A Toolkit of Context and Resource Sensitive Widgets

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ABSTRACT

Most human-computer interfaces are designed to run on a static platform (e.g. a workstation with a monitor) in a static environment (e.g. an office). However, with mobile devices becoming ubiquitous and capable of running applications similar to those found on static devices, it is no longer valid to design static interfaces. I have designed a user-interface architecture which allows interactors to be flexible about the way they are presented. This flexibility is defined by the different input and output mechanisms used. An interactor may use different mechanisms depending upon their suitability in the current context, user preference and the resources available for presentation using that mechanism.

KEYWORDS: Context Sensitive, Multi-Modal, User-Interface Architecture

BACKGROUND AND AIMS

Many modern applications are designed to run on powerful workstations with large monitors and powerful graphical capabilities. Whilst this is often the case, perhaps the user wishes to run the application on a less powerful laptop, or perhaps even on a hand-held device. Equally, most human-computer interfaces rely solely on the visual modality for presentation despite work which has shown other modalities can be effective in enhancing the interface (e.g. Brewster, 1998, Oakley *et al.*, 2000). The platform the interface is being presented on can impact the resources available for presentation. For example, a workstation with a large monitor will have more visual resource available than a hand held device. This implies that the interactors, or widgets, that make up the interface need to be sensitive to the presentation resources available. Similarly, the resources used for presentation should depend upon their suitability. Visual feedback on the screen of a mobile phone is of no use whilst the user has the phone to his/her ear, whilst audio feedback is of no use in a loud environment. User requirements are also an important aspect to be considered. A visually impaired user has no need for visual feedback, whilst another user may have impaired hearing limiting the range of sounds he/she can hear. These user needs may also be supplemented by user preferences such as one user prefers a 3D effect visual display and another prefers the audio feedback to be presented in a jazz style.

This work can be extended to include input mechanisms also. A workstation may have a mouse and keyboard as input mechanisms, but a hand held device may rely on gesture input or speech input mechanisms. These differences in input mechanisms should not require a different widget, but rather each widget should be able to handle multiple input mechanisms, using those suitable for the current platform.

The aim of my work is to produce a toolkit of widgets which can meet the three requirements described above. The widgets should be sensitive to the presentation resources available, the context of the interface and the needs of the users. These

widgets will be the framework around which further research can be done into the use of multi-modal interfaces, the switching between different modalities in an effective manner and the design of context sensitive interfaces.

WORK TO DATE

The framework of the toolkit has been implemented in Java allowing multiple output mechanisms to be used for the widgets. Three widgets – buttons, progress bars and pull down menus – have been implemented. A simple control panel has been implemented which allows users to change the weighting given to each modality. Several output mechanisms have been implemented to demonstrate the flexibility of the system. A visual output mechanism has been implemented, primarily based upon the standard Java Swing widgets. Only the progress bar is not based upon the analogous Swing widget, allowing it to be more flexible in its presentation. The weight for the visual presentation is mapped to the size of the widget, with the progress bar also changing the information displayed to maximise the utilisation of the space used. Two auditory modules have been implemented based upon previous research into auditory interfaces (Brewster, 1998). The two modules differ in the way they handle the change in the weight for audio feedback, one mapping weight onto volume, the other mapping weight onto the number of midi channels used to produce the sounds.

The use of external modules, which hook into the toolkit allowing the widgets to respond to their context has also been investigated. Two such modules have been implemented. One monitors the ambient volume of the environment, allowing the widgets to adjust the level of the audio feedback to suit. The second monitors the screen size and adapts the size of the widgets accordingly.

FUTURE PROGRAMME OF WORK

Currently, only the framework for output has been implemented. This will need to be extended to include input. The current implementation separates the presentation of the widget from the behaviour of the widget. This will need to be replicated for input, with the input behaviour for individual input mechanisms separated from the generic, or abstract, behaviour of the widget. By allowing widgets to use multiple input and output mechanisms which are independent of each other it will be necessary to allow some communication between them. If, for example a widget uses 3D spatialised auditory feedback and gesture input where the user selects the widget by pointing to the source of the sound it is necessary for the input mechanism to know the location of the output sound.

EXPECTED OUTCOMES OF THE WORK

The completed toolkit will allow interfaces to be used on multiple platforms, with the widgets adapting to the available context. Further, the toolkit will provide the framework upon which further research into multi-modal and context sensitive interfaces can be done.

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