

## HARDWARE INTERFACE DEVICES

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### 1. "Selspot" optoelectric gait measurement device (2- & 3-D)

Woltring & Marsolais

-- commercially available from:

SELCOM AB, Partille, Sweden, & Hamamatsu Television, Japan

"...sequentially pulsed light-emitting-diode targets on the subject are observed, with data fed into a computer for combination with force plate data...offers potential for clinically useful real-time acquisition and analysis of three-dimensional data."

### 2."Twinkle Box" 3-D computer input device

Burton & Sutherland

-- U. of Utah/ARPA

"...measures positions of many 3-D points in such rapid succession that they appear to be measured simultaneously. ...The Twinkle Box, with three lights attached to a cap could replace bulky mechanical headgear. Other lights could be attached to fingertips or body to allow user to interact with objects viewed through the head-mounted display."

### 3."Self-Tracker" optical sensor

Bishop & Fuchs

-- U. of North Carolina

"...real-time 3-D computer input that uses a cluster of identical custom integrated circuits as an optical sensing device...determines position and orientation in a room-sized environment of the sensor as it is held or worn...advantages are unrestricted user motion, capability for simultaneous tracking of several users, passive tracking with no moving parts, freedom from electromagnetic interference."

### 4."Magic Wand" electromagnetic six degree-of-freedom digitizer

Schmandt

-- Polhemus Navigational Sciences

"...picks up x, y, z, and pitch, yaw, roll of a small sensor relative to a larger radiator 40 times per second...minicomputer controls the radiator currents and processes the sensor signal for accurate location calculation"

5. "PLTZ" electro-optic shutter stereoscopic viewer  
Roese & McLeary  
-- Navel Ocean Systems Center

"...stereo pairs are displayed in an alternating manner on the even and odd field scans of a conventional 2:1 interlace raster scan CRT display. When viewed with electro-optic shutters operated synchronously with the CRT field scan rate, the alternating perspective views are perceived as stereoscopic images with strong binocular depth-of-field sensations."

6. "Bat" 6-dimensional mouse  
Ware & Jessome  
-- University of New Brunswick

"...encodes relative position and delivers data in all 6 dimensions needed for object placement."

7. "DataGlove" hand gesture interface device  
Zimmerman, Lanier, Blanchard, Bryson & Harvill  
-- VPL Research

"...provides real-time gesture, position and orientation information...analog flex sensors measure finger bending; hand position and orientation are measured either by ultrasonics (providing five degrees of freedom) or magnetic flux sensors (providing six degrees of freedom); piezoceramic benders provide the wearer tactile feedback."

8. "DataSuit" interface system captures, records, and renders the movement of the human body  
Lasco-Harvill, Blanchard, Smithers, Harvill, Coffman  
-- VPL Research

"...garment covers the body from neck to ankles, registering the position and orientation of the joints of the body. An absolute positioning system tracks the movement in six degrees of freedom within the room..allows full body participation in virtual realities..."

9. Stereoscopic Display Using Double Guest-Host Liquid Crystal Cells  
Miyashita and Uchida  
-- Tohoku University/NHK Science and Tech. Research Labs

"...flat-panel, direct-view display using LCD's which belong to the polaroid glasses type...based on stepography composed of two crossed polarizer sheets whose absorption is patterned by photo-process."

10. "Sorcerer's Apprentice Wand"

Vickers

-- U. of Utah

"..pistol-grip shaped wand has four push-buttns, a slide switch, and a small potentiometer for communication to the computer; cable extends from bottom. Position only is monitored. Ten-pin connector on top of wand accepts a tip from one of three tracking devices -- a continuous wave ultrasonic transducer, a "puppet" tip and a sonic spark pen...to alleviate limited communication with the computer, capabilities of the wand were extended to include interaction with a wall chart."

11. "Coda-3" provides remote non-contacting means of monitoring movement

-- not yet available in U.S.

"...uses optical scanning to sweep three fan-shaped beams of light across the field of view and then senses the reflections from up to eight 'landmarks'."

12. "Op-Eye" optical sensor position tracker

United Detector Technologies (UDT)

-- MIT Media Lab

"...a two-axis lateral effect diode detects the position of a spot of light on its surface. Two-dimensional position information is then obtained via four electrode connections at the edges of the detector. Signals from these conntections are fed into the interface module, amplified, and digitized. Motion is constrained to the intersecting fields of view of two cameras..."