Software for the visually impaired

The image of a computer keyboard and screen is so universal that the idea that a computer can communicate with its user by other means rarely, if ever, crosses our minds. However, for the visually impaired, a computer screen is of little or no use as a means of conveying information. Synthetic speech systems have thus been developed to 'read' computer outputs to visually impaired readers. Here, Crista Earl and Jay Leventhal of the American Foundation for the Blind give an overview of how such systems work. Then, along with Gisela Dimigen and Mike Burton of Glasgow University, and Archie Roy of the Royal National Institute for the Blind, they review how leading screen readers fare when interpreting the output from statistical programs.

A Screen Reader Solution for Accessing SPSS 9.0 Without Sight

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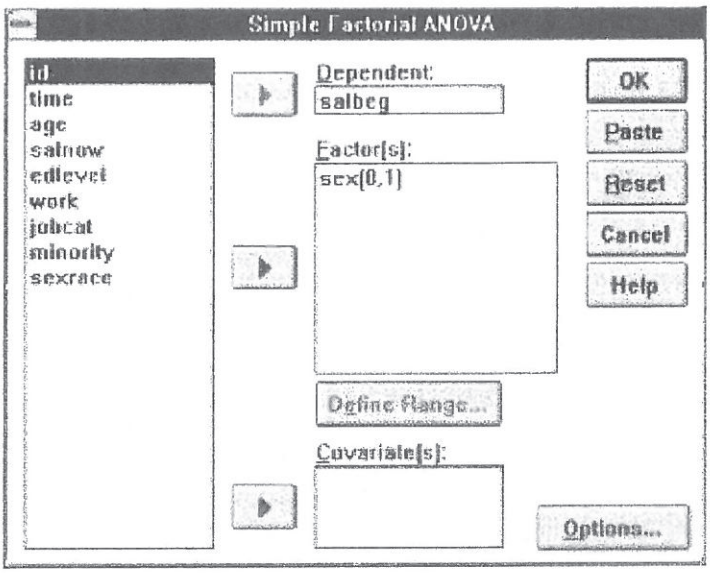
Two previous articles in this collection[1,2] discussed how a blind person utilises a computer and how successful this is in the case of SPSS (an internationally well known program, designed to deal with data management and statistical analysis), outlining various serious software barriers to access.

Screen readers that cater for both synthetic speech and Braille reach a larger blind population than screen readers that use only one of these methods. So JAWS, which is such a screen reader, was assesed for its ability to deal with the demands of SPSS. The window version of SPSS is very userfriendly and therefore popular amongst sighted students. With the advent of window-based screen readers that allow Braille and speech output of the screen content, blind students have also tried to use SPSS. It was concluded that many features of SPSS can be easily accessed by blind users through JAWS, features such as the data entry grid, the menus, and large parts of the dialogue boxes.

Since screens in SPSS are arranged in grids, we began with the manufacturer's Window-Eyes set file for Excel 97. We created or adjusted existing Window-Eyes hot keys to read the cell name, the cell contents, and the status line. These hot keys read "windows," or zones on the screen which consistently held the information we were looking for, and allowed us to find a particular cell and its contents. Since SPSS allows navigation within the grid of data, we then set the arrow keys and tab key to read the cell address followed by the cell contents. This way, as the blind users navigate from cell to cell, relevant information is read. This conventional approach taken by screen readers to reading spreadsheets has apparently proved effective.

However, reviewing tables in SPSS presents difficulties and therefore tables have to be exported into Excel or Word (notepad), where the column and row headings are announced for each single cell, making scanning of tables easier than in the SPSS format. Much more serious problems are encountered when using the dialogue boxes. An example of a dialogue box in a simple factorial variance analysis (ANOVA) is shown below.



The problem is the arrow buttons, which are vital for selecting a variable for a statistical analysis by putting the selected variable into another area of the dialogue box such as "Dependent List" and "Factor List". A sighted user can easily control these buttons by a mouse. However, the blind user has no equivalent keystroke which would tell him which button he is on and in which direction the arrow is pointing. In effect a blind user cannot use SPSS without the help of a sighted person. We have therefore attempted to make these control buttons (and hence the dialogues) accessible to blind users for the first time.

The problem is two-fold:
Firstly, SPSS dialogues are not consistent. Blind users use the tab key to navigate around a dialogue box. However, in some dialogues the Tab key misses out a button. In such cases a blind user who tabs around the dialogue will not be aware of this essential control.

Secondly, in many SPSS dialogues there are more than one arrow button. In fact there can be up to four identical buttons (three in the case illustrated). Simply announcing the button as 'arrow button' would not enable the blind users to tell which button they are on and what happens when they press it.

We have now overcome both these problems. JAWS scripts not only announce all arrow buttons but also analyse the content of each dialogue and announce whether a variable will be added or removed, and which list the variables will be added to or removed from. An example would be 'add salbeg to dependent variable list' or ' remove variable sex from factor(s)'. Furthermore, special, context sensitive help messages guide the blind users through the dialogue boxes. In addition, a more extensive online manual is available by a special keystroke.

The export of SPSS tables into Excel and Word and the re-entry into SPSS

has also been speeded up compared to the method suggested by Earl and Leventhal[2] by creating a single keystroke for these procedures. The blind user can now review the content of a table quickly before returning to another data analysis.

The developments to make SPSS accessible to blind people either by Braille or by speech are now complete. We tested the SPSS configurations on Windows 95, Windows 98 and Windows NT Version 4 and we are making our configuration of Jaws 3.2 and 3.3 with SPSS 7.5, 8 and 9 more widely available.

Future developments will have to extend access to graphical information as well, such as graphs and 3D plots. The Departments of Computer Science and Psychology at Glasgow University are presently researching this possibility by using techniques from Virtual Reality.

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