Concise: A Responsive Data Overview for Small Spaces

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Abstract—The presented work aims to provide an exploratory interface of limited data points with a focus on small screen displays. This interface acts as an overview of the underlying information—a method for simple analysis.

Index Terms—Mobile devices, information visualization, small screen display, user interface, usability.

1 Introduction

The "Concise" application is an interface that explores various data points of the US Census data for the year 2000. It takes income and persons in household as input; taking these input data points, it finds the percentage of income spent on housing and the household language that best match those criteria.

The goal of Concise is to use a small amount of screen real estate to explore data in an efficient and responsive way. Concise uses the iPod resolution (220 x 176) and color depth (16-bit) as its test scenario.

2 The "Concise" Interface

This interface uses very simple methods for exploring data points. It works on two axes: the horizontal determines the household size and the vertical selects the income level. The user is able to drag the vertices of the triangle to control the length of these axes. The longer the length, the greater the value of the associated variable.

The output is displayed in two ways. The household language is displayed at the top of the triangle (using the top vertex to "point" to the output value). The other output value, which is the percentage of income used on housing, is displayed as a larger bar overlain on the income controller axis. The size of the output bar is the actual percentage of the overall income controller bar.

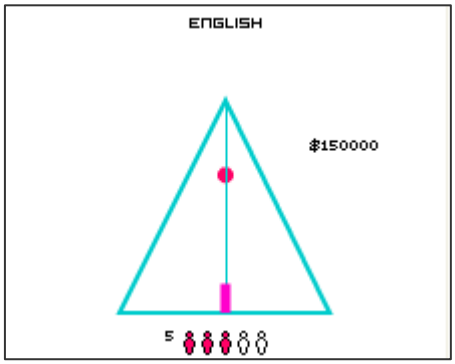

Fig. 1. Concise interface showing English as the major language for households of five with and income of $150,000.

When addressing the issue of the small screen interface, both input and output methods must be optimized. The Concise interface serves many purposes in its limited real estate.

2.1 Types of Data

Both input data points are numeric interval data. This simplifies input as a number of methods could be used to enter this information. I decided upon the "slider" type of control for its cognitive aspects. The length of the slider is readily translated into magnitude of a variable. Both the height and base length of the triangle are used as a slider.

As the "persons" controller is dragged, the value increases or decreases. A person icon is displayed for each person in the household. A text value is also presented. The icons visually display the quantity rather than requiring the user to process the number symbol.

The input value of income is represented both in the height of its controller bar and as a textual number.

Output data is both categorical: household language spoken (English, Spanish, etc.), and numerical: percentage of income used for housing. The categorical data is displayed as text and the numeric data displayed as a length. The length of the display is based on a percentage of the bar beneath it.

2.2 Input as Output

The input interface of Concise also acts as an output view. As the user interacts with the input mechanism, the same device acts as a display for relevant data. For instance, when the user adjusts the number of persons in the household, the income bar displays a dot to indicate the average income for households of that size. By displaying data within the actual controls, we can make the best use of the limited screen real estate.

The "income" controller also acts as both input and output. As the user drags this bar, the level of income increases or decreases. Additionally, it modifies the "persons" controller to indicate the average household size at this income level. The pink person icon indicates the average household size and the outlined person icon indicates the user selected household size. By overlaying these two values, we make the most of our limited space—two variables are being displayed at once.

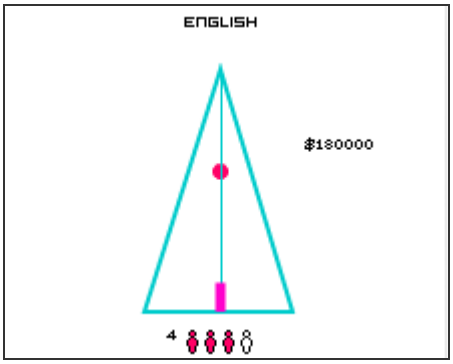

Fig. 2. Average income displayed as a pink dot and average household size displayed in pink.

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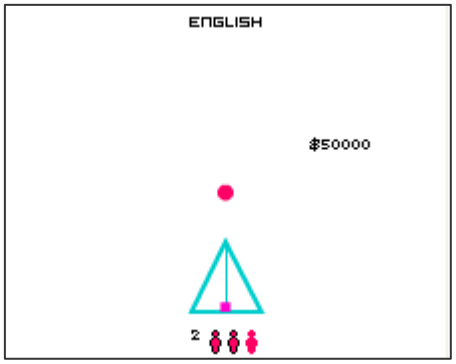

Fig. 3. Average income is higher than the selected value and average household size is greater than the chosen value.

2.3 Side Effects

A subtle yet interesting side effect of this interface is the shape it creates. By dragging the vertices of the triangle, one can achieve squat triangles, tall and thin, as well as other sizes of triangles. These shapes act indicators themselves of the data represented.

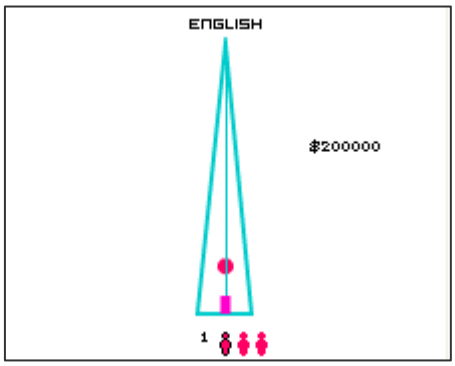

Fig. 4. A high income and low household size causes the interface to be tall and thin.

3 Exploring the Small Space

Designing Concise illuminated a number of issues regarding the small space. The size of the space not only affects the visual design of a system, but also the cognitive factors of usability.

3.1 The User Factor

Responsiveness is paramount in an interface that displays small amounts of data. The user needs very little time to absorb and understand the output presented in Concise. There are only four variables to analyze. Therefore, the user is able to quickly move from analysis to input and can rapidly vacillate between the two. As such, the interface must be as responsive as the user is active. If the user were made to wait for data update, the loss of immediate gratification would dissuade the user from exploring data.

Achieving this level of responsiveness depends upon both processing speed and size of data. The data for Concise was aggregated from the census data. In this sense, we are anticipating the user's intentions with exploring the data. By consolidating data we can query the database expeditiously and quickly update the user's interface.

3.2 Visual Aspect of Devices

Designing for device interfaces and other small spaces poses unique visual display issues.

3.2.1 Color Depth

While the Concise interface is represented in 16-bit color, it could also be presented in grayscale or with a limited color palette without diminishing the information presented. Size, length, shape, text, and icons all contribute to conveying the information. Color certainly helps the user distinguish elements from on another, but it is in no way necessary.

3.2.2 Screen Resolution

The screen real estate is obviously a major factor for devices. Some of the hurdles in this realm can be alleviated by input devices. For instance, a touch screen allows for more freedom of user input than a clickwheel.

3.3 Limitations of the Interface

The proposed interface is obviously not suitable for substantial data analysis. It does not represent a view of all information; it merely provides an overview of the data.

4 Conclusion

While small screen displays pose issues for displaying complex data, the limitations also help create novel approaches to conveying information. The concept of Concise is simple and can be applied to various types of information. Also, multiple Concise interfaces could be used in conjunction to encompass even more data points. It could also be used in even smaller spaces.

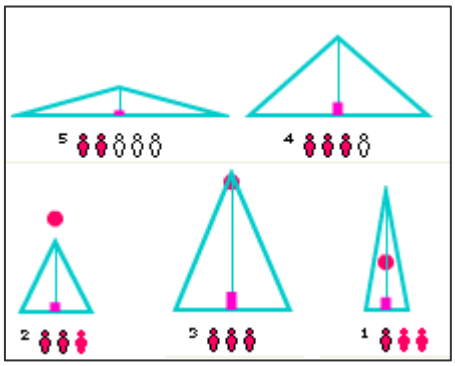

Fig. 5. Numerous Concise interfaces in one small screen.

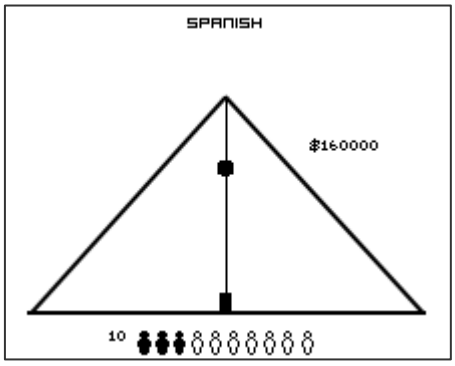

Fig. 6. Interface presented in black and white without loss of integrity.