Problem Statements

1. The “DISCO” System

The objective of this effort, currently underway, is to provide a programmable light and sound station, for therapists and teachers to use when teaching choice-making and cause-and-effect relationships to physically and developmentally impaired children. Utilizing light, sound, videos, music, spoken-word, and tactile stimulation such as soft vibration, the station will help therapists and teachers create a positive feedback, or a calming environment for students who react positively to enhanced sensory experiences. The clients and customers are the teachers and therapists. The users are the handicapped students. The plan is to keep statistics on successes and failures during use, so that teachers can alter the experience, and use it as part of a child’s Individual Education Plan (IEP).

In preparation for this project’s use this Fall, a team of Computer Science and Engineering students piloted this project. The enthusiasm of this pilot team for helping handicapped children through the use of stage lighting, fog machines, fiber optics, water, sound, music, and video has been overwhelming and immediate. Some students have gone so far as to purchase equipment on their own to build prototype systems. Students dubbed it the DISCO system, for obvious reasons.

The Center for Handicapped Children’s Learning Center in Williamsville, NY has again agreed to allow us access to their facility for student tours and interviews. Therapists from the center will visit class. Videotaping of the teachers, therapists, and children is again expected. The Computer Science students in the Software Engineering course will be immersed in the client environment as much as possible.

2. An Augmentative Communications Device

The objective is to use software, commercial-grade technology, and an agile user interface to help speech-impaired individuals to communicate. The key to the software capability will be context-awareness, phrase completion, and an evolving intelligence that will prepare responses in anticipation of choice, in order to make the device easier to use over time, for individuals with gross and fine motor impairments. The communications device will be a readily available laptop computer with touch-screen, joystick, trackball, or other input capability, and simple audio and speaker output. Software will serve to translate simple selection into speech.

In order for the device to be used by the severely handicapped, it must contain an “auto scan” mode, in which menu choices are highlighted sequentially and a selection is made by a single switch.

3. Badge Tracking System

The Center for Handicapped Children requires that all teacher, therapist, and student activity be tracked to the minute. Therefore, they require an identity badge, card-sweep, attendance and categorization database, to track entry into and out of buses, buildings, and rooms. The system must identify automatically the person, place, and activity. It must time-stamp and categorize the activity, provide security through common-sense judgments (e.g. alarm the same person entering widespread locations within seconds, etc.).

Administrative staff will use the system for accounting purposes, to bill school districts for services. Therapists and teachers will use the system to assure that mandated therapies and activities are accomplished (e.g. that a student received three hours of speech therapy on a given day). Facilities personnel will use the system in the event of an emergency to locate all people within the facility in real time.

Security personnel will use the system to monitor normal vs. suspicious activity, and provide the basis for alarms and monitoring restricted areas.

4. A Remote Control Wheelchair
Teachers of the severely handicapped will find great benefit in the ability to control the wheelchair of a child who is unable to control it themselves. The problem to be solved includes appropriate safety measures, spatial sensing and determination, perhaps sensors in the walls to lay out safe routes, hardware control at the chair and input processing from the remote steering unit. The chair will include a camera, and the remote controller will include a video image.

5. Computer and Internet Access via a Single Switch

Design the means to navigate a desktop and surf the Internet using a commercial-grade computer and a single head-switch. See:

http://rjcooper.com/switch-click/index.html

for an example of the type of input device that is available for people with gross motor disabilities. The software that you design and write should be able to present choices that make sense, and provide the means for a person to select and acknowledge the next operation with a single click. Note: the amount of time it takes to scan and select is irrelevant, since this capability does not currently exist in any form. This system should allow the launching of any program, the specification of any target URL, etc.

This program should provide the following functionality:

• The ability to select the method for iterating through the list, such as verbalizing each element in the list, or highlighting each specific element.
• Once a program is selected, if the program requires further configuration, to present the different options and have the desired on selected.
• A simple interface for adding and removing programs. Any program can be used, such as Internet Explorer or UB Talker.
• A set of standards and the required documentation to add additional functionalty or allow the programs themselves to take advantage of certain functionality of this software.

6. Any other computer and technology-based system that you deem beneficial to this population.

Some of the other suggestions that have come from CHC, Elderwood, and Aspire include:

a. A program to manage a child’s Individual Education Plan at school and Care Plan at home – the ability to schedule, track contacts and appointments, control household tasks, speak instructions, dial the phone, provide prompting and reminders of the rather complicated life that the disabled have.

b. A single-switch music and video management program, so that people with limited motor skills can control their music and video libraries.