48727 Fall 2024 Final Project Proposal

Author: Chia Hui Yen

Prof. Vernelle A. A. Noel, Ph.D. ([vnoel@andrew.cmu.edu](mailto:vnoel@andrew.cmu.edu)) ; TA: Stella Shen ([chenyis@andrew.cmu.edu](mailto:chenyis@andrew.cmu.edu))

**Exploring/design Tech approach**

## ****Preface****

Key:

探索human as a agent 在建成空间中的移动（Invisible Data）所代表的情绪，并进一步探索这个情绪的表达方式和价值，意于促进hybrid (physical & virtual world) 交流的效率和深度

The key of body motion 是有ubi comp的concept在seamessly link btwn virtual & physical

（for example zoom meeting, zoom in 放大hand gesture）

* Intelligent zoom
* Zoom out ->镜头跟随

Project map down.

Build a program, using a framework that can manipulate in python, adapt with webcam recognize the face pose/feature.

The purpose, build a video call plugin program using body motion data as hint, 模拟真实和人面对面的感觉，bridge the virtual & physical world 交流，提升hybrid lifestyle体验。

Feature:

There are video from webcam and background music.

* when user in video talking motion detected, turn down background music volume.
* When not talking, turn up the background music volume.

If num of face == 1:

When the distance <threshold:

Not zooming in or out normal,

When the distance > threshold, and isTalking:

zoom following the face

If fistDetected:

isManualZoom==true

Zoom(toface)++ until max, then zoom—until min and repeat zoom++…

If num of face > 1:

If on eof the face is talking:

Zoom to the person talking

Else:

Not zooming at all

This project builds on the foundational ideas explored in Assignment A6: Hybrid Bodies, which considers the integration of virtual information into daily life through thoughtful design approaches.

By extending the concepts of viewing hybrid as the future 常态 of daily life, the project focuses on reimagining how users engage with and approach information in virtual environments, including the medium/method, the timing of read, and where it was it. (Reference)

Why is (the exploration of 研究hybrid approach) matters? >>>

This project critiques and expands the hybrid lifestyle—remote and in-person interactions—with a specific focus on emotional communication. The goal is to design and demonstrate an XR-based messaging system that transmits and interprets non-verbal emotional cues through motion data, connecting human users seamlessly across physical and virtual spaces. (Reference)

The product supported by ideas from cybernetics (Assignment A5) and tangible interaction (Assignment A4), which helping bridging the divide through human-centered interaction and advanced technical systems. To complete the design of systems that fluidly connect the physical and virtual worlds.

## ****Concept and Central Questions****

From the preface I mentioned above, I can say that virtual is not only a copy from real-life data, *"the transition from a reality to a collection of possibles."* Instead, it creates new realities by introducing *"irreversibility in its effects, indeterminacy in its processes, and creativity in its striving"*. This project engages this transformative potential by asking:

1. **What is a "good" system for interacting with the virtual world? (Thoughts)**
2. **How can non-verbal, emotional cues be effectively communicated in virtual environments? (Thoughts)**

**What role does motion data play in bridging physical and virtual worlds?**

These questions aim to explore the balance between human-centric design and the technical complexity required for meaningful virtual-physical interaction. Drawing from Lévy’s insights, the work emphasizes the "dialectic between the virtual and the actual" (p. 27), aiming to create systems that enhance human connection while preserving the authenticity of physical presence.

Focus: 亲密关系

## ****Theoretical and Conceptual Framework****

#### **Virtualization as a Creative Force**

Lévy argues that virtualization "fluidizes existing distinctions, augments the degrees of freedom involved, and hollows out a compelling vacuum" (p. 29). This project embodies this principle by breaking traditional barriers in communication. Instead of relying on text or video, it explores motion as a universal, non-verbal language.

#### **The Medium is the Message**

Inspired by Marshall McLuhan’s "the medium is the message," this project investigates how the medium of body motion shapes emotional communication. McLuhan’s idea that "the media with which we interact exert a greater influence on us than the messages contained in the media" (A6-2.pdf) is central to designing a system that prioritizes the medium (motion data) over traditional messages.

#### **Hybrid Spaces and Tangible Interaction**

The system aligns with the hybrid living model described in the course, where "the member of the conventional corporation travels from the private space of his home to the public space of the workplace. In contrast, the telecommuter transforms his private space into a public space and vice versa" (Lévy, p. 35). This duality is reflected in the project’s ability to blend physical gestures into virtual spaces, enabling richer interactions in remote or hybrid settings.

## ****Prototype Description****

The prototype extends ideas from Assignment A6-2, "3D Messenger, the sticky notes” the sender can write a 3D message and pick a location and pose for the receiver. In this enhanced version, the message is enriched with emotional data derived from motion, creating a more immersive experience.

The project involves designing and prototyping a system that captures, analyzes, and visualizes emotional states through motion data. It achieves this by incorporating three critical components:

#### **System Workflow & Features**

1. **Input: Data Capture**

Motion data is recorded using sensors (e.g., Kinect or OpenCV) to track non-verbal cues, hidden or intentional, such as posture, walking speed for status, and hand gestures. These inputs are encoded into meaningful emotional states using classification algorithms.

The sender is aware of non-verbal signs given by the receiver such as their posture and walking speed. Such information gives clues into the emotional state of the recipient.

(Research support)

1. **Processing, semantic understanding : Encode & Decode**

Semantic understanding tools (e.g., TensorFlow, PyTorch) allow the system to analyse and generalize and reconstruct data across users and contexts. (Reference)" Algorithms classify motion patterns into emotions (e.g., happiness, frustration). >>> Build a dataset ML model (or pipeline it) for this, what to input.

* Collect diff dynamic motion or pose pattern, reflect/map them to status

Example: walking speed, frequenzy/timeframe of moving/sitting that reflecting the mood of a person.

* Train based on labelled data
* Test & evaluate accurancy

1. **Output: Visualization and Interaction**

Enhanced Sensory Feedback. The emotional data is translated into animations or visual effects, colors, or 3D models in a virtual environment. Haptic feedback or audio cues enhance the sensory experience, allowing users to perceive emotional nuances. (Reference)

Cross-Domain Interaction: Integration of virtual and physical gestures for hybrid scenarios.

* Way to send noti -> not like spoonfeed but hint unusual

### Plan to work on:

Basically 2, processing

## ****Evaluation and Impact****

#### **Evaluation Metrics**

1. **Accuracy:** How well the system interprets and communicates emotions.
2. **Usability:** User feedback on interaction intuitiveness and emotional clarity.
3. **Immersion:** The extent to which users feel present and connected.

#### **Critical Potential**

The project challenges traditional communication methods by leveraging XR to create meaningful connections. It underscores the power of virtualization to "intersect classical space-time intermittently, escaping its 'realist' clichés" (Lévy, p. 31).

## ****Conclusion****

This project explores how XR systems can humanize virtual communication through non-verbal, motion-based messaging. Rooted in concepts of virtualization, hybrid living, and tangible interaction, it demonstrates the transformative potential of computational design to bridge the gap between physical and virtual worlds. As a technical artifact, it aspires to redefine how we experience and interpret emotional connections in an increasingly digital era.

Reference

1. <https://www.e-flux.com/architecture/intelligence/310403/too-much-information/>
2. Becoming virtual: reality in digital age, Lévy, 1998.
3. The Medium is the Message
4. Critical Multimedia