

Intersection: Computer Graphics for Everyday Living

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1 Introduction

We investigate how computer graphics can support daily activities in everyday environments. *Intersection* presents real-time information of buses and trams, for those who use public transport as everyday means of transportation. It is a wall-hung display situated in office or home environments, helping people to plan their departure time by a simple glance. *Intersection* is a visual artist's interpretation of the specific data, not intended to be generalized to other kinds of data. The purpose is to let the graphics clearly reveal what information that is shown and display cues for how to read it, supporting the users memory. Subtle text, visible at a close glance provides detailed information. Users can map one or several buses and trams to the intersection, to fit their mental model over the closest bus and tram stop.

Intersection is part of ambient display research, exploring how to present digital information in physical surroundings. In previous work some displays also take inspiration from visual artists, but without using the artist's own ability to visually express specific data. In our own previous work [Skog et al. 2003], we used the visual style of Piet Mondrian to present both weather and bus information. [Stasko et al. 2004] uses visual themes, for example a beach view where beach objects display stock change, traffic and other information sources. In this case, the same graphics display various data for everyday use, without providing visual cues to support the user's memory.

2 Intersection Displaying Bus Arrivals

Intersection enables people in the Göteborg area to see when buses arrive to their closest bus stop (see Figure 1). It is designed to clearly reflect its information and support both overview and detail. Beyond this, it is designed to enable easy end user manipulation to map buses (and trams). The visualization has the visual theme of a traffic intersection, with colored "queuing" lines of traffic - representing bus arrival times. The length and the color of a traffic line show the amount of time left before a bus arrives. A blue long line represents a long time, whereas a red short line shows that the arrival of the bus is very soon. The colors vary from blue, green, yellow, orange and finally red, to represent relative time. The absolute time is indicated by the colored dots that form a traffic line, so that each row of dots represents one minute. The traffic lines are subtly animated, to reveal that the display is active. When a traffic line goes towards red, its dots shake faster and more noticeable until "the bus" finally leaves, and the line disappears. The colored large "mosaic blocks" in the corners reflects the color of the closest traffic line, and give a quick impression of the users' departure status, even from far. Each block has subtle text that reveal which bus it represents. This is incorporated in the same way as an artists' signature, to be visible without interrupting the graphics. If a block is grey and has no traffic line, it either has no bus connected, or cannot reach



Figure 1. *Intersection* situated in an office environment to present bus information (top-left). The graphics are designed especially for bus and tram information (top-right) Close up of the display with bus name and number in subtle text (bottom)

information about a specific bus. The users can choose to have up to four buses and trams connected, arranged any way they like. The interface is intended for a touch screen, where users can chose the buses and their position by pointing and clicking. The visualization uses OpenGL and C++, and the input data originates from a web-based service, using the local transit authority's sensor system to keep track of buses and trams in the city.

3 Preliminary Evaluation

Four people have been interviewed to find out issues about the readability and the design of the display. Two usability experts were interviewed, both familiar with the concept of ambient displays. The other two were long-term users of our earlier Mondrian bus display. All four thought that *Intersection* reminded them of urban environments or crossroads and that it was easy to understand. They found the possibility to add several buses very suitable, and even suggested that it could be beneficial to be able to change the layout and the rotation of the intersection - to fit different peoples' bus stops. All interviewees mentioned that it was appropriate that a block would turn grey when the display cannot reach data about a specific bus. The two users of our earlier display asked for a possibility to see if more than one bus, on the same line, was approaching. The next step is to find out how this approach to computer graphics for everyday environments is received, when used over an extended time.

References

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