

Evaluating the Comprehension of Ambient Displays

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ABSTRACT

We introduce an evaluation framework for ambient displays, with three levels of comprehension: *that* data is visualized; *what* is visualized; and *how* it is visualized.

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INTRODUCTION

Ambient displays promise to provide users with important information in the place where they most need it. For instance, what looks like a modern painting on an office wall might in fact show when the next bus leaves from a nearby station [2]. There have been surprisingly few evaluations of such displays in actual use, although a heuristic approach has been suggested [1]. One reason is that ambient displays need to be installed over long periods of time, and the usage is of low intensity – perhaps a user will only glance at the display a few times a day. Observational studies are therefore difficult and time-consuming to perform. Another, even more important problem, is the lack of clear evaluation criteria – what, exactly, do we want such a display to accomplish?

THREE LEVELS OF COMPREHENSION

Ambient displays have to work on many levels – aesthetics, utility, integration the with user’s environment, etc. It is therefore useful to first identify the most important aspects to evaluate. One crucial factor is *comprehension*, i.e. how well a user understands (and, consequently, is able to use) an ambient display. We argue there are three levels of comprehension, where each is a pre-requisite of the next:

1. *That* information is visualized
2. *What* kind of information is visualized
3. *How* the information is visualized

Becoming aware *that* an object in the environment is an information display might not be as easy as it sounds, in particular if the system is installed in a public place. As an example, let us consider large screen showing what looks like an abstract painting [2]. If a user finds out *that* it is an information display, she then needs to understand *what* can be gained from the display – in this case, bus departure times.

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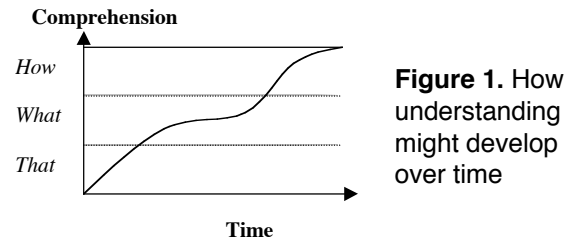


Figure 1. How understanding might develop over time

Finally, *how* does one translate the visual appearance of the display into actual information? Here, it turns out the size and position of colored fields show the departure times of buses in the vicinity. At this point, the user has moved through all three stages of understanding (c.f. **Figure 1**), and is now in a position to actually start using the display.

APPLYING THE FRAMEWORK

Most HCI experiments *start* at our level 3; the user is supposed to already have enough information to use a system. However, a poorly designed ambient display, or one without sufficient instructions, might never even make it past the first stage. The diagram in Figure 1 can be adapted to show various types of learning curves, e.g. designs that are too difficult to learn (comprehension never reaches the final stage), or those which are too difficult to remember (comprehension drops off after time). Factors that affect comprehension can also be identified and evaluated. By changing independent parameters, e.g. the availability of instructions or the display’s position, we can see how they affect users’ comprehension over time.

CONCLUSION AND FUTURE WORK

We have identified comprehension over time as an important factor when evaluating ambient displays. Our framework provides a simple form of formulating hypotheses and expressing results during evaluation. We first used this framework informally to evaluate a novel display of bus departure times [2]. The next step is to use it as a basis for our hypotheses when conducting a long-term study of an ambient display.

REFERENCES

1. Mankoff, J. et al. Heuristic evaluation of ambient displays. *Proceedings of CHI 2003*, ACM Press, 2003.
2. Skog, T., Ljungblad, S. and Holmquist, L.E. Between Aesthetics and Utility: Designing Ambient Information Visualizations. *Proceedings of InfoVis 2003*, IEEE, 2003.