



Soft Keyboard for the disabled

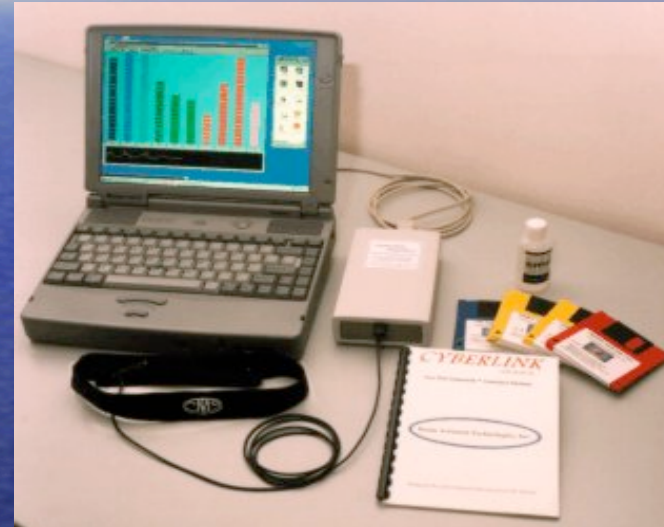
Paul Gnanayutham, Chris Bloor
and Gilbert Cockton

Introduction

- This paper discusses an investigation carried out in designing and evaluating a neurorehabilitatory communication interfaces for nonverbal quadriplegic and other clinically brain injured persons.
- In previous research brain-injured persons communicated using a brain-body interface and a computer program with simple text such as Yes, No, Thanks etc (please see reference [7][8]). This research was further developed into a soft keyboard, which gave a brain-injured person an interface to create simple sentences. The users used the soft keyboard with a brain body interface. This paper reports on the soft keyboard developed and the experimental results of this research.

Brain Body Interface

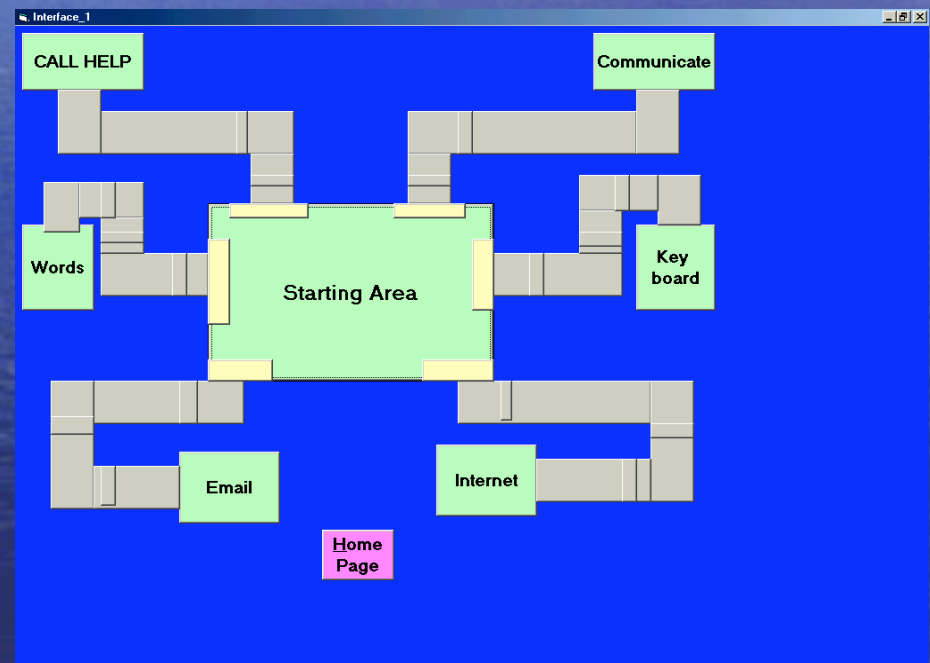
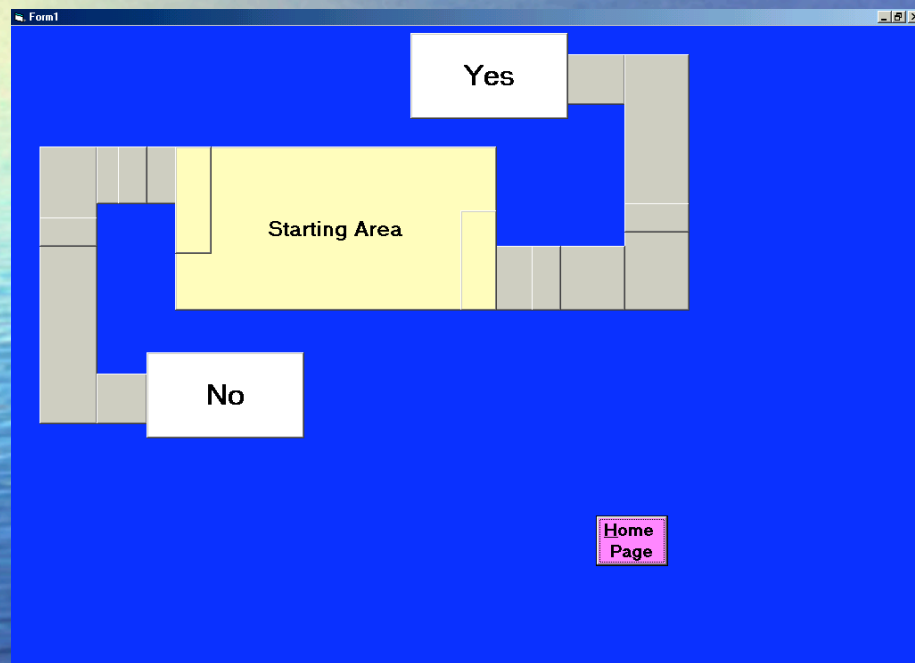
- HeadMouse™ - using wireless optical sensor that transforms head movement into cursor movement on the screen
- Tonguepoint™ - a system mounted on mouth piece
- Cyberlink™ - a brain body actuated control technology that combines eye-movement (EOG), facial muscle(EMG) and brain wave (EEG) bio-potentials detected at the users forehead
- Having considered various assistive devices this research chose the Cyberlink™ as the best device for the brain injured quadriplegic nonverbal participants.



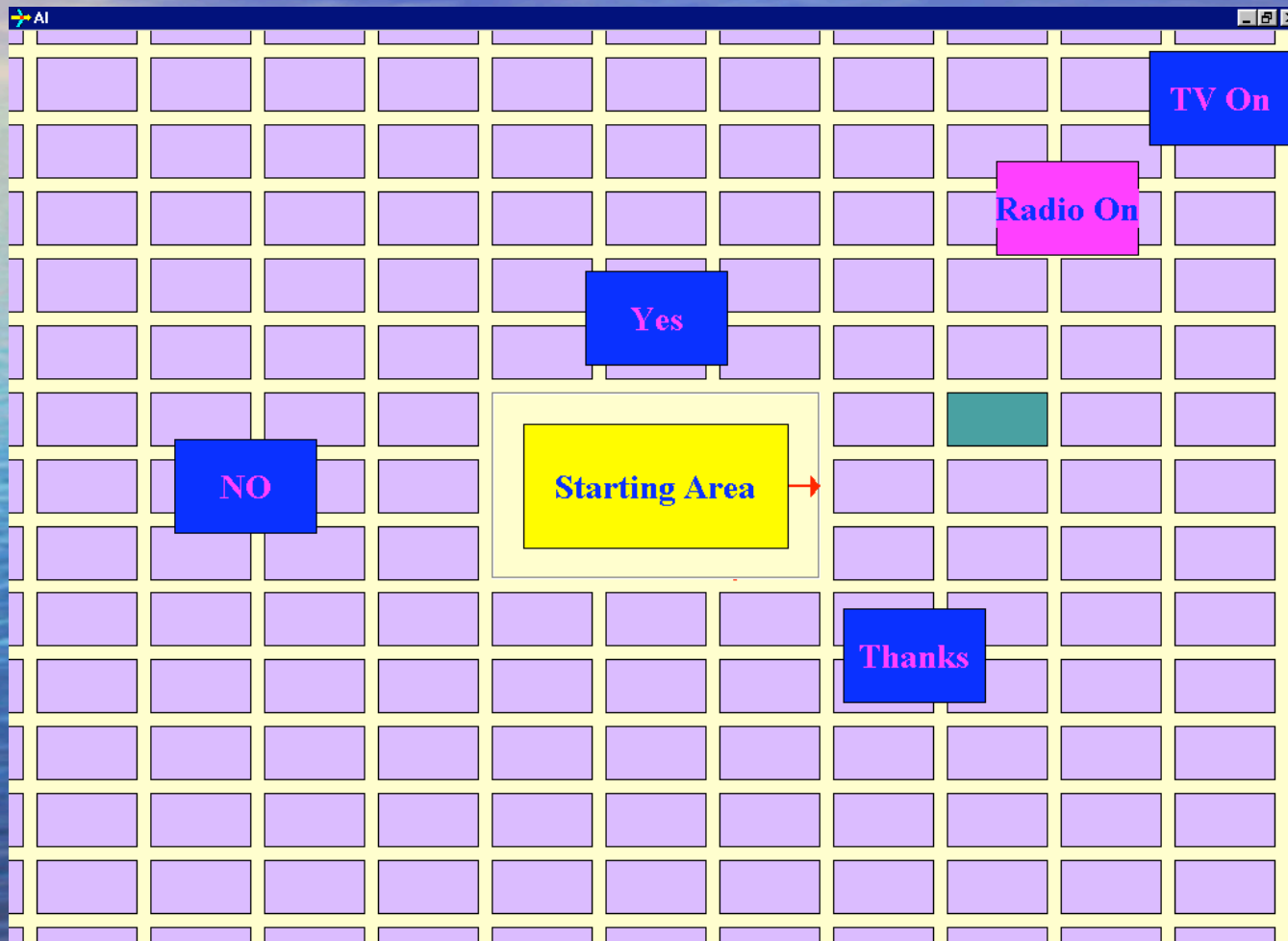
Experimental Results

- It should be noted that the investigators obtained all permissions and informed consents from the institutions, participants, and/or their guardians before research began. A wide range of research methods is used in Human-Computer Interaction
- When it came to this research, there was no specific methodology so a new methodology was developed. The approach used was one of developing a prototype interface using non-disabled people as test subjects, then evaluating the interface with brain-injured participants. This allowed better feedback at the development stage and faster development.
- The keyboard was tested with ten able participants for refining the prototype. Having designed the prototype, the keyboard was tested with five brain-injured participants. Two of the disabled participants were able to make simple sentences

Phase One of the Research – Consisted of Visual Basic Interfaces

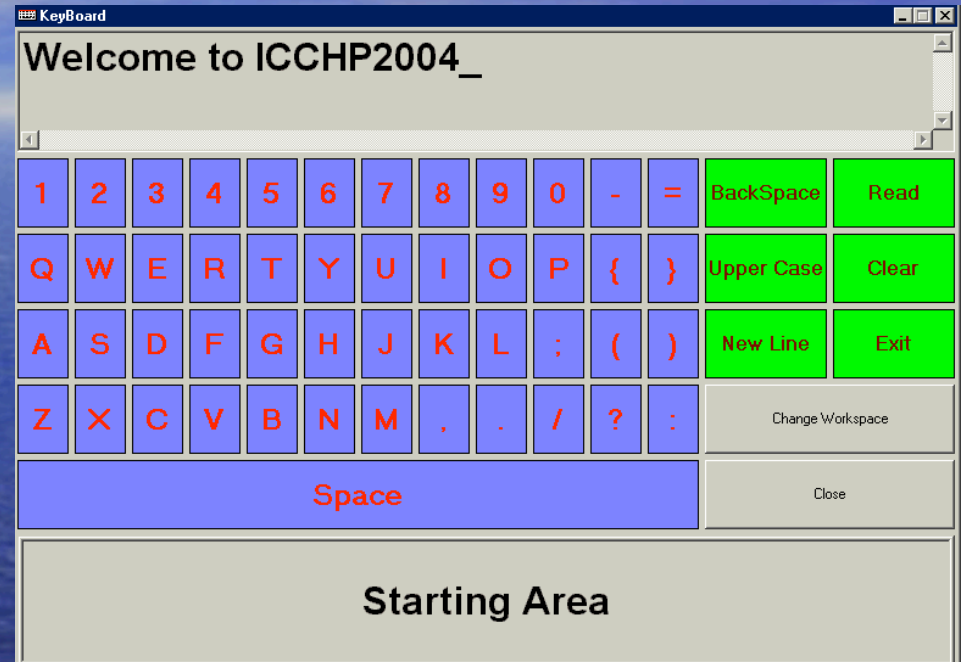


Phase Two of the Research – Consisted of C++ Interfaces



The Soft Keyboard

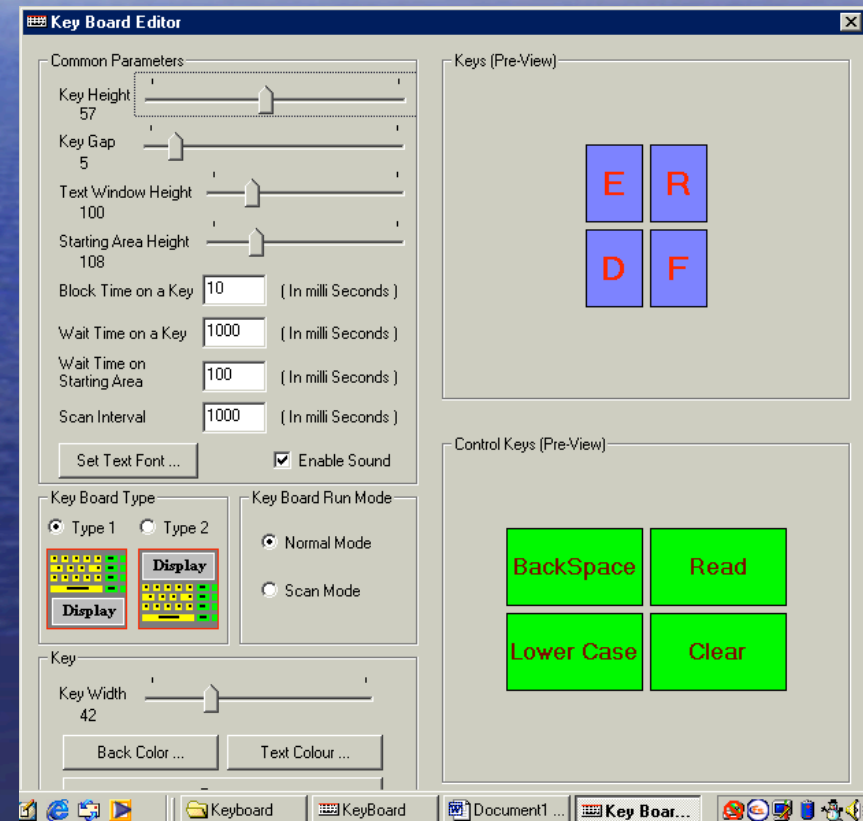
- Alphanumeric keys shown in blue
- Control Keys shown in green
- Two modes of operation, Normal or Scan mode
- In normal mode, the user moves the cursor to a key and keeps the cursor on a key for a pre-defined time. This will display the alphanumeric character, read the key in an audible voice and jump to the middle of the Starting Area. This will be repeated for each character.
- In the scan mode the keys will be scanned row by row and the user need to perform a click and choose the key. This will display the alphanumeric character, read the key in an audible voice and continue scanning.
- The control keys perform Backspace, Caps Lock, New Line (or enter), Read (reads what the user has written in the display window), Clear (clears everything in the display window) and Exit.
- "Change Workspace" and "Close", are two buttons for the exclusive use of the carer. "Close" button is to close the application and "change Workspace" button is explained in next slide.



The Soft Keyboard

“Change Workspace” button, it will open into window shown on the right. This window enables the carer to change the following parameters of the keyboard:

- Enable/Disable Sound
- Key Height/Key Gap
- Keyboard Layout
- Text Window Height
- Starting Area Window Height
- Wait time on a Key
- Wait time on the starting area
- Font



Conclusions and Discussions

- The most powerful feature of this keyboard was the “Change Workspace” which offered configuration facilities for this keyboard to set individual preferences according to the level of disability.
- This keyboard was evaluated with Cyberlink™ but can be used with any mouse or switch; hence the researcher hopes other users with motor sensory deficiencies will consider it.