

## THE VIRTUAL BODY

William Bricken

August 1990

[These notes and memos describe the design of the Virtual Body software component of VEOS.]

Since the participant is included within the virtual environment, the representation of self is fundamental to virtual interface design. The Virtual Body is the primary reference point, the interface between the user and the virtual environment. It provides direct access to computational graphic objects; it is the channel of direct action and control. Monitoring the Virtual Body provides the computational system with a complete record of actions taken by the participant.

The Virtual Body is a software toolkit for:

- attaching arbitrary hardware input devices to arbitrary representations of components of our body. Usually the linkage will emphasize naturalness.

- making psychometric measurements of behavior in a virtual environment, and

- maintaining coherence between the patron's model of physical activity and the virtual representation of that activity.

The unique aspects of the Virtual Body are:

1. The sensor measuring participant activity is designed to be transparent. Natural physical movement directly affects the computation; there is no apparent interface. The Virtual Body software maintains the illusion of direct interaction.
2. Mapping between physical action and computational effect is flexible and dynamic. A spoken word, for example can change the computational effect of shifting one's gaze from "Identify that object" to "Transport me to that object."
3. Physical actions in a virtual environment furnish psychometric data on performance, resource expenditure (load), and cognitive model. Since action can be taken literally (there is no symbolic transcription filtering the meaning of behavior), performance in a virtual environment mimics performance in reality. As long as the representation of the task is valid, the user's behavior directly indicates the user's ability to perform.

## Components of the Virtual Body:

Sensors are physical devices which sense natural movement. Sensors that are under development include:

- Head tracking
- Eye tracking
- Voice recognition
- Hand movement (right and left)
- Body movement (torso, arms, legs)
- Touch locales (fingertips)

Sensors furnish a data stream to the computational environment. The Virtual Body includes software for:

- mapping this data stream to representations of body components in a virtual environment display,
- interpreting the data stream as instructions to change the virtual environment, and
- collecting and analyzing the data stream as psychometric information.