Final Project Proposal (Nov. 6, 2007)

Interactive Chair for Navigating 3D Virtual Space

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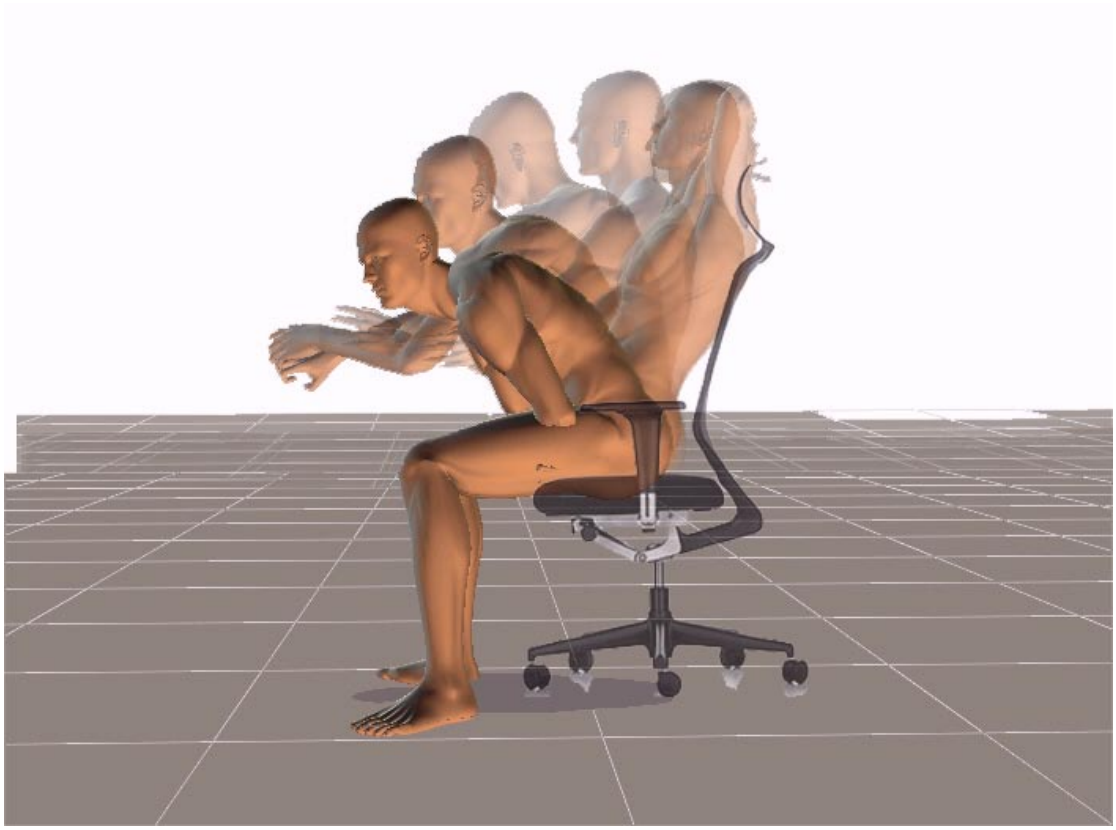
Our group is expanding the midterm project, aiming at designing and implementing the chair as a body-oriented interface to navigate and socially behave in the 3D virtual space.

I. Objectives

1. 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 other actions (e.g. gestures) can be performed concurrently. Finally, navigators could control their walking speeds intuitively and immediately by leaning forward or backward to specific degree.



2. Proxemic feedbacks from virtual companions

- Sensing and adjusting interpersonal distance plays a critical role in social activities in the physical world. On the contrary, it is very difficult to enrich proxemic behaviors in the virtual world with existing 3D interfaces, due to limitations on sensory modality and body motor control. We will use the dynamic range of vibration on the chair to reinforce the sense of interpersonal distance in the virtual world, especially when we are being encountered by other users or objects from our sides or back. We expect this haptic feedback could trigger immediate actions of users such as leaning forward or backward.

3. Gaze control by swiveling the chair

- Although there has been critique against this idea from the class, ***we still believe the swiveling action while facing the screen is natural enough to increase the degree of engagement with the virtual world, as it utilizes our natural bodily skills.*** The immediate task required here is to find the range of swiveling angle which does not discomfort users in maintaining the gaze direction to the screen. We will conduct a user test regarding this issue before implementing our design.

II. Implementation

1. Sensor for the actions of leaning forward, backward, left and right

- 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 of the back of human body against the backrest of the chair, by using either
IR camera (http://www.naturalpoint.com/trackir/) or
Ultrasonic rangefinder (http://www.arduino.cc/en/Tutorial/UltrasoundSensor)

2. Proxemic feedback

- We will install a set of **DC motors** on different parts of the chair so that users can sense the directional feedbacks (i.e. left, right, front and back).

3. Sensor for the swiveling angle of chair

- We will improve the prototype interface designed in the midterm project, using the **Potentiometer** and **Erector assemblies**.

4. Additional programming works will be followed to connect sensors and outputs to the particular 3D software (Torque Game Engine).