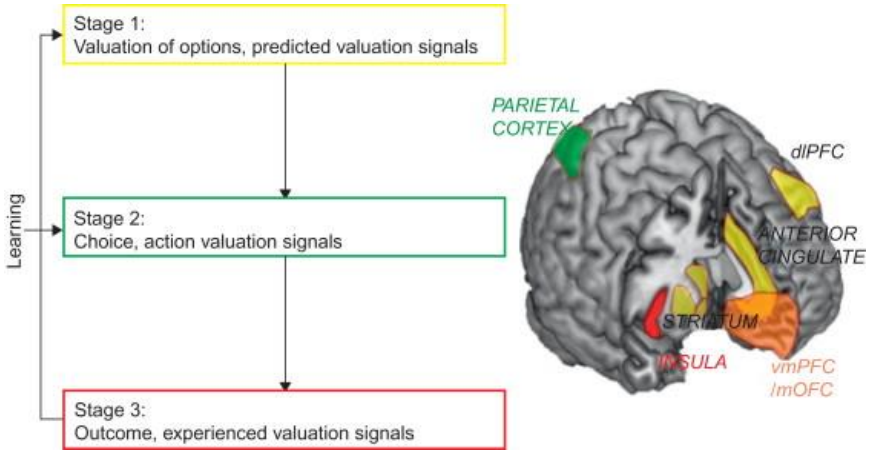
Social reinforcement learning using VR avatar

Taeho Kim (CGV Lab)

Jaejoong Kim (CNDL)

Problem Definition

- How does the human learn from social value?



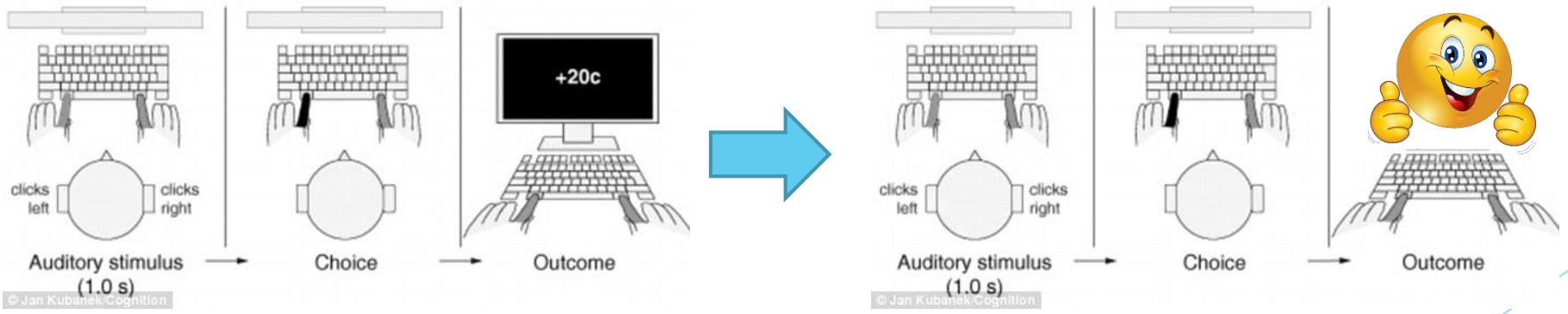
Goal

- Objective
  - Create the VR environment for the social reinforcement learning task

    Natural experimental design
  - Replace “reward” in previous tests in to “social reward (emotional reward)”

    Money/grade *to* ***virtual emotion*** *from the avatar*
  - Perform an experiment through proposed environment

    Clinical validation and other feedbacks

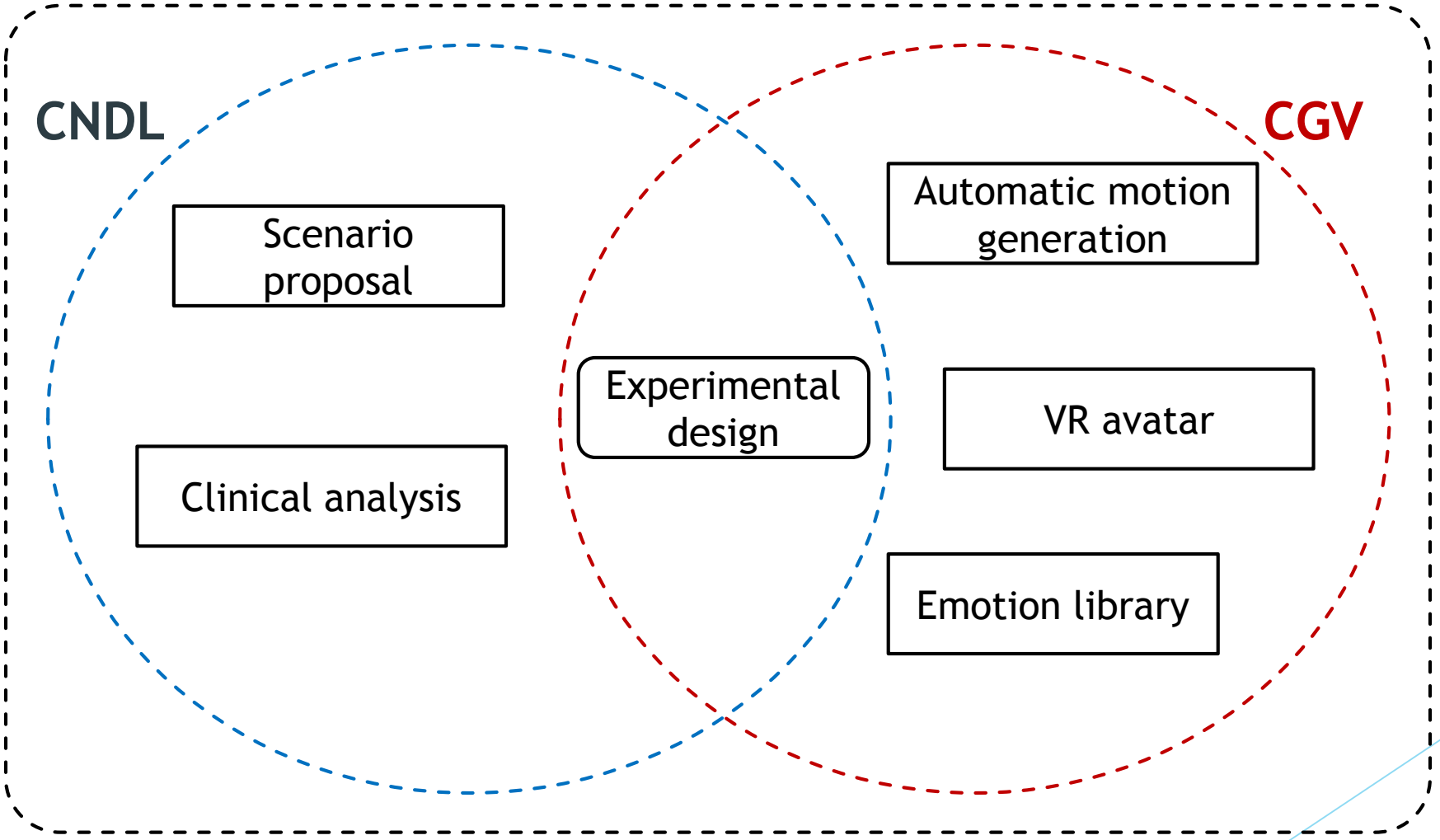


Goal

- Sub-research issue for each lab
  - Social rewarding/aversive situation used in previous social reinforcement learning studies failed to evoke realistic emotional experiences
  - → **CNDL:** Develop a **experimental design and analysis method** related to social reinforcement learning with VR
  - Since the experiment will be communitive situation between user and virtual avatar, **maintaining the natural situation is important**
  - → **CGV:** Develop an **algorithm for generating natural avatar motion** dew to the gazing direction of the user during communitive interaction

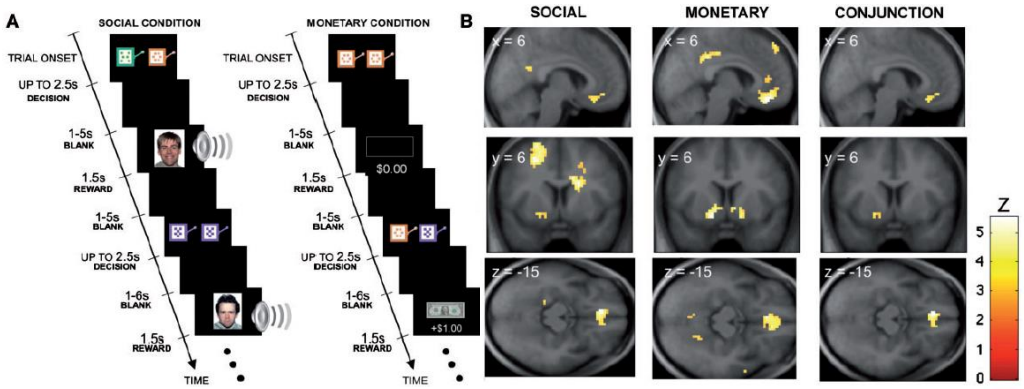
Overview

Social reinforcement learning in VR environment



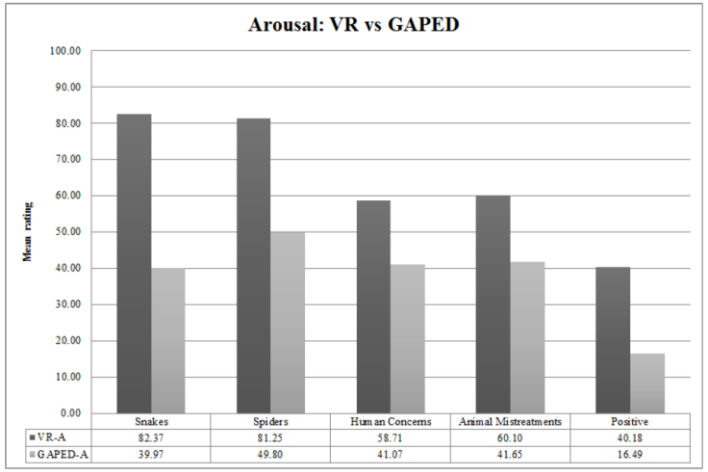
Social reinforcement learning

- Previous researches using social reward



Lin et al, 2012

- Different arousal induction in VR and 2D picture



	Snakes	Spiders	Human Concerns	Animal Mistreatments	Positive
VR-A	82.37	81.25	58.71	60.10	40.18
GAPED-A	39.97	49.80	41.07	41.65	16.49

Fig. 2. Mean arousal ratings for picture categories in Virtual Reality and GAPED

Sergio et al, 2014

Social reinforcement learning

- How to design realistic social reinforcement learning task using social interacting situation
- Which psychological trait/state of subject makes difference between social reward and monetary reward (ex: alexithymia, depression, anxiety..)

Social reinforcement learning

- Expected participants: KAIST students
- Methods
  - Analyze participants' behavior using reinforcement learning model
  - Compare model parameter between monetary reward and social reward
  - Investigate correlation between psychological trait/state with model parameter
  - Separate effect of arousal and valence of social reward on value computation by varying degrees of arousal and valence of avatar

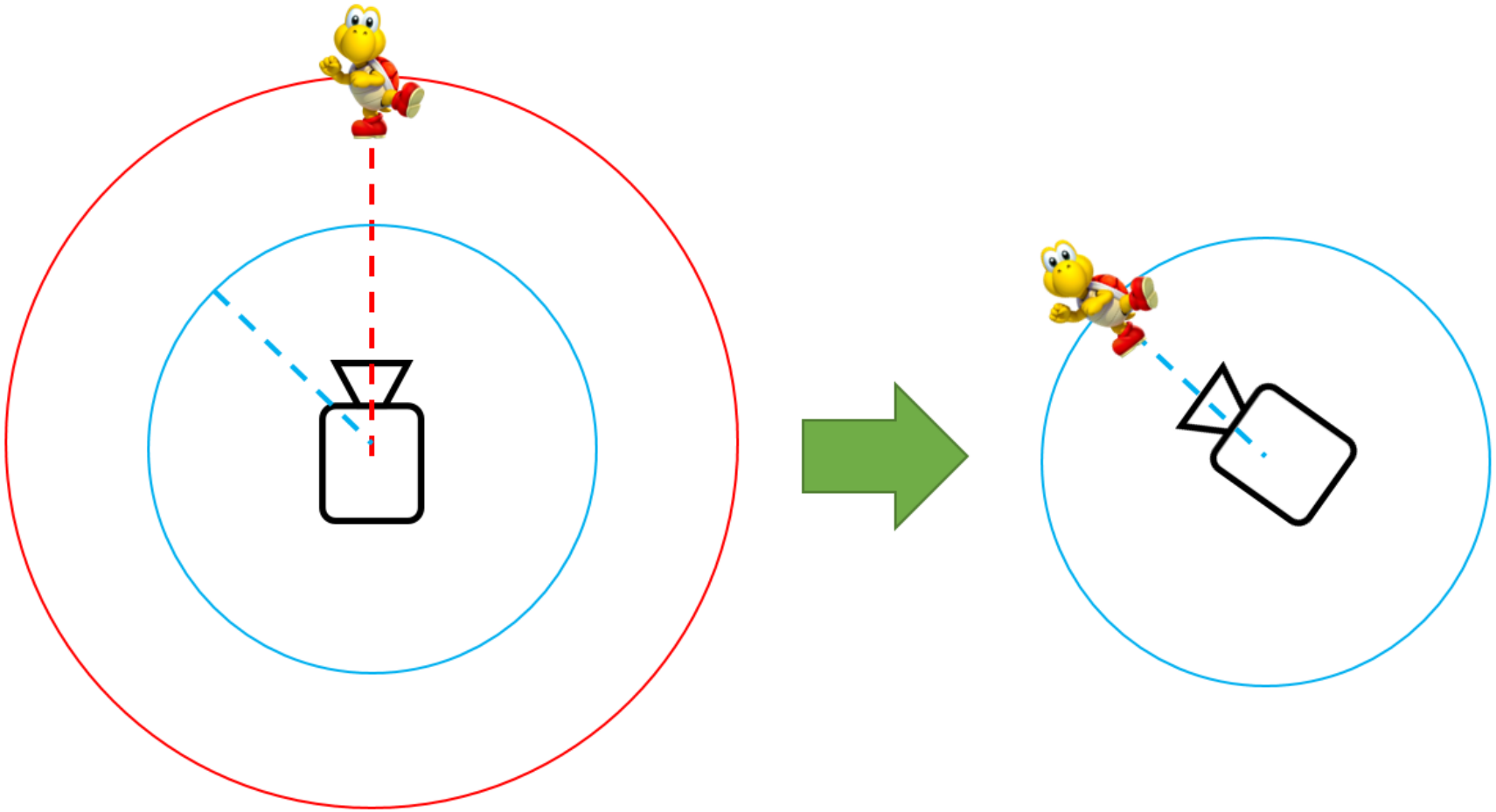
Natural avatar motion in communitive interaction

- For the experiment in last-Wednesday forum
  - **Build motion library to express emotion**
    - Motion capture
    - Facial expression capture
    - → *Using vision input device (Kinnect, etc.)*
- Research topic
  - **<u>How to generate natural motion without recorded (fixed) motion</u>**
  - or how to create natural motion by blending existing recorded motions
  - Motion for the "Eye contact" with user
    - Rather than change the pose of the **whole body with rigging motion**, just move **part of the body in the avatar** for certain small change of head distance
    - →
    - →

Natural avatar motion in communitive interaction

- For the experiment in last-Wednesday forum
  - **Build motion library to express emotion**
    - Motion capture
    - Facial expression capture
    - → *Using vision input device (Kinnect, etc.)*
- Research topic
  - **<u>How to generate natural motion without recorded (fixed) motion</u>**
  - or how to create natural motion by blending existing recorded motions
  - Motion for the "Eye contact" with user
    - Rather than change the pose of the ~~**whole body with rigging motion**~~, just move **part of the body in the avatar** for certain small change of head distance
    - → Compare the difference between whole body rigging motion and part of body rigging motion with given task **[actual amount of motion, user familiarity]**
    - → Develop an algorithm that makes a part of the body motion with given numerical input and body joints

Natural avatar motion in communitive interaction

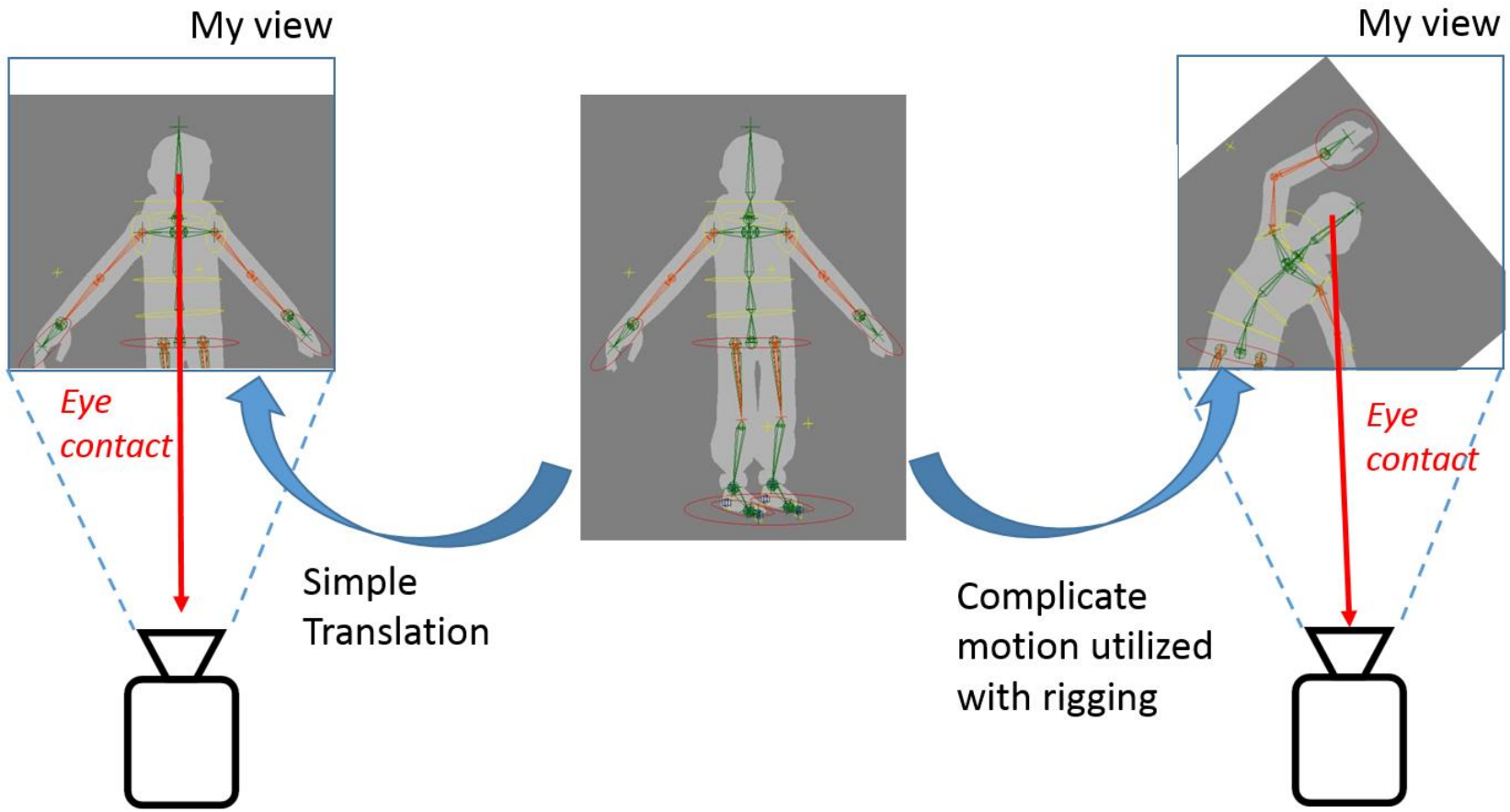


Red: initial distance and direction of the camera

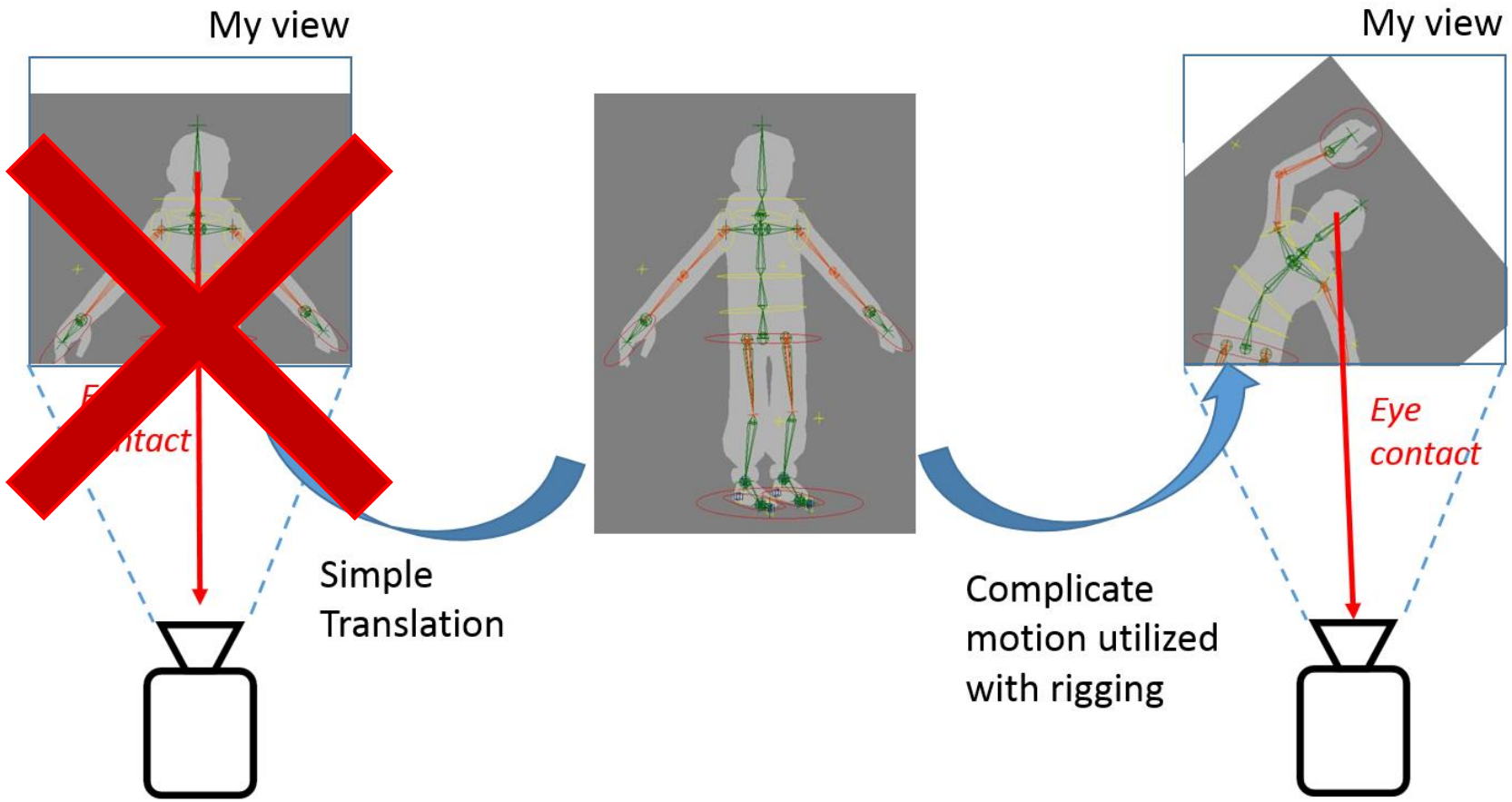
Blue: desired distance and direction of the camera

→ **How to move the character with natural motion**

Natural avatar motion in communitive interaction



Natural avatar motion in communitive interaction



Considerations

- Eye tracking can be utilized
- 3D stereoscopic monitor with non-magnetic glasses
- User study for the VR avatar motion have to be performed

Tentative Plan

- ~ May
  - CGV: Create prototype of the virtual avatar with emotion library
  - CNDL: Create task in 2D
- June ~ September
  - CGV: Build virtual environment for the experiment utilized with stereoscopic monitor
  - CNDL: Transfer 2D paradigm to virtual environment and perform pilot experiment
- October ~ February
  - CGV & CNDL: Perform an social reinforcement learning experiment using VR and improve the system from the feedbacks

THANK YOU ☺