Midterm Project Proposal (revised) & Sketches (Oct. 8, 2007)

Interactive Chair for Navigating 3D Virtual Space

Seung Wook Kim / Hsin-Hsien Chu

This project aims at designing and implementing the chair as a body-oriented interface to navigate and socially behave in the 3D virtual space.

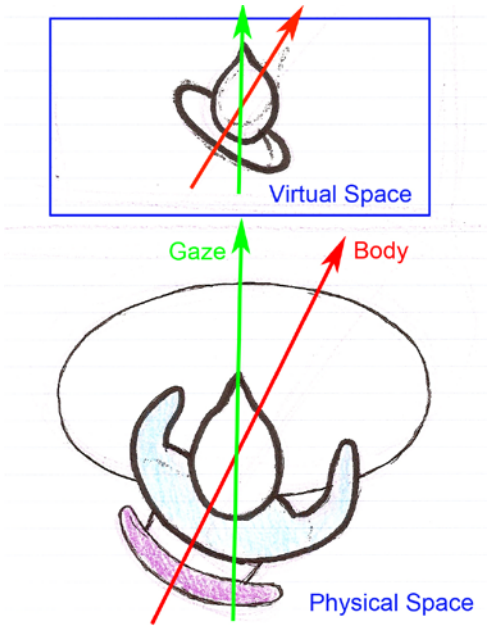
- In this project, we presume a typical office setting as the user environment, in which a user sits on a swivel chair and stares at a desktop display.

- The application to be used is a 3D-game-like program (such as World of Warcraft or Second Life) where the user typically sees the virtual world in first or third-person point of view.

- The proposed interface translates a user's bodily actions to the followings:

1. Control of the gaze direction decoupled from the body orientation

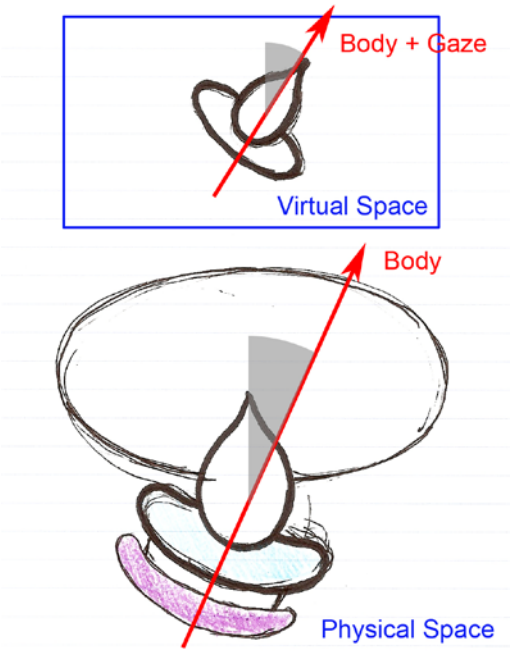
- By rotating his or her body on the swivel chair, the user can look around the surroundings, while keeping the body constantly oriented in the virtual space. This enables, for example, changing the gaze direction even during walking toward a particular destination. It also allows multiple users to communicate "face-to-face" through their avatars, by providing them with a natural way (like what we normally do in the physical world) to make an eye contact to one another, without necessarily rotating the whole body.



* Implementation: A potentiometer will be used to detect the swivel angle of the chair as rotated by the user. A set of force sensor resistors (FSRs) will be applied to the chair so that the existence of a user on the chair can be identified. In addition, vibrating motors can be attached to both corners of backrest so that the user can get the feedback when a virtual object (avatar, vehicle, wall, etc.) collides with the user.

2. Control of the body orientation

- The proposed interface shall be able to translate the user's intention to rotate the entire body orientation (including the gaze direction) as well. The distinction between coupled and decoupled orientations can be made by utilizing typical postures of human body in the desktop-chair setting, e.g. putting elbows on either the front-end of desk or the armrests of the chair (i.e. the whole body rotates when elbows are not pressing either the desk or the armrests).



* Implementation: Additional FSRs and their cover plate (to be designed) can be applied to the desk or the armrest of the chair, to sense the elbow position.

3. Extension to the final project: Walking around the virtual world while sitting on the (physical) chair

- Using our physical body (i.e. leaning upper body to front, back, left or right) in navigating the virtual world can bring us several benefits. Firstly, it does not require the conscious process as much as the use of mouse, keyboard or joystick, since it is normally what we do when we walk around the physical world. Secondly, the use of body in navigating can release both hands free to manipulate other devices, so that more actions (e.g. gestures) can be occurred concurrently. This possibility will be investigated and prototyped in the final project.

* Implementation: Unlike precedent researches on the chair as an interface, which normally depend on the statistic pattern of force distribution on the seat pan, we are planning to detect the position and distance of the back of human body against the backrest of the chair, by using FSR, IR camera and/or accelerometer.