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Context-aware Design Pattern For Situated Analytics: Blended Model View Controller

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Abstract

This paper presents a context-aware design pattern for situated analytics called Blended Model View Controller. Our approach is an event-driven design, allowing a seamless transition between the physical space and information space during use. The Blended Model View Controller allows common user interface controls to work in tandem with printed information on a physical object by adapting the operation and presentation based on a semantic matrix. Also presented is an authoring tool that has been developed to assign the parameters of the semantic matrix. We demonstrate the use of the design pattern with a set of augmented reality interactions including; pinch zoom, menus, and details-on-demand. We analyse each control to highlight how the physical and virtual information spaces work in tandem to provide a rich interaction environment in augmented reality.

Keywords: Augmented Reality, Situated Analytics, Immersive Analytics, Interaction Techniques, In-situ Interaction, Context-driven Interaction, Blended Model View Controller.

1. Introduction

Situated Analytics (SA) [1] is a new research area that aims to provide analytical reasoning embedded in the user's physical environment. It brings together visual analytics (VA) and augmented reality (AR) [2]. SA extends the *blended space* concept introduced by Benyon et al. [3], which blends digital data into the physical space. It builds on the blended space parameters [4] by adding analytical interaction. Thus the *SA space* is an analytical interactive blended space, advancing AR interfaces to draw information from physical objects and incorporate the details into a hybrid view combining virtual and physical interaction controls.

This paper is an extended version of blended controls [4], presenting a context-aware design pattern for SA, supporting a Blended Model View Controller[1](UI). The design pattern is state-based, allowing a seamless transition between the physical space and information space during use. The Blended Model View Controller is a step forward to leverage the natural ability and to take advantage of the physical context as an affordance for the interaction operations.

Figure 1 highlights a blended user interface control example that uses both the physical and virtual spaces to enhance perception by providing a pinch zoom mechanism to magnify the information on the physical package, which might be applicable for those with impaired vision. The blended user interface control uses to support situation awareness interaction

Figure 1: Situated Analytics Blended Model View Controller, showing a magnifying pinch zoom on the surface of a consumer product.

leveraging both the physical and virtual spaces to provide their functionality.

The presented design pattern allows AR UI designers to develop controls that have a synergy between the semantics of the virtual and physical information. The presentation of the UI controls is dynamic depending on the placement and function on a particular object. The novelty of the presented techniques is their context-aware dynamic design for blended physical and virtual user interface control specification. The design pattern has been designed to fulfill requirements for SA interactions, which include: 1) The users need to interact with physical objects–physical space—and the data associated with each physical object—information space, 2) the SA user interfaces work in tandem with the physical context, and alter to take account of the real world situation, and 3) the physical and virtual content is coupled, as there is no separate independent input

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[1]User interface controls are interactive graphical objects employed to allow a user to interact with computer applications, for example, menus and buttons in a GUI.