

CSE 542 Software Engineering Concepts

System Specification for project 'Care'

Version 1.0

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1 Problem Statement

Implement a system so that a user with gross motor disabilities could navigate, use the desktop applications and browse through the internet using just a single head switch and a personal computer.

The user should be able to open any program on the desktop using just the single switch. The various options within the application must also be accessible through the single switch. The user must be able to change the settings and preferences within the applications as well. There must be an option to go back to the previous menu or return to the desktop by quitting the application or just by minimizing it. There must be a method to iterate through the list in order to select the desired application. The items from the list may be highlighted or verbalized in order to identify the item to be selected. The user must also be able to add or remove the programs present in this list.

The software must also be able to surf the internet using the single button. The user must be able to specify the URL of the desired websites, navigate through them and open new web pages by clicking on the links. The user must also be able to enter information on the website for e.g. entering username and password.

The user must also be able to listen to their favorite music or view movies using this switch. The system should be able to control the media player software as well. It should allow the user to select the songs or movies to be played. Users should also be able to create, edit and save their own play lists.

The software must be well documented and must follow the standards properly so that any extensions to it can be easily made in the future.

2 History / Current Solutions / Deficiencies

2.1 History

- What is Switch/Scanning?

The standard method to make selections in a Windows program is with a computer mouse or keyboard. You move the cursor around the screen by moving the mouse. When the cursor is over the item you want to activate, you click one of the mouse buttons.

However, if one does not have the physical ability to use a mouse or type on a keyboard, one can use a feature called "switch/scanning".

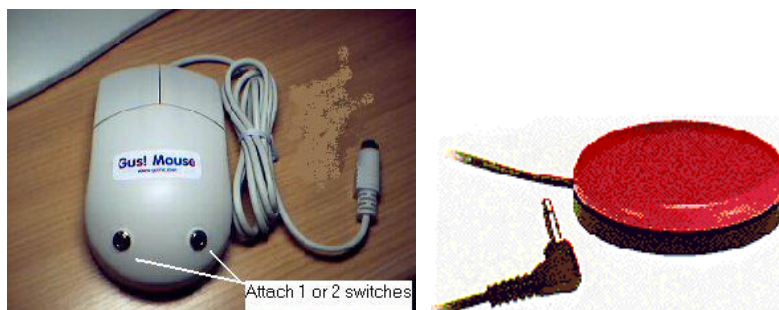
- How does it work?

Switch/Scanning is comprised of two parts. The "switch" is a small hardware device (see picture below) connected to the Mouse / Computer with a short cord. It is usually placed under a finger, toe or other body part that can be moved voluntarily to activate the switch. Once the "switch" is connected to the computer and the "scanning" mode is turned on, the user can make selections by simply activating (pressing) their switch.

- The Switch:

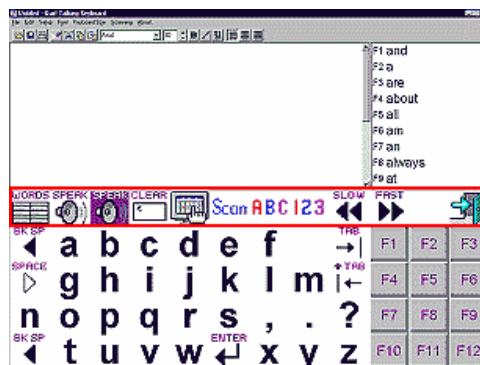
Switches come in all shapes and sizes, but the most common type is the small (2") round plastic type (see picture below). The "switch" is connected to the computer by plugging it into the Mouse which has two special jacks built into it. The Mouse is, in turn, connected to the standard mouse port on the computer. Now that you have your "switch" connected to the computer (by way of the Mouse), you are ready to begin "scanning." Some switches can be connected to the computer directly by USB port.

Connect the switch (right) to the Gus! Mouse (left)

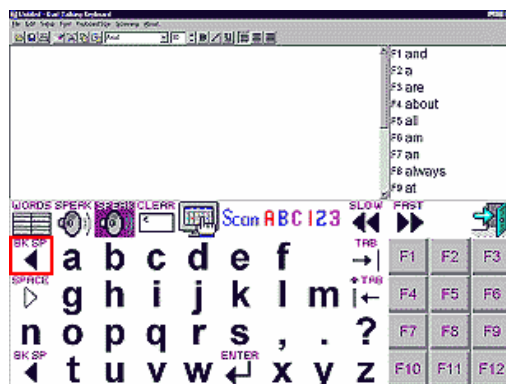


- Scanning process

The term "scanning" describes the manner in which items on the computer screen are sequentially highlighted, one after the other, until the user activates the switch to make their selection. In other words, the computer offers the user a series of choices which can be selected by pressing the switch. The most common scanning sequence is called "row/column scanning". It typically involves highlighting one row after the other until the user presses their "switch" when the desired row is highlighted. Then the scanning sequence moves across the row, highlighting each item within the selected row until the user makes their selection again.



Row/Column Scanning begins by scanning each row one after the other. The user simply activates their switch (or left mouse button) when the row containing their desired choice



After a row is selected by activating the switch (or left mouse button) the scanning sequence begins to scan item along the selected row. In this example, the 2nd row was selected and now the scanning is moving along each item on that row.

The user simply activates the switch again to make their specific selection, which sends the selected letter to the document. Once the letter is selected, the scanning automatically reverts back to row by row scanning (as shown above). If

a word from the word rediction list box is desired the user simply selects the function key (eg. F8) adjacent to the word (eg. "always").

2.2 Current Solutions

- WinSCAN (The interface):
WinSCAN provides users of single-switch input devices independent control access to educational and productivity software, multimedia programs, and recreational activities that run under Windows 3.1 or Windows 95/98 on IBM and compatible PCs. WinSCAN works with most external adaptive switches and the popular SS-ACCESS single-switch interface cable from ASI.

- SS-ACCESS (The switch):

SS-ACCESS is a single-function, single-switch interface solution for user PC and Windows 95/98 and/or MS-DOS 3.3 or higher. Easy to install, simple to use, and compatible with the widest range of computers and application programs. One can choose a keystroke, function key, combination key command, or mouse click to be sent to the single-switch application program each time the user presses the switch. Adjust the repeat rate and dwell time (i.e., the activation delay) to suit the abilities of the user. SS-ACCESS is designed especially for new Windows software and older DOS programs from ASI, Edmark, Laureate Learning Systems, and other publishers who provide built-in single-switch accessibility features and scanning controls.

2.3 Deficiencies of the current solutions

- Do not provide a simple interface to browse the internet
- The current cost of the solutions is very high.
- The software platform on which the solutions were developed are older and hence does not take advantage of all the current available technologies.
- Does not support multimedia applications
- Is restrictive and does not support future expandability

3 Functional Requirements

3.1 Desktop Navigation

The system should allow the user to navigate through the desktop. The user can provide input only with a single switch and all features provided should be accessible by using just this single switch. It should provide a way by which the user can browse through the programs available on the computer. The user should be able to select and open the desired program.

Once opened the different options within the application should also be accessible just by a single click. The user should be given unambiguous options to choose from, which will help them complete their task. The options should be selectable from a list where the selected element is either verbalized or highlighted. The user should be provided with the option of going back and changing their selection if a wrong choice is made.

3.2 Internet Browsing

The system should allow the user to browse through the internet. It should allow the user to specify their desired URLs. Once the required page is loaded the user should be able to navigate through the content. The user should also be able to access the links on the webpage and open them. If required the user should also be able to enter information on the webpage. The system should also let the user to save for later use, a copy of the webpage that they liked.

3.3 Multimedia Applications

The system should allow the user to access their multimedia files. The user should be able to play their music and video and should include common feature like play, pause, volume control, next song, previous song, etc. It should also allow the user to browse and search through the library of songs stored on the computer and select and play the songs from the library.

A phone dialer application should be provided, which will allow the user to dial a phone number or call a stored phone numbers. The user should be able to talk using the speakerphone.

3.4 Remote Management and Logging

A supervisor should be able to monitor the activities of the user. This supervisor can either be in the same room or should be able to monitor from a remote location. The system should also allow for logging of the activities of the user which can be later be replayed and analyzed.

3.5 *Appliance Management*

The system should be able to control different household appliances. It should be able to support simple tasks of turn on and off things like the lights in the room. It should also be able to provide additional control over other appliances, like setting the temperature of the house.

3.6 *Easy Expandability*

The system should be flexible enough to provide for easy addition of functionality as required. Hence well documented standards would be required so that the modifications and expansions can be made with ease and minimum interference to the current features and settings.

4 Relevance and quality of life

4.1 Relevance

- The system provides a single point interface that users can operate anytime in all applications.
- Single switch device can be used with a variety of applications such as internet browser, text editors etc to provide context specific options.
- In contrast to other input devices a single switch system device provides a simple and easy to use interface.
- A single switch can help handicapped students because of their limited movements.
- Access to the internet can help them learn and improve their skill sets.

4.2 Quality of life

- Learning time for the students can be minimized by use of the system.
- Teaching & making students understand can become easy for the teachers and family.
- Help students develop new skills.
- Help students develop a sense of independence.
- Enable students to explore the internet.
- Help students interact with people having similar disabilities over the internet.
- The proposed system will be a great benefit since it will remove the need to manipulate physical books and papers which may be difficult.

5 User Profile and Deployment Environment

5.1 Users

- **Students**

It is difficult for the students to use the computer with the regular interface due to their gross motor disabilities, although these students may have good mental ability. These students have poor sense of body position and poor coordination of muscle groups. Hence these students find it difficult to select programs, use them and connect to the internet using the normal mouse and keyboard. Thus we want a system which can give the students just a single switch for all operations. This can help such students use the computer effectively and also help them communicate to their family and therapists. The students could also use a telephone in case of an emergency and even control the household appliances using the system. This will give them a sense of independence in doing small regular tasks.

- **Teacher and therapist**

This software has to be used by the teacher/therapist for teaching the student how to use the software and to make the user understand its use. It is difficult for the therapist to understand the learning pattern and the liking of the student, or even if the student has actually learnt how to do a particular thing, such as use a particular program or the use of the internet. It is also difficult for the therapist to understand the complete pattern too as the student may not use all the features in front of the therapist. Hence we want a system so that the therapist can monitor the usage by the student even when the student is not around.

- **Family**

The family of the student may help the therapist by teaching the student how to use the software. The family can help the student use the computer. The family also wants to know when the student is in some emergency and also understand what the student is communicating. Thus from the family point of view, we want a system which can help the student communicate with them.

5.2 Deployment environment

- The final deployment environment would be classrooms with windows XP installed PC's.
- The application can be can be shut down or restarted abruptly by the users. Safe exit procedures may not be followed by students.
- Hardware, if any, must be electric shock and fire proof as the students have gross motor disabilities.

6 Constraints

6.1 Technical

- The software developed should be compatible with Windows XP and later windows operating systems.
- Applications must have minimum RAM requirement of 256 MB or less.

6.2 Schedule

- The project has to be completed and delivered within 1 year after the project contract is signed.
- The first demo of the suggested system must be given within 3 months.

6.3 Budget

- The total cost of the system should not exceed \$20000.
- Payment will be done after the approval of deliverables as expected by CHC.

7 Project Deliverables

For our project, following are the project deliverables:

7.1 Software

- *Installation CD*: A CD with installation binaries and installation guide.
- *Code*: Complete versioned source code in application structure.
- *Device drivers*: Hardware device drivers, if any.

7.2 Documentation:

- *HLD*: High level design document
- *LLD*: Low level design document
- *Test Specification*: Test specification and test results document.
- *User's Guide*: Easy to follow user's guide including the all the functions, features, and sample demos.
- *Administers guide*: Guide for installation, configuration and error resolution information.

7.3 Training and support

- *Installation*: The initial installation at the site to be implemented.
- *Onsite training*: Onsite training to be provided for installation, use and administration.
- *Maintenance*: Maintenance of the system for 1 year after the final acceptance of the system.

7.4 Hardware

- *Switch*: The single switch and the hardware necessary for the interface between.

8 Future plans and expandability

8.1 Customization

As of now, the software requirement does not impose any restriction on the time needed to scan and select from the list. But as the system develops and users become comfortable with it, it will be important to minimize this scan time. The following could be added in the subsequent phases:

- The software must be self adaptable and must be able to customize the scan time with respect to the level of comfort and understanding of a particular user. It must also record the average response time for each user to hit the single click so as to monitor their physical progress.
- The system requires only a single button to take input as of now. In further implementations two such buttons, one for each hand may be used if required. These buttons would be like the right and left click buttons of a mouse. These switches can be used to control two different lists, in order to reduce the time to traverse, select or cancel options.

8.2 Language support

The software, as of now, is expected to have only English virtual keyboard to take input from user. It may be necessary in the future to support for different languages like Chinese, Devanagari etc.