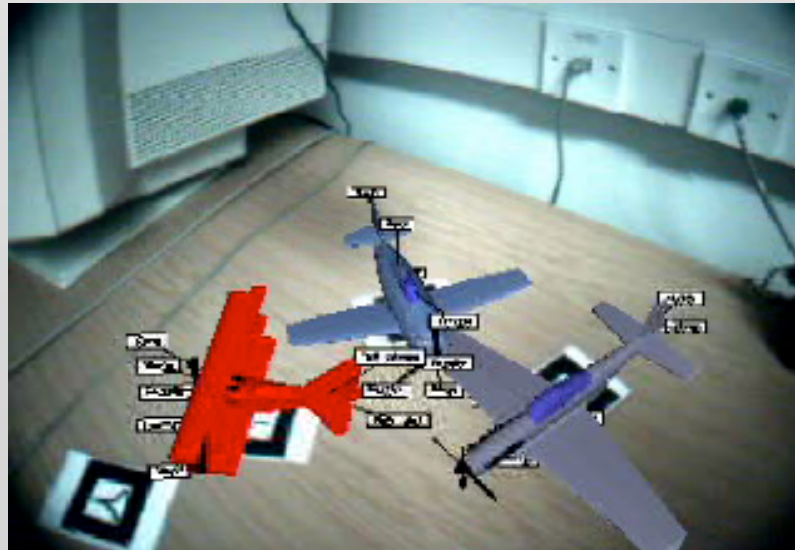
- Head-mounted display



- Wearable
- Stereoscopic
- Optical see-through or camera-mounted

Augmented Reality

- Features:
 - Augmentation of real objects by virtual annotations
 - Individual display & control for each viewer





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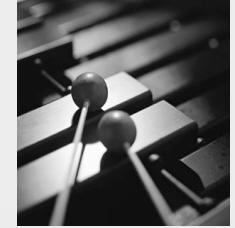
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Music in Virtual and Augmented Space

Virtual Xylophone



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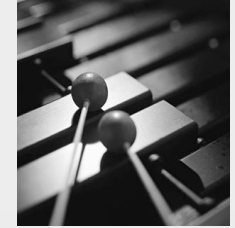
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- Hardware Setup
 - CAVE
 - Shutter glasses
 - Data gloves
- Interface
 - Virtual plates
 - Virtual keyboard
 - Virtual mallet

Virtual Xylophone



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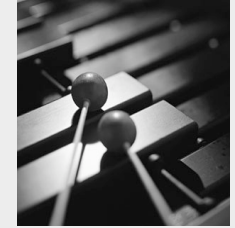
Conclusions

- Control Features
 - Note, volume & decay time
 - Layout customization
 - Save and reload work





Virtual Xylophone



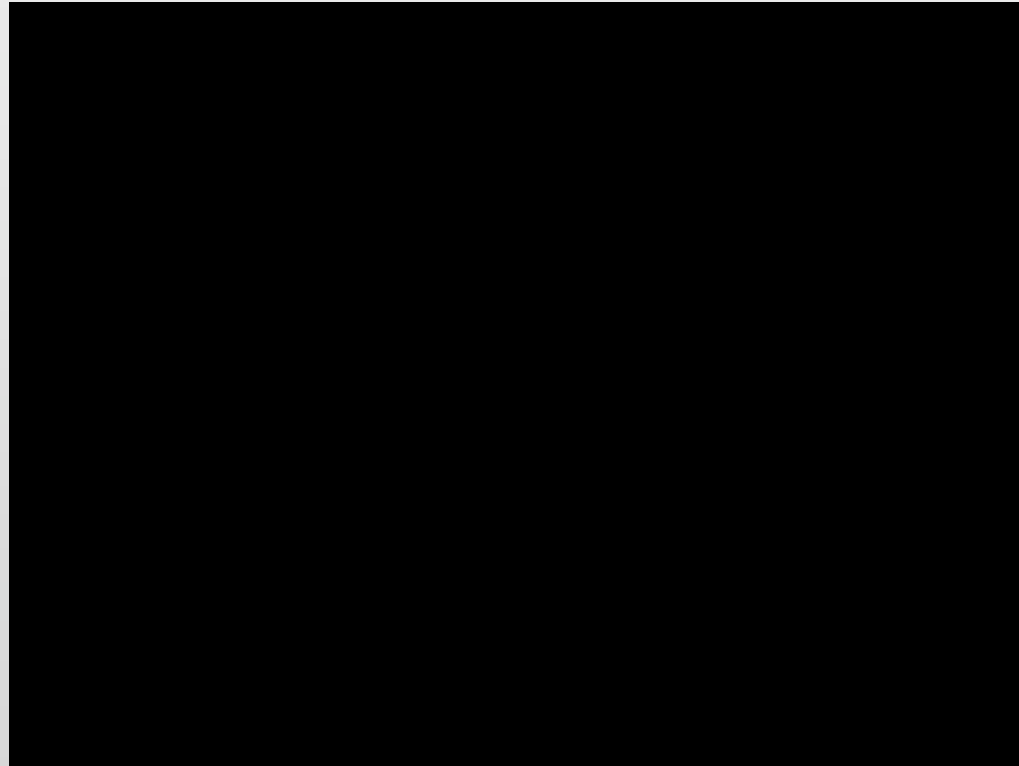
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Gestural FM Synthesizer



- Hardware Setup
 - CAVE
 - Shutter glasses
 - Data gloves
- Interface
 - Virtual keyboard
 - Hand gestures

Gestural FM Synthesizer



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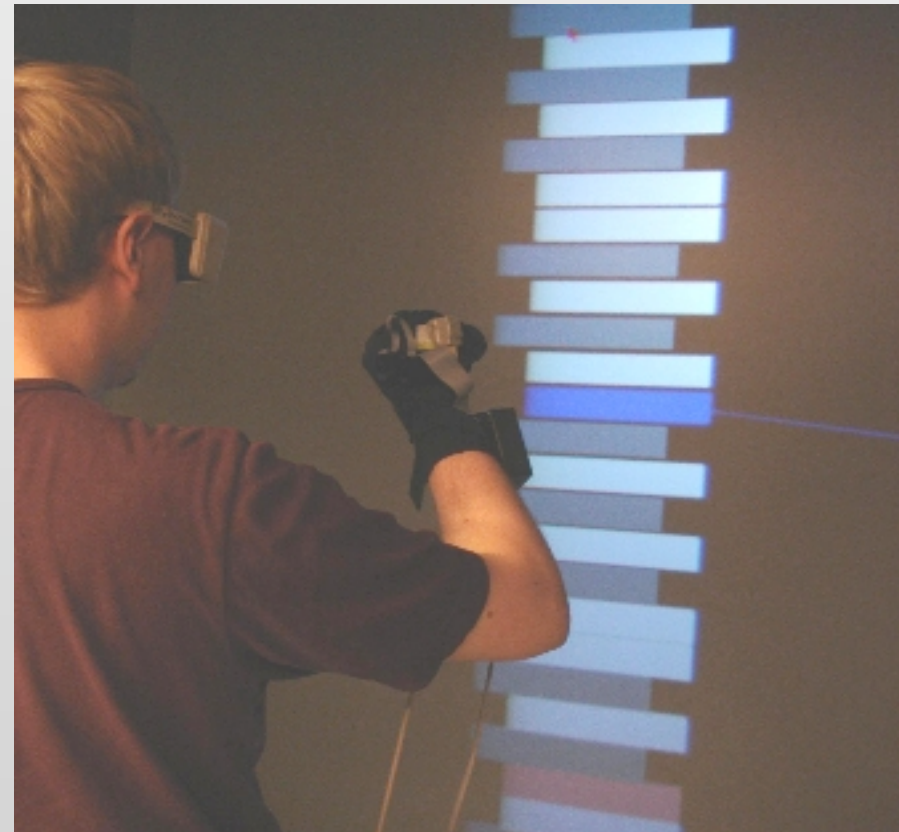
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- Control Features

- Pitch
- Volume
- Timbre





Gestural FM Synthesizer



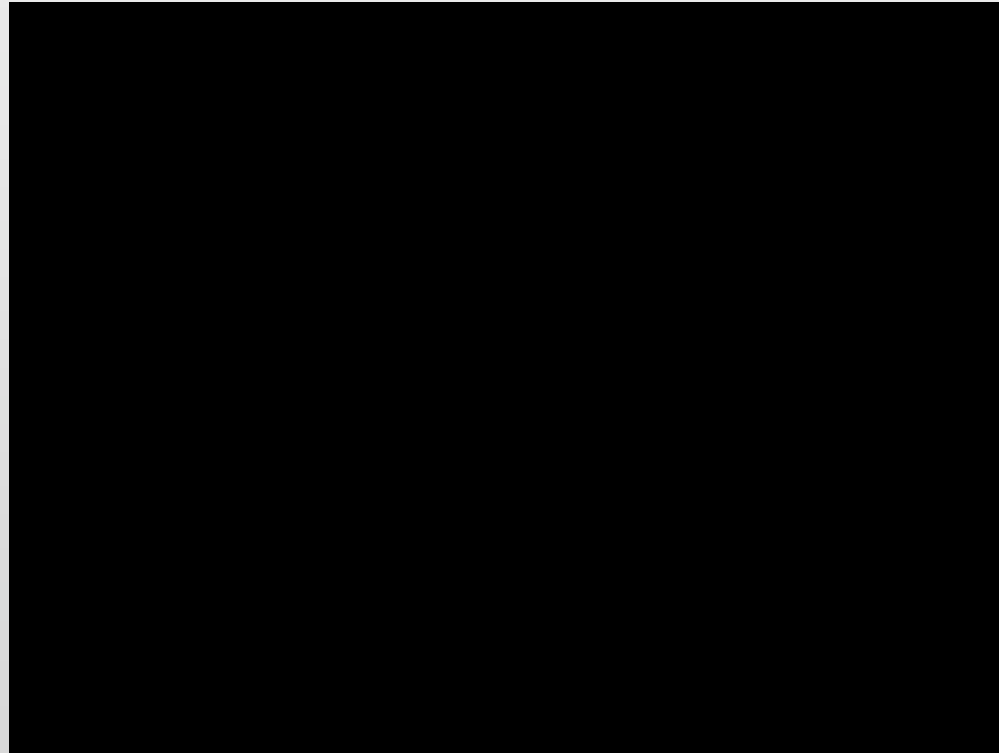
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Virtual Air Guitar



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- Hardware Setup
 - CAVE
 - Data gloves
- Control Features
 - Pitch
 - Vibrato
 - Volume
 - Mute
 - Slides



Virtual Air Guitar



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Augmented Groove



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- Hardware Setup
 - Table
 - Overhead camera
 - HMD
 - Marked LP records
- Interface
 - Manipulating LPs
 - Animated virtual objects

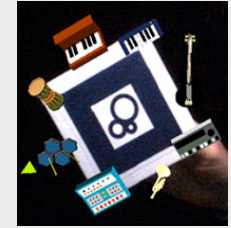
Augmented Groove



- Control Features
 - Track selection
 - Pitch
 - Volume
 - Jamming

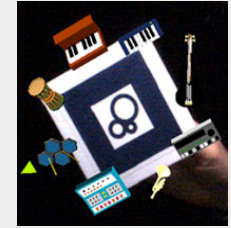


Music Table



- Hardware Setup
 - Table
 - Overhead camera
 - Large screen display
 - Cards with fiducial markers
- Interface
 - Manipulating cards
 - Animated virtual characters

Music Table



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- Control Features
 - Note selection
 - Loop timing
 - Pitch
 - Volume
 - Length
 - Phrase copying
 - Phrase editing



AR/DJ

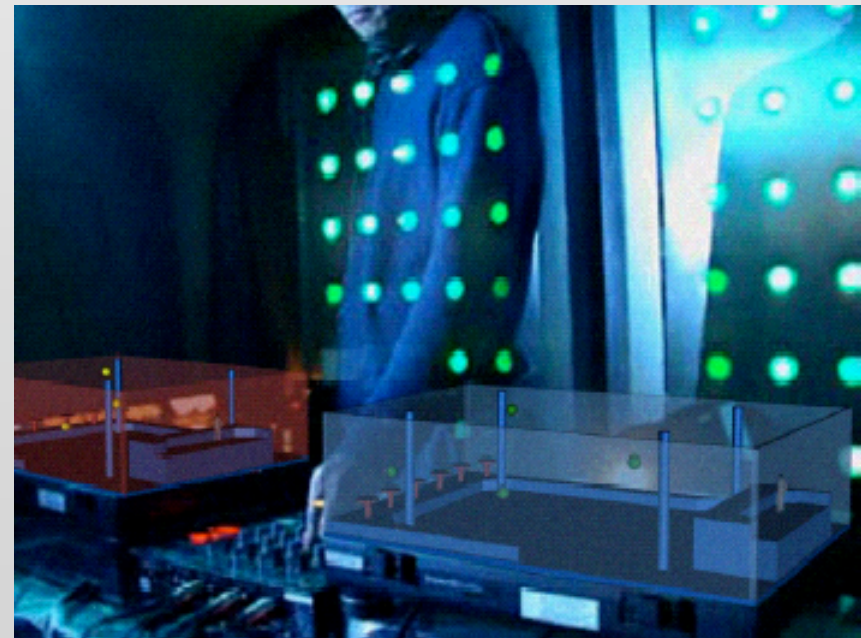


- Hardware Setup
 - Pen tracker
 - Keyboard
 - HMD
 - 3deSoundbox sound engine
- Interface
 - Virtual 3D model of dance floor
 - Sound source points

AR/DJ



- Control Features
 - Sound sample selection
 - Sound source position
 - Effects:
 - Compression
 - Flanger
 - Reverb





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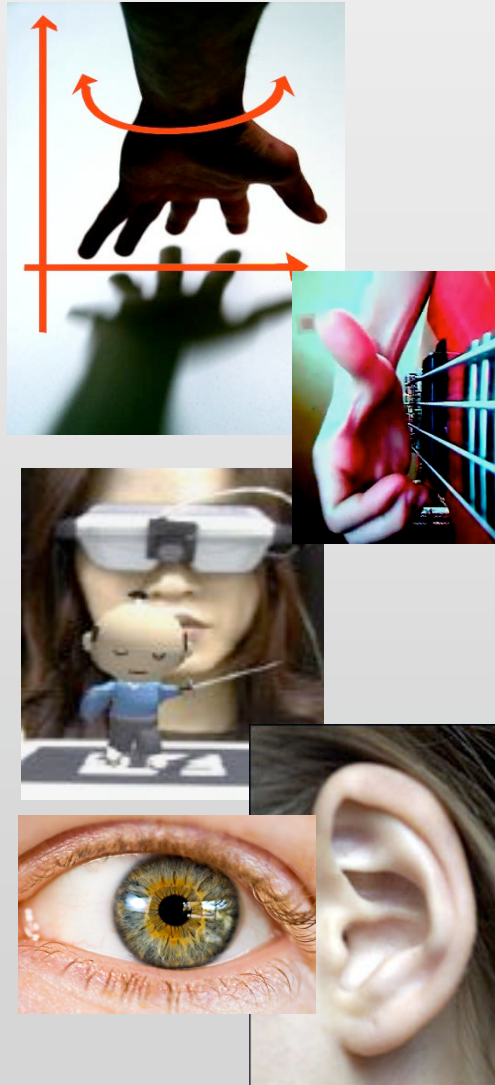
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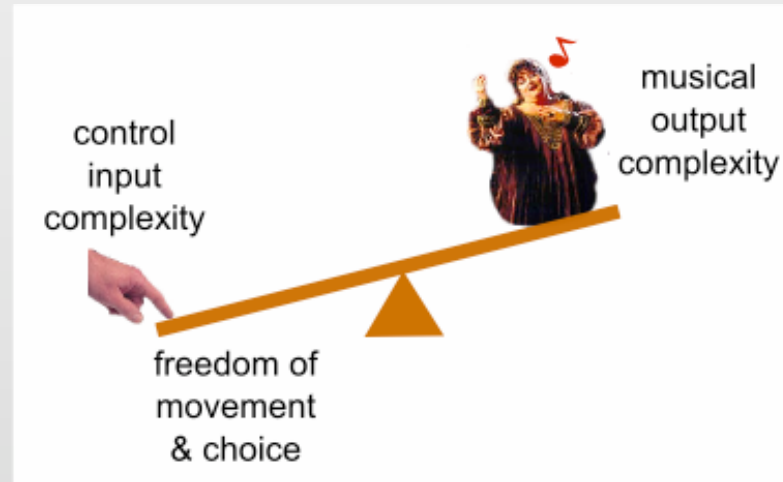
VR/AR Features



- Mapping in 3D
- Spatial resolution
- Dynamic visualization
- Latency & registration

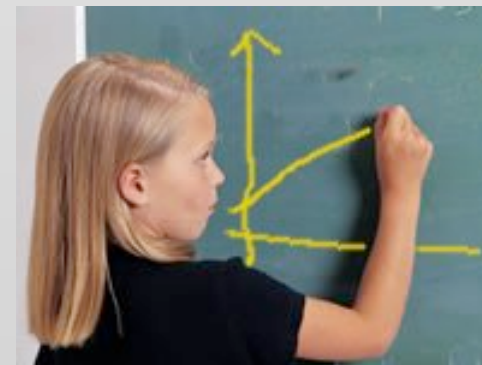
Evaluating Instruments

- Efficiency

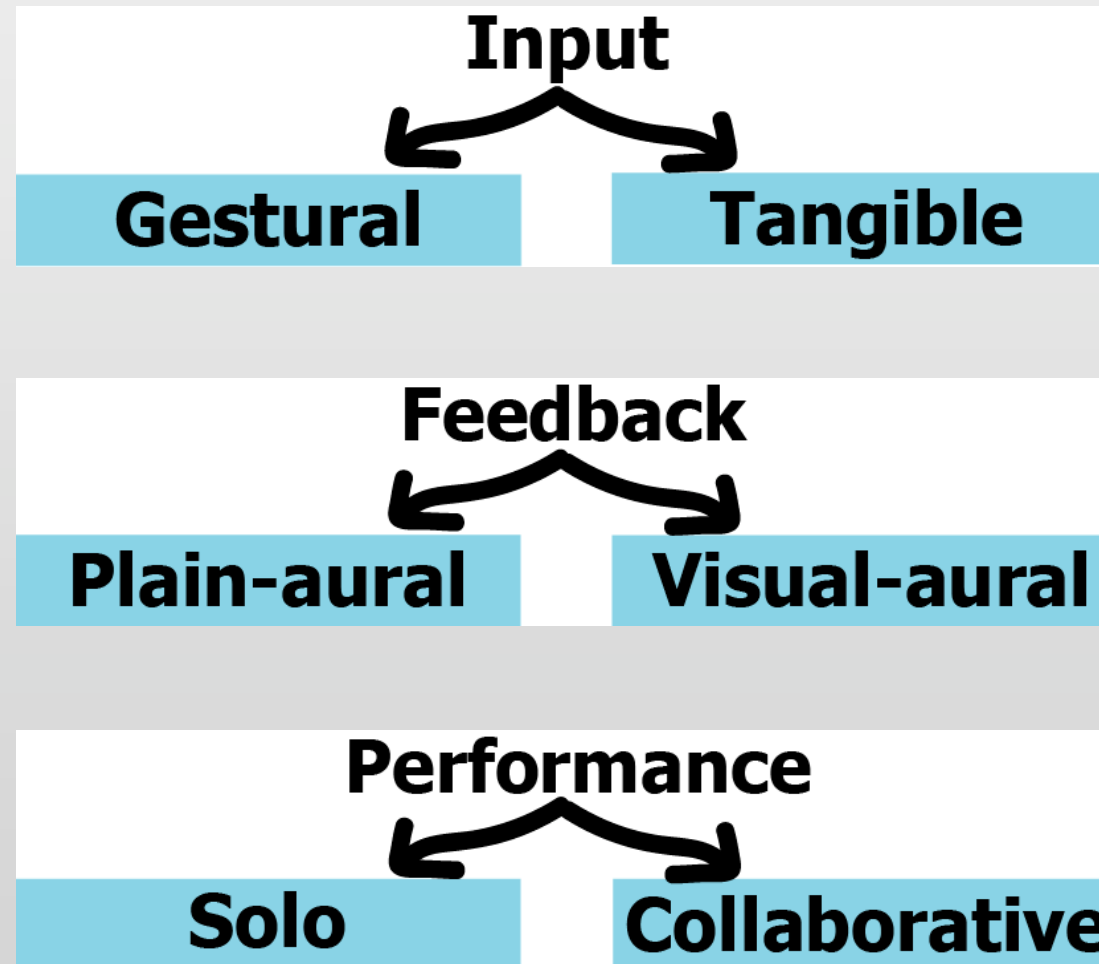


- Learning Curve

- Rewarding point
- Mastering point



Taxonomy



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Metaphors used in Virtual / Augmented Space



- Traditional instruments



- Scale model



- Live creatures



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Conclusions

- VR/AR musical instruments
 - Potentially efficient instruments
 - Facilitate learning and understanding musical abstracts
 - Latency & registration issues
 - Expression of emotion & aesthetics
 - Still need improvement



The End