Motion Capture
Part IV
Hand and eye trackers

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Outline
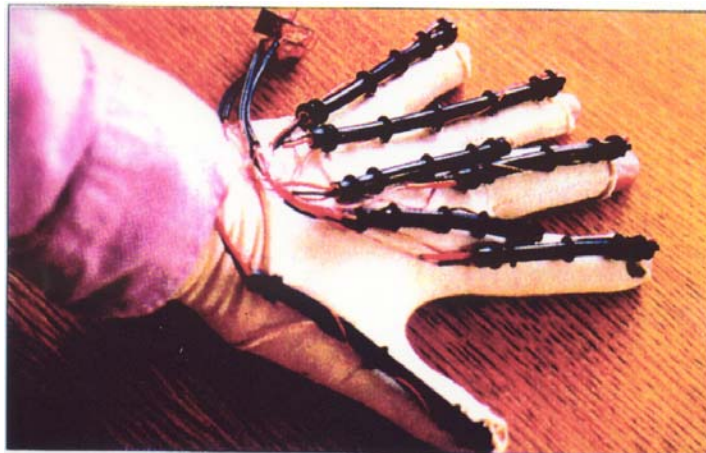
Gloves

Haptic displays

Eye trackers

Gloves

Monitor fingers position and force.

Problems with the motion of the fingers:
• overlap.
• fine movements.
• fast movements.
• rich repertoire.

Sayre glove (1976)
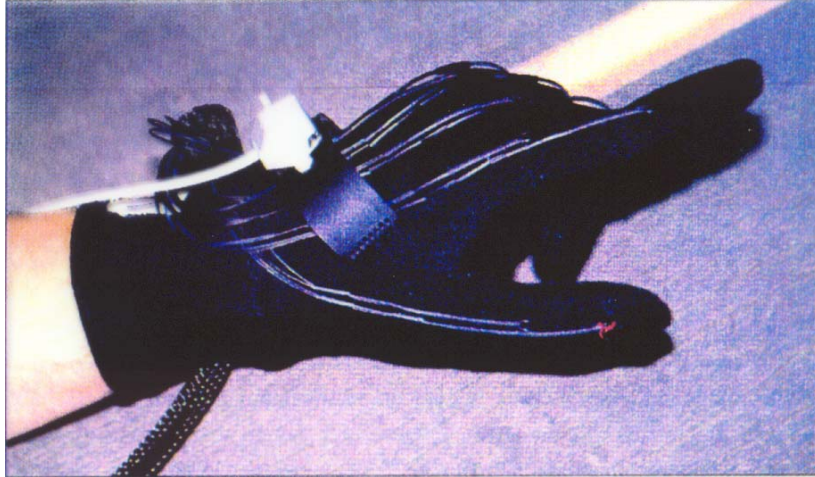
MIT glove (1977)

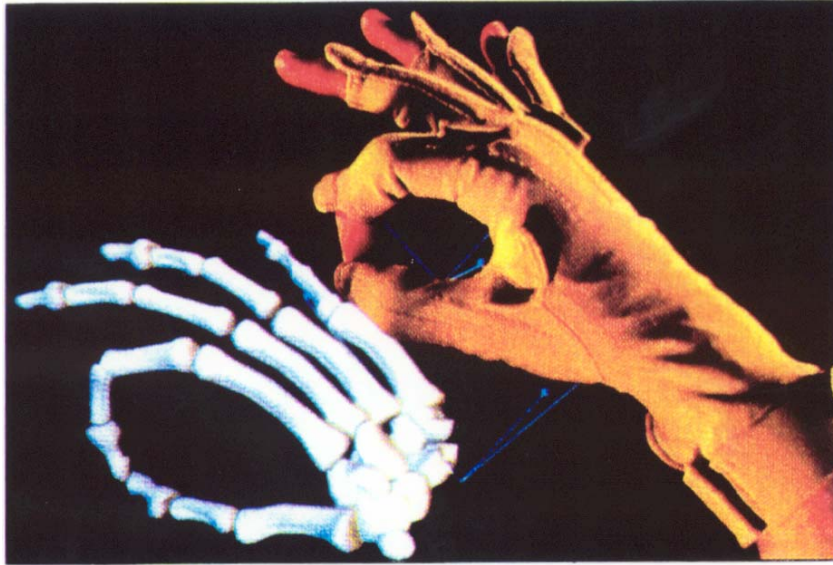## Digital Data Entry Glove (1983)

Data Glove (1987)

Power Glove (1990)

Cyber Glove (1995)

Calibration

Estimate of the geometrical parameters in the transformation operated by the sensors (e.g. the perspective transformation operated by a video-camera).

Estimate of the parameters, which describe distortions introduced by the measurement system.

Measurement of a known pattern. From its distortion, the parameters can be computed.

Algorithms adopted: polynomial, local correction (neural networks, fuzzy).

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Haptic displays

Convey to the subject the sensorial information generated in the interaction with the virtual objects: force, material texture…

Measure the force exerted by the subject on the virtual environment.

Aptic displays provide a mechanical interface for Virtual Reality applications.

Most important developments have been made in the robotics field.

Requirements of haptic displays

• Large bandwidth.
• Low intertial and viscosity.

Technological solutions:
• Direct drive manipulandum (Yoshikawa, 1990),
Phantom (2000).
• Parallel manipulandum (Millman and Colgate, 1991;
Buttolo and Hannaford, 1995).
• Magnetic levitation devices (Salcudean and Yan, 1994;
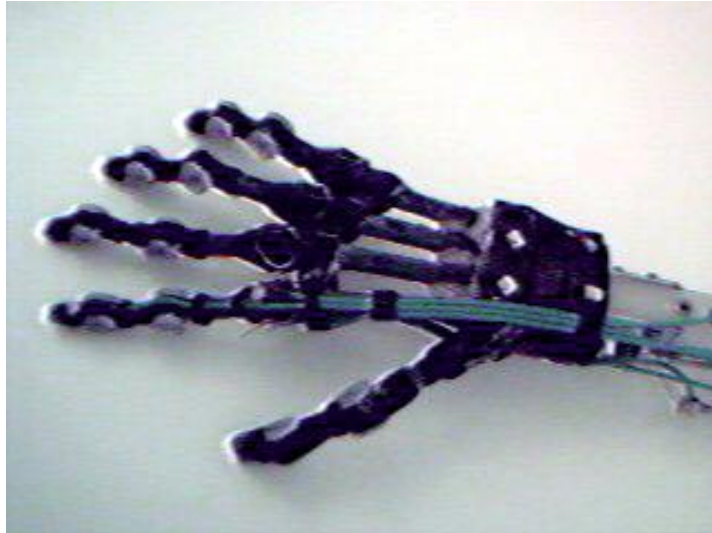Gomi and Kawato, 1996).
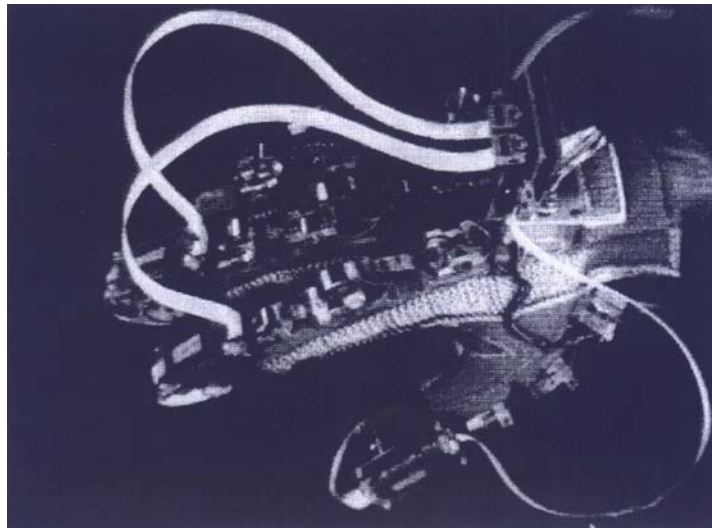• Gloves (Bergamasco, 1993).

Direct drive manipulandum (phantom)

Parallel manipulandum (schema)

Hannaford et al.
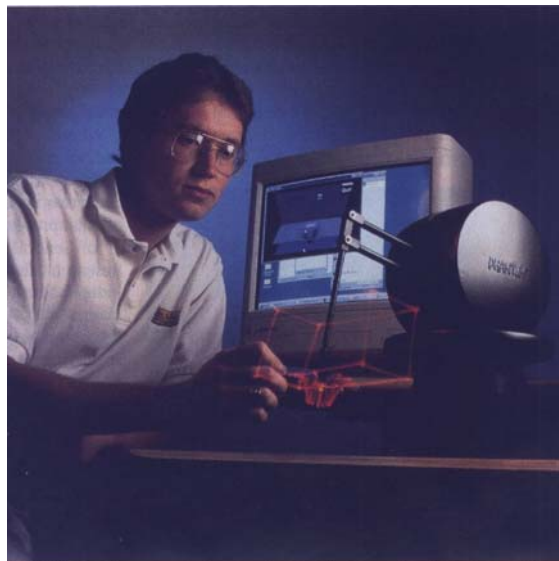
Pen haptic display

Gloves (Gini et al., Blackfinger, 2000)

Percro gloves (Begamasco, 1993)

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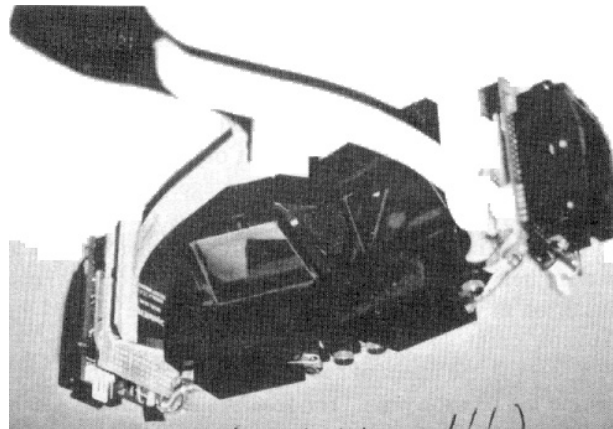
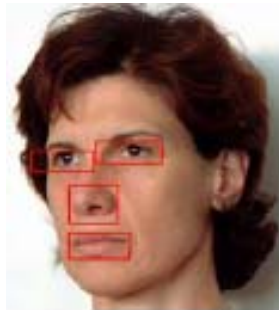Eye trackers

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Gaze input

- Contact lenses carrying magnetic coils.
- Tvcameras aligned with an IR LED source.
- Stereoscopic eye-wear.
- The direction of gaze is decided by measuring the shape of the spot reflected by the frontal portion of the cornea (Ohshima et al., 1996).

Vision based eye trackers

Color information
Geometry information (circles, relative position...)
Histogram analysis on gray level.
...

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