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Abstract. Capturing the interaction of users in a room based on real-world and electronic sensors provides valuable input for their interactive stories. However, in such complex scenarios there is a gap between the huge amount of rather fine-grained data that is captured and the story summarising and representing the most significant aspects of the interaction. In this paper we present the CollaborationBus Aqua editor that provides an easy to use graphical editor for capturing, authoring, and sharing stories based on mixed-reality scenarios.

1 Introduction

Gathering information is necessary to preserve and reconstruct group experience and interaction [Appan *et al.* 2004; Lutters 2002]. In order to document this interaction in detail, access to data that is not directly visible or available in the environment is necessary [Goncalves & Jorge 2003]. Using mixed-reality data from the physical as well as the electronic world in storytelling provides a valuable means to document group interaction and meetings [Pankoke-Babatz *et al.* 2004].

Storytelling is a complex process; it can be broadly structured into the following three steps: (1) capturing of data; (2) authoring stories using the gathered data; and (3) publishing and sharing the authored narrative [Kelliher & Davenport 2007].

In this paper we present *CollaborationBus Aqua*—an editor that supports elegant capturing and storing of data from the physical as well as electronic world, visual composition of narrative episodes based on these data, and sharing and browsing narrative episodes among authors. In the next section we present the concept of *CollaborationBus Aqua*. We then describe the user interaction with *CollaborationBus Aqua* and report on its implementation.

2 Concepts of CollaborationBus Aqua

CollaborationBus Aqua is based on three core concepts. First, capturing mixed-reality data about an environment is leveraged to provide storytellers with the necessary means to capture sophisticated data without the need for any technical knowledge through an editor application with a rich graphical user interface. Second, visual composition allows users to create stories in a graphical manner. Based on the users' compositions, complex programmatic behaviour is created within the environment. And thirdly, synergies that emerge in this process are displayed and mediated through the editor. In the following, we describe these three core concepts in detail.

2.1 Capturing of Mixed-Reality Data

Capturing mixed-reality data with sensor-based environments to provide storytellers with input for authoring stories is a task that was typically conducted by developers or administrators of sensor-based infrastructures in the past. *CollaborationBus Aqua* provides a convenient graphical editor as a front-end to a sophisticated sensor-based platform. Users can easily manipulate sensors that capture event data in a drag-and-drop manner. The powerful sensor-based platform *Sens-ation* [Gross *et al.* 2006] manages all the capturing, processing, and storing of the data for the users in the background.

2.2 Visual Composing

Visual composition in *CollaborationBus Aqua* is based on the paradigm of visual programming, which supports the development of applications or configuration tasks by means of visually appealing graphical representations rather than using one-dimensional text lines of code [Myers 1986]. These graphical representations abstract programmatic behaviour, but still provide an indication of the underlying structures and implementations.

According to Crawford the fundamentals of interactivity are: listening, thinking, and talking [Crawford 1993]. The *CollaborationBus Aqua* editor is exactly based on these fundamentals providing sensors, inference engines, and actuators as graphical elements. *Sensor* components acquire environment data and after transmitting these data to the platform, *inferencing* processes allow to abstract knowledge and conclusions from the gathered data and *actuators* trigger actions according to the findings of the inferencing process. These components are instantiated by drag-and-drop, and the stories in the form of connections among the components are created by drawing lines between the respective representations. The editor handles the necessary technical procedures in the background and provides an indication whether the established connections are correct on a technical as well as semantic level.

2.3 Sharing and Browsing Compositions

CollaborationBus Aqua provides a shared repository for composed stories that every user has access to. A browsing mechanism helps to preview and explore available stories. Furthermore, a synergy notification is sent to users who are using the same components for their stories. *CollaborationBus Aqua* mediates between authors by representing visual cues to synergies and offers a browsing mechanism to explore synergetic compositions.

By leveraging communication and exchange between the authors in order to discuss synergies and their implications, *CollaborationBus Aqua* translates the process of authoring mixed-reality stories into a cooperative sharing and communication process.

3 User Interaction of CollaborationBus Aqua

The *CollaborationBus Aqua* editor provides a graphical user interface with the *CollaborationBus Aqua* main window and the Inspector (cf. Figure 1). The *CollaborationBus Aqua* main window provides three parts: the Operation Mode toolbar on the upper end of the window allows to switch between *Connecting*, *Editing*, and *Sharing*; the Composition Area in the middle provides the Component Browser that allows users to go through and pick components as well as the Story Plot that allows users to compose the story; and the Statusbar on the lower end of the window that allows users to change the zoom level of the composition view. The Inspector provides details and actions on individual components. We will now discuss the three operation modes in detail.

After establishing a connection with a sensor-based environment in the *Connecting* mode, the *Editing* mode can be accessed. In this mode, the main content view is divided into the *Component Browser* and the *Story Plot*. The Component Browser lists all available components and allows the instantiation of discovered components by dragging them on the *Story Plot* below. In the *Story Plot*, graphical representations for the instantiated components are created and users may create relationships and connections between them by drawing lines with the mouse. The *Sharing* mode finally allows users to save their compositions to the global repository and provides access to the composition browser for exploring other users' shared compositions.

Most of the composition tasks are realised by interacting with the *Inspector*. Inspectors

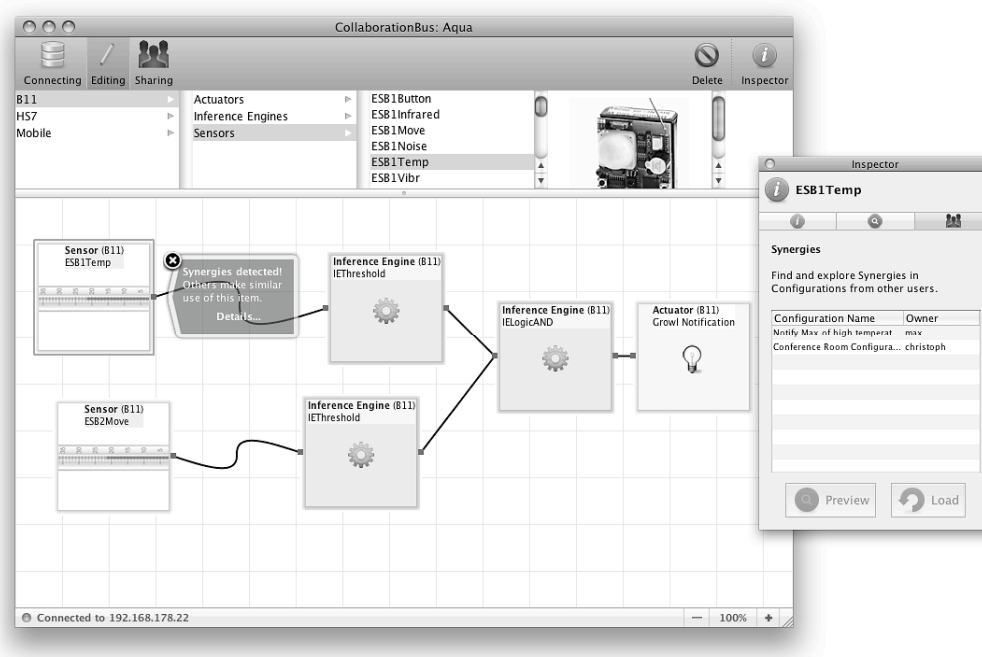


Figure 1. The CollaborationBus Aqua main window and Inspector.

are commonly found in operating systems or application programs and provide detailed information and means for manipulation according to the currently selected items within a graphical user interface. The *CollaborationBus Aqua Inspector* helps to learn about components, explore recent data (such as sensor events), and configure component behaviour.

4 Implementation

CollaborationBus Aqua is implemented as a stand-alone application in Java 1.5.0_13 on Mac OS X 10.4.9. It uses the *Sens-ation* platform for attaching sensors and storing sensor data. The communication between *CollaborationBus Aqua* and *Sens-ation* is based on XML-RPC.

5 Related Work

Authoring tools and editors for stories are widely-spread and commonly used in the field of digital storytelling. Editors like the *InAuthoring Environment* [Barrenho *et al.* 2006] or *LOGTELL* [Ciarlini *et al.* 2005] provide storytelling authors with the necessary tools for composing their stories. Typically, these storytelling editors do not allow to capture multimodal contextual data, which is crucial for the creation of rich stories that document real-world group experiences and interactions [Goncalves & Jorge 2003].

In the context of ubiquitous computing technology, event- and sensor-based environments capture multimodal contextual data. Some examples of editors for ubiquitous environments are the *eGadgets* editor that implements a simplified configuration process based on a plug-synapse abstraction model [Mavrommati *et al.* 2004]; and the *Jigsaw Editor* [Humble *et al.* 2003] that represents the front-end to a user-oriented framework to supports users configuring domestic ubiquitous environments. These editors do not provide storytelling support.

6 Conclusions

We introduced *CollaborationBus Aqua* that supports storytellers with the access and processing of real-world data from an event-based sensor environment. The editor realises a sophisticated interaction concept that abstracts the complexity of the multifarious components in a sensor-based environment and therefore allows storytellers to use the available sensors and other components for the creation of rich stories.

With the help of sharing and browsing mechanisms, storytellers are able to share the compositions that describe how the acquired sensor data can be gathered for their narrative episodes with other users of the editor.

The *CollaborationBus Aqua* currently supports the management of sensors, inference engines, and actuators. For the future it would be good to extend it with capabilities for editing and sharing fine-grained sensor data.

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