VR Gesture Interface based on Human-animal Interaction

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Problem – VR User Interfaces

Currently, there isn't a well-defined, unified VR user interface

- 2D UI ported into 3D, not adapting to the medium

- Button mapping for basic controls can be different among experiences

  - E.g. Teleport

  - One exception is the "Trigger" button

- Many VR experiences have custom designed interfaces to meet their interaction need

Problem – Embodiment

VR provides the sense of embodiment

- Players have embodied virtual body, but their bodies are not used
- Controls are mapped onto arbitrary buttons, usually based on traditional game controllers, could break immersion

Need embodied interaction

Related Work – Scholarly Articles

Tangible Interaction Framework

Hornecker et al. presented Tangible Interaction: A Framework on Physical Space and Social Interaction

Principles of Direct Manipulation

Shneiderman's three principles for designing comprehensible, predictable and controllable user interfaces

TraceMatch

A versatile technique that uses a single camera to match motions performed by users following the animations on a display

User-Defined Body Gestures for Navigational Control of a Humanoid Robot

Obaid et al. gestures to control the non-player "companion" can be: user-centric, robot-centric, and independent of either perspective.

Memorability of Pre-designed & User-defined Gesture Sets

Nacenta et al. found that participants significantly preferred user-defined gesture sets, and it took less time to learn

User-Defined Gestures for Surface Computing

Morris et al. analyzed gestures performed on tabletop touchscreen: some commands elicit little gestural agreement, need on-screen widgets

Hornecker and Buur. 2006. Getting a grip on tangible interaction: a framework on physical space and social interaction
Clarke et al. 2016. TraceMatch: a computer vision technique for user input by tracing of animated controls.
Shneiderman.1997. Direct manipulation for comprehensible, predictable and controllable user interfaces

Related Work – VR Games

The Unspoken

VR action game in which players duel with other magicians by **casting spellings using gestures**

Falcon Age

Interacting and bonding with a baby falcon. Then work together to escape the robot camp...

Related Work

Prior studies in Gestures Interfaces are mostly focused on 2D surfaces

- Direct manipulation of the object of interest

- Using visual cues

Findings from analyzing user-defined gestures

- One hand is preferred to two

- User-defined gestures are prefered to pre-designed gestures

Approach

Gesture Interface

XBOX Kinect,
Microsoft HoloLens

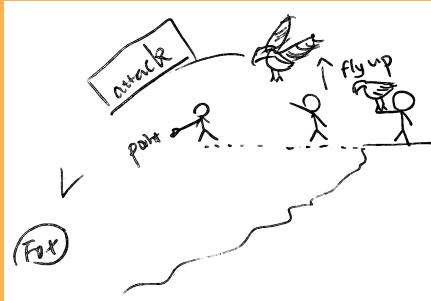Image: Brian Klug.
Microsoft Kinect: The AnandTech Review

Human-animal Interaction

Mogolian eagle hunters,
pet owners

Image: Cecilia Clark. Photography Tour,
Visit to a Kazakh Golden Eagle Hunter, Mongolia

Design Timeline

Eagle Hunters

Sign Language

User-defined Gestures

Pet Gestures

Based on the body language of Mogolian eagle hunters

Al Jazeera, *Mongolia: The Last Eagle Hunters*

nice to meet you

@nyledimarco

Inspired by sign language and the concept of Spatial Grammar

Nyle DiMarco. Top 10 Basic ASL Phrases.

Based on reward-based behavior modification, the process of defining gestures is incorporated into the game play

Based on Interaction with Pets

Drawing circles to roll over

Throwing and Fetching

Design Criteria

Interaction Design	Hand Gestures	Pet Gestures
Select	Point	Call name to get its attention
Activate	Draw Circles	Draw circles to make it roll over
Action/Direction	Throw	Throw sticks for it to fetch
Cancel	Stop	Call name while clapping

Gestures
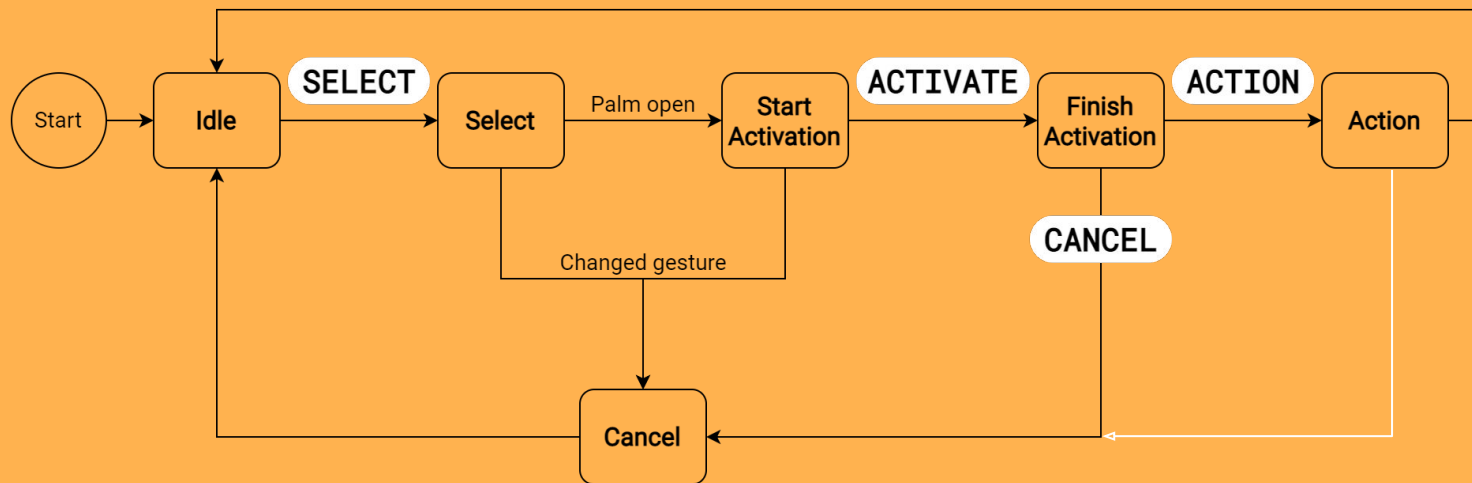

SELECT

ACTIVATE

ACTION

CANCEL

Implementation

Gesture State Machine
- gestures are highlighted in white

Technology

Hardware
HTC Vive Pro
Valve Index Controllers

Software
Unity Engine
SteamVR v2.5

Demo

Gestures
STOP gesture

Summary

- VR interface should be intuitive

- VR interactions like laser pointers are not based on real-life

As a proof of concept, I implemented this prototype of human-animal interaction based gesture interface.

Future work: test my prototype with more kinds of interactions:

- interacting with multiple companions

- interacting with non-animal targets

- manipulate abstract targets (e.g. menu interfaces)

Outlook

- Inspire future VR experiences to use gesture interfaces

- Inform the UX design of VR and AR gesture interface

THANKS

Questions?