1. Introduction

-An investigation was undertaken which sought to determine what sort of methods could be employed to improve the usability of computers for the elderly.

-The investigation narrowed the scope of computer usage down specifically to web-browsing. Thus, the techniques determined to make web-browsing simpler, are likely able to be extrapolated to the task of making computers generally more usable for the elderly.

-Voice recognition was perceived to be one way of improved computer usability for the elderly. Thus methods of voice referencing and visual annotations were specifically investigated.

1. Aim

Primary aim:

-Determine which of two voice referencing techniques performed better as a means of referencing links (with regard to correct command-result outputs).These referencing techniques being:

* Numerical voice referencing : Assigning a sequential number to each link on a page and allowing users to reference links by specific numbers.
* Spoken link name referencing: Links are referenced by a specified word within the link name

-Additionally, determine what techniques are preferred by the user (numerical or spoken link name referencing)

Secondary aim:

-Determine what sort of visual techniques can be used to improve the usability of the internet

-Feasibility of using online voice processing API????

1. Contextualisation

-Older people in some countries are said to have more disposable incomes [ref] and more time on their hands.

- Older people however often suffer from particular ailments (such as arthritis) which inhibit their use of computers (which could be use to order groceries for those incapable, entertain, conduct financial transactions, or communicate).

-With time, more and more of the elderly will be computer literate and thus need to be able to operate computers with ease if they are to maintain a good standard of living.

-Voice recognition is one of the ways that the elderly can be aided in their use of computers

1. Methods

Iteration 1

-discuss non computer literate thus need for sequestional test which isolates variables.

Iteration 2

Iteration 3

1. Analysis

**Solving primary aim:**

**Performance of referencing styles:**

-Figure x below shows the percentage errors made for each iteration as shared between the numerical referencing system and the name referencing system. The main conclusions from this data are:

* Numerical referencing experienced more errors in the first, simple, iteration. This is probably because the first iteration tested the numerical method first without warm up (meaning higher errors may simply be a result of the accustomisation period)
* The second iteration saw fairly equal error rates between numerical referencing and spoken name referencing. Since a warm up round for each of the techniques was now allowed, these results are more reliable than the first iteration. However, the smaller sample size does detract from the trustworthiness of the results.
* In the 3rd iteration, numerical referencing seemed to perform better than spoken link name referencing. This indicates that having a predefined, familiar, vocabulary (i.e. set numbers) contributes to improved speech recognition performance.

**Preference of referencing styles**

-The preferences ,as polled from users, is given below in figure X. The following results can be concluded from the given figure:

* The results of iteration 1 indicate that most users prefer using the numerical referencing technique, even thought the technique experienced more errors than the link name referencing technique in the earlier iteration. This could be due to the fact that most of the test (additional visual testing) was conducted using the numerical method. This could have biased users towards this method.
* The latter two iterations, show no strong inclination towards either referencing technique. This indicates that on more complicated sites, either technique will suffice. However, in light of iteration 1’s results, it could infer that simple web-pages are more suited to numerical referencing.

-testing hybrid

**Solving secondary aim**:

See section xxx for visual stuff...

**Additionally noted results:**

**Error rate with age increase**

**-**The error rate for the elderly was expected to increase, and indeed did for all iterations as is indicated in Figure XXX. However, two anomalies can be noted. For one, there is no error rate indicated for 55-65 year olds in the second iteration. This is because no-one from the age group was tested for the second iteration. Also, the third iteration shows that the 75-85 year old category experiency the best performance. This is because only one person from that age group was tested in that round and they spoke exceptionally clearly.

-More samples are need to conclusively prove the point, but the results do sufficiently indicate the general trend of decrease recognition performance.

**Women vs. Male**

**-**The average errors per gender were recorded for each iteration. There seems to be a significant performance difference between male and female voice recognition performance results.

-This indicates that special attention especially needs to be paid to elder female users. For instance, the voice recognition engine may require special training for elderly women.

-It should be noted however that that there were significantly more female than male test subjects in the conducted experiments. This result could thus be an anomaly.

1. Future work

–Future work could include investigations into the following:

* Creating more significantly more complicated websites that use a combination of numerical and spoken link name referencing and observing performance and preference.
* Website section referencing and if section colouration can be used to imprive the clarity of different sections.
* The use a ‘smarter’ command analyser which picks up alternative words for the the same thing (eg scroll down and down could be interpreted as the same thing)
* Seeing how performance can be improved by using a stand-alone speech engine trained specifically for the elderly (and specifically for male and female).
* Investigating how best to enable users to enlarge (“zoom”) different portions of the page.
* More comprehensive browser control with voice (implementing a voice recognition plug in).
* Developing a generic way of identifying keywords in links etc.

1. A word on implementation

?

1. Conclusion

-An investigation into voice controlled web-browsing was conducted as a means of determining what techniques can be used to improve voice recognition and user experience.

-Numerical referencing of links seemed to have a worse performance with less complex pages and a better performance on more completed pages (compared to spoken name referencing).

-Numerical referencing was preferred on smaller pages but became more comparable to name referencing in preference for larger pages. This suggests that a combination of numerical and spoken link names might work well together.

-VISUAL PREFERENCE...

-In general, age seems to have a significant affect on the performance of voice recognition. Specific models should be developed for handling the elderly voice.

-The results indicate that males tend to have less trouble with the used voice recognition engine. This may also indicate the further need for engines to be specifically modified to handle elderly females and the mistakes they generally make.