

Transforming Web Graphics for Mobile Devices

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Abstract

As the Web has been developed quickly, there are more and more demands for accessing Web applications from mobile devices such as PDAs. Since the screen size of a mobile device is very limited and varies from each other, we need a capability of transformation from Web graphs to suit mobile device displays. Such a transformation usually includes location change, differential scaling and semantic zooming. This paper presents a visual approach to the layout transformation of graphical objects from the Web to mobile device screens. The underlying theory of our approach is a context-sensitive graph grammar formalism. We use an enhanced node-edge diagram with a spatial partitioning mechanism to represent layout structures and support automatic transformations. Several examples of graph transformations are provided to demonstrate the conciseness and expressiveness of our context-sensitive graph grammar formalism. These extended context-sensitive graph grammars with spatial specifications can also be used in a wide range of applications such as multimedia interfaces, electronic publishing and XML document conversion.

Keywords: Graph Transformation, Layout, Mobile Device, PDA, Visual Languages, Graph Grammars, Parsing.

1. Introduction

With the rapid development of the Internet technology, there are more and more graphs to be delivery on the Web. At the client side, there are various kinds of viewing conditions, such as varying screen sizes, style preferences, and different device capabilities. For example, consider the case of a user viewing a diagram representing an organizational structure on the Web, the fully expanded diagram is of considerable complexity and may be unsuitable for small displays [1]. Thus, if the diagram is to be viewed on the screen of a mobile device such as a PDA (Personal Digital Assistant), the original layout may not be appropriate. The small size and forms of display on PDAs introduce several new constraints for human computer interaction design. Further, the standard components of traditional graphical user interfaces, such as scrollbars, buttons and menus, which on a desktop only take a small percentage of the available screen estate, take up a considerable percentage of screen space on a PDA [5].

Of various systems that address the above problems, there are primarily two approaches: static and dynamic (interactive). This paper discusses only the static approach. In the static approach, the techniques include:

- **Alternative layout.** To adapt to the style of a PDA screen, there is usually a need to change the position of some object. This implies an alternative layout. For example, a vertical alignment presents a different visual perception and requires a different screen estate from a horizontal alignment, as shown in Figure 1.
- **Scaling.** The simplest solution to the problem of the limited screen size is *linear scaling* (or *normal zooming*), but this is often not the best way. The more elaborate technique is