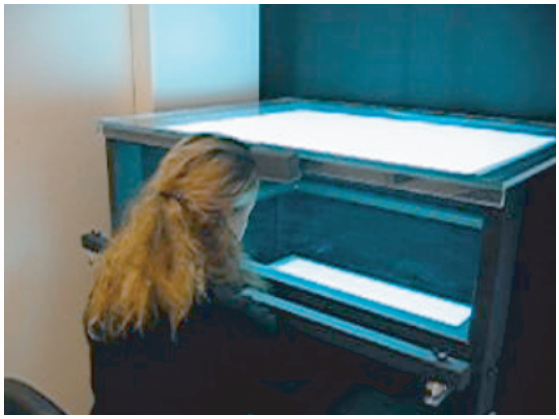
Human Factors

research and technology division

Adapting to Virtual Environments and Teleoperator Devices

Objective

To identify the ways in which operators of virtual environments and teleoperator devices (e.g., robotic arms) use adaptation to overcome the sensory-motor and intersensory conflicts they often experience with these devices.



Approach

We expose human subjects to laboratory-induced conflicts between eye and hand or between different sensory systems (e.g., vision and audition) and measure their perceptual and perceptual-motor adaptation to these conflicts and the variables contributing to or impeding this adaptation. An example of such a variable is delay of feedback.

Examples of conflicts we are using:

- Movements of the hand on a digitizing pad are programmed to produce atypical motion of the cursor viewed on the computer monitor
- Reaching for objects while looking through a light-displacing prism, causing misperception of limb position and reaching errors
- The visual and auditory stimuli from a single object are caused to emanate from separate spatial locations

Impact

This research has revealed the existence of two qualitatively different types of adaptation: Perceptual recalibration and visual-motor skill acquisition. This distinction has allowed us to diagnose the type of adaptation a given virtual environment or teleoperator device will produce and whether or not this adaptation will result in significant aftereffects. This information, in turn, is expected to contribute to the development of optimal procedures for training astronauts and other operators on how to make the best use of these advanced technologies.

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