

content will still be difficult to navigate.

## 5.DISPLAY TECHNIQUES

The final technique that will be documented is that of modifying the way the content is interpreted when it is displayed, without actually modifying the content, contrary to the previous two categories of techniques.

This is an area that is being very actively researched, however, there have yet to be any commercial web browsers that exploit the following covered techniques.

### 5.1The Gateway

The Gateway[8] is a method of displaying a full page on a small screen without employing any modification of page layout or content (an overview transformation[3]). The advantage of this is that there is no possibility of making page content inaccessible or altering its meaning.

The Gateway works by scaling a full rendering of the web page to the dimensions necessary to fit in a single screen on the target display. The page remains static and a user can select parts of the content that would like to view in additional detail, at which point it provides a full-scale view of that particular component. Figure 3 shows The Gateway in use.

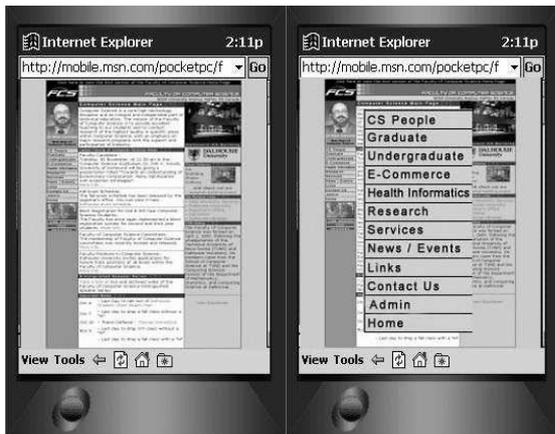


Figure 3 – A demonstration of The Gateway (images from [8])

Initial research shows that users prefer using the Gateway to approaches that use linear migration[3]. The research in paper [3] also suggests that users preferred direct migration to linear transformation. This research only had ten participants however, so no valid conclusions can be drawn from this. It is unlikely that direct migration is a more popular method of display than linear transformation, due to its usage and showcase in the popular Opera web-browser[4] and the Minimo web-browser[6].

### 5.2Transparent Widgets

Transparent widgets are less of a display technique and are more involved with the interface in which web content is displayed. It is suggested[2] that available display space can be maximised if control widgets (e.g. the back and forward buttons in a browser) are displayed semi-transparently over

page content.

The added complexity of navigation this technique introduces will rarely warrant the display space it affords, however, the idea of transparent widgets may be useful if implemented in a different way. The paper[2] admits a learning period and high initial error-rates with the chosen implementation, which would not be acceptable in a commercial product.

### 5.3Flip Zooming

Flip Zooming[11] is a technique very similar to The Gateway[8]. It employs a zooming view of the document and also removes all scrollbars, similar to The Gateway. To achieve this, pages are broken up into pieces that fit on the target device display. The currently focused piece is displayed at the original zoom level in the centre of the display, surrounded by the other page pieces, displayed at a much lower zoom level. Shortcuts are provided for switching between the next and previous pieces, as well as being able to choose a piece directly by selecting it with the pointing device. Figure 4 shows Flip Zooming being used on a prototype browser with a 160x160 pixel display, vs. direct migration on the same display.

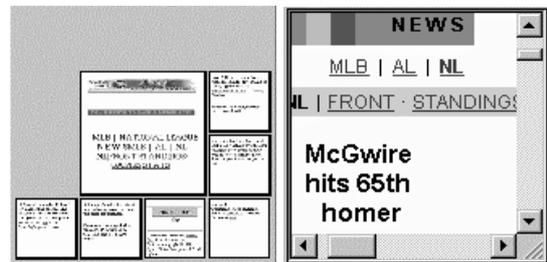


Figure 4 – Flip Zooming vs. Direct migration at a resolution of 160x160 pixels (images from [11])

The process of splitting a web page into cards requires some analysis for those pieces to contain relevant information, and thus for the technique to be useful. The implementation in paper [11] used a simple lexical analysis algorithm. It was found that the unfocused pieces were too small to be of use unless a user had previous knowledge of the layout of the page, and so further techniques were used extract content, such as those discussed earlier in this paper.

A disadvantage of this technique, as with using transparent widgets, is that there is a considerable familiarisation period. An ideal solution would be intuitive enough to be obvious on first glance how things work, or require very minimal discovery. Some of the problems covered in paper [11], such as unfocused pieces being unreadable, may not be valid on a display with a higher resolution, as are becoming common in recent hand-held devices.

## 6.A COMBINATION OF TECHNIQUES

Based on the information gathered on the previously examined processes and techniques, I suggest that a combination of these may be the best way of making general web content more accessible on small screens.