A Full Hand Cyber Grasp System

1. Research Team

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2. Statement of Project Goals

The goal of this project is to create a new cyber touch system, which will be able to provide tactile sensing to 29 pressure points of human hand. This is a quantum leap forward given that the best device commercially available has ability for only 5 pressure points and creates unrealistic forces on irrelevant locations of hand.

3. Project Role in Support of IMSC Strategic Plan

The proposed system is a general purpose haptics device and hence it will be related to multiple issues in the IMSC Strategic Plan.

4. Discussion of Methodology Used

The methodology has been disclosed to the IMSC Director and due to proprietary issues is not being disclosed here.

5. Short Description of Achievements in Previous Years

A haptic device for breast self examination training was successfully designed and developed during our first year of involvement in IMSC.

A minimally invasive two-finger haptic device was successfully designed and developed during the second year of involvement in IMSC.

5a. Detail of Accomplishments During the Past Year

- A conceptual mechanical design was made at the beginning of the project.
- We have designed a special actuator for the system in cooperation with a company. We will soon receive the first three units of the actuator from the company
- The dynamic hand representation software has been completed. We have created a much more elaborate virtual hand model than any equivalent model used in haptics.
- Electronics development has been going well. We now have the system for receiving and concurrently processing the 20 channel (4 per finger) analog input at a pretty high frequency. We are now building the actuator drivers and testing on a breadboard.
- We are most behind on mechanical, but due to high cost of machine shop we have refrained from sending designs to them. Our department just purchased a 2D laser

cutting machine and a 3D rapid prototyping machine. We should then be able to build most of our needed parts with these machines.

6. Other Relevant Work Being Conducted and How this Project is different

There are several haptic glove systems being developed using cables, pneumatic cylinders, etc. We are using a novel force feedback approach that has a much more realistic effect while operating at much higher frequency as compared with current systems.

7. Plan for the Next Year

- We plan to integrate the system with a global 3D positioning sensor and use a more elaborate collision detection system.
- We will devise methods for inclusion of mass inertia effects to enhance the realism of grasp.
- We will investigate various industrial applications of the system in collaboration with industrial entities.
- We will actively seek a company to commercialize the technology.

8. Expected Milestones and Deliverables

Hardware completion, May 2004
Software integration, June 2004
System demonstration June 2004

9. Member Company Benefits

The system may be commercialized and used in haptics applications.

10. References

Numerous references on virtual hand model, cyber grasp concepts and systems, and electronics data acquisition and processing are available upon request.