# InfoCanvas: A Highly Personalized, Elegant Awareness Display

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## ABSTRACT

People currently monitor a great deal of information via the Web, but this often interrupts their primary task or work flow, and it consumes valuable screen real estate. In this paper, we describe the InfoCanvas, a highly personalized, elegant, aesthetically-pleasing, abstract display that is being designed to help people maintain awareness of important information. We present techniques used in the InfoCanvas for representing data in a graphical, abstract manner, and we describe an ongoing evaluation study of the system.

### Keywords

Awareness information, peripheral display, art

## INTRODUCTION

There is an ever-increasing body of information available to us via the Internet. Some of this information we use on a daily basis to do our jobs or other tasks. However, there is also a sizable amount of information that we would like to maintain a certain level of awareness of. For example, a person might want to know tomorrow's weather forecast, a stock portfolio's daily performance, when email arrives from an old college buddy, and when any news article about Mars exploration is posted. While this information may be important, the person may not actively seek it out on a regular basis because of forgetfulness or simply not having the time required for checking. We call this type of information *awareness information* and this paper presents our efforts in helping people to stay abreast of awareness information.

Currently, computer users who wish to periodically monitor awareness information must do so in a fairly clumsy manner. The three common methods are to open a web browser and specifically seek out a variety of web sites, open multiple browser windows once and leave them running in the background to allow for an occasional glance, or utilize a personalized start page such as MyYahoo that consolidates some of the information into a single page and browser interaction. However, all of these methods are fundamentally unsupportive of the task at hand in that they take data that is fundamentally peripheral in nature and force it into the center of attention. These methods are interruptive to normal activities and are certainly not elegant in their presentation of information to the user.

Recently, new systems have been developed for monitoring awareness information in a more peripheral manner. Sideshow uses a side-bar on a display or on a docked PDA to convey awareness information [1]. What's Happening uses a small corner-of-the-display window that cycles between information items [7]. Others integrate information into the environment through ambient, physical displays [6]. Our objectives seek to provide high information bandwidth and breadth as in Sideshow, but to do so in an elegant, visually appealing manner that blends smoothly into a person's work environment, even enhancing their surroundings.

## DESIGN GOALS

After realizing the current problems with monitoring awareness information, we decided to design a display that would achieve three simple goals. These goals were determined by an analysis of the task of monitoring data and through interviewing individuals about their usage of awareness information. The three goals are:

1) *Create a display that is elegant, peripheral, and that blends into the user's natural environment.* This goal entails moving the presentation of information off the user's computer desktop and onto a secondary display device. Placing information in the periphery allows the user to ignore it while accomplishing their normal tasks, but keeps it available for a quick glance at any time. An eye-pleasing display with a proper form factor will blend into the environment, calling less attention to itself and increasing its peripheral nature.

2) *Make the representation highly personalized and consolidated.* People are interested in more than just one or two items of awareness information, thus an awareness display needs to be capable of representing a multitude of information simultaneously. In addition, the particular attributes of the information that is of interest, and the priority that the user gives to each, will vary from user to user, thus the display needs to allow the user to customize it to their own preferences and needs.

3) *Be capable of representing the user's sensitive data.* Many people are interested in staying aware of their current financial status. This information is one example of highly sensitive awareness information that the display must be capable of representing in a manner such that someone passing by would not be able to read. Without a means to

display sensitive information, the goal of consolidating all information in one display cannot be achieved.

## THE INFOCANVAS

With these three design goals in mind, we created the InfoCanvas [3, 4] – an abstract pictorial representation of awareness information that is presented as a painting hung on a wall (Figure 1) or a picture frame set on a desk (Figure 2). We think of the InfoCanvas as being a form of "Information Art." The painting is of a scene, such as a beach, desert, or aquarium in which elements of the scene represent particular information of interest. The artwork elegantly blends into the environment, while providing a glanceable portal into the user's information world.



Figure 1. InfoCanvas as a painting on the wall.



Figure 2. InfoCanvas as a painting on the desk.

The InfoCanvas is a highly personalized display, in that the user is capable of designing the entire scene – from the background to every graphical image representing a different data element. By looking at the example canvases in Figures 3 and 4, one cannot easily discern the information encoded by the designer into each canvas. The creator of Figure 3 encoded traffic as the color of the lady's bathing suit (red is poor, yellow is fair, green is good), email from their significant other as a seashell that appears by the chair, the performance of a stock index by the horizontal position of the boat on the horizon, and tomorrow's forecast by the weather shown in the sky. Note how some representations are more abstract (traffic) while others are more literal (weather).

The mappings described above contrast with the approach of another person who designed the scene in Figure 4. This person chose less literal representations such as blooming flowers to represent a warm forecast for the next day, a sun that appears when a discount airfare is available to Miami, and socks on a clothes line representing the number of unread emails. We envision that users will eventually be able to "paint" information onto canvases using a fluid set of highly interactive tools, enabling even artistically-challenged people to create eye-pleasing information displays.



Figure 3. One example InfoCanvas representation.



Figure 4. Another example InfoCanvas representation.

The abstract nature through which information is portrayed with the InfoCanvas allows sensitive data to be represented without the risk of a casual passerby being able to monitor it as well. The choice of using a high-resolution LCD display allows for a great deal of flexibility in the amount of information that can be shown simultaneously and the ways in which it can be represented. Thus, we believe that the InfoCanvas meets all three of our original design goals.

The graphical nature of the InfoCanvas, however, does not easily lend itself to monitoring data that the user needs detailed information about at a moment's glance. Rather, the InfoCanvas excels in monitoring information where only a general sense of status is needed. For example, the InfoCanvas is better suited for a person who only cares that it is highly likely that it will rain this afternoon, versus knowing that there is an 80% chance of rain. The lack of the ability to purvey details is one reason that the InfoCanvas is well-suited for monitoring awareness information – as by definition, the user is not interested in the precise details at all times.

One can certainly imagine, however, situations in which a person wants to know details about something that is on a canvas, such as a bank account balance before writing a check. In this instance, the balance is no longer peripheral information and is actually critical to performing a task. The InfoCanvas is not intended to support the user in these types of tasks. However, we plan to explore an interactive version of the InfoCanvas where via touch, speech, or mouse movement, the user can investigate details of anything on a canvas.

### REPRESENTING DATA GRAPHICALLY
The InfoCanvas is a special kind of peripheral display. It enables the user to represent a large quantity of information in a small space with a high degree of personalization. This is achieved through the use of a number of different means of altering the scene's elements. For example, a graphical object or image representing data can either appear or disappear, change its image, move along a path, scale up or down, rotate, or populate an area (like a field of flowers) in response to changes in the data it represents. Obviously, different actions make more sense for different types of data. Information such as whether or not an email has been received or if a price has dropped below a particular threshold is boolean in nature and easily maps to the appear/disappear functionality, for example.

Representing information such as the weather is more complicated in that there are several different attributes of weather that might be of interest, such as the condition, temperature, or chance of precipitation. In addition, some attributes such as the condition, have a multitude of different states (sunny, mostly sunny, partly cloudy, etc.) A weather junkie might like the current weather condition mapped to a literal image (sun, clouds, rain, etc.), and the current temperature might dictate how high or low the image appears in the sky.

Such a mapping would give a rather direct and detailed representation. However, another user who only cares about extremes might have the sun only appear when the temperature is to exceed 90 degrees and rain appear only when the chance is greater than 50%. Regardless, with the personalization afforded to users, it is possible for people to specify a level of detail that is appropriate for each particular situation.

In the representations covered so far, data is mapped from an input value to an output representation. However, other types of information of interest to people do not fit this particular model. Two primary examples are textual information (headlines or special event announcements) and images/pictures from a web page (cartoon or web cam). A person may want to know more than the fact that some type of headline is available. In particular, the person may want to see the headline. This is a slippery issue for the InfoCanvas in that we do not want displays to become too literal and direct. Thus, we have developed a compromise. Text can be placed onto a scene, but only in a way that fits smoothly with the given theme. For example, in the beach canvas, a headline might be displayed on a banner being pulled through the sky by a plane. Similarly, images and pictures must be presented in some context, for instance on a book cover, a television screen, or a billboard.

### STATUS AND USABILITY STUDY
We currently have the "back-end" of the InfoCanvas implemented in a prototype system. It can monitor various types of data sources and maintain a visual mapping of those sources. We are currently designing the "front-end" painting tool that will allow end-users to interactively specify data of interest and create the graphical representations of that data.

Also underway is an initial study of the InfoCanvas being used in actual work environments. The goals of the study are to evaluate the concept, to discover other issues surrounding awareness information monitoring, and to provide design guidance for building the painting tool. The study is being conducted with five participants of various backgrounds and jobs. It began with initial interviews conducted to gain a better understanding of the role that awareness information plays in each participant's daily work life. We interviewed each participant about the information they monitor, how often they check it, the means by which they view it, and their motivation for examining it.

Because we have not yet built the front-end scene construction tool, we are using paper cut-outs to allow the participants to design a personal InfoCanvas. We created five different "themes", built simple backgrounds for each, and developed a large set of image objects that might be placed in the scene. With our aid, a participant selects objects from the collection to represent awareness information of personal interest, places the objects on the background at desired locations, and decides how the object will change to represent its corresponding data.

Next, we install a second monitor on the participant's computer, and we run InfoCanvas on it using the scenes that the person designed. After installation, the canvas is left to run as-is, allowing the user to glance at it to get an overview of their awareness information. Each week, we will conduct a short interview with each participant. The interview will focus on assessing how much the user has utilized the display and any difficulties that they are having in interpreting its representation. The session will also be a chance for participants to suggest changes that they would like to make to their canvas, since in a fully functional version of the software, users would be able to repaint information representations at any time. We plan to run the InfoCanvas in each person's room or office for six to eight weeks to allow for sufficient data collection and for any novelty effects to wear off.

## RELATED WORK

As mentioned earlier, a number of existing research projects have similar motivations to our work. A number of researchers have explored various types of ambient displays that integrate into a person's physical environment, such as spinning pinwheels, water ripples projected on a ceiling, or soothing sound effects added to s space such as done in the ambientROOM project [6]. Another project used bubbles in an aquarium to convey information of interest [2]. However, these physical devices are limited in their bandwidth, and they can typically only represent a small number of information sources at a time. Furthermore, their physical characteristics restrict their usefulness to monitoring certain types of data. For example, water ripples on the ceiling could increase in intensity as traffic conditions worsen, but there is no direct correlation between the intensity of ripples and tomorrow's weather forecast.

In an effort to overcome the limitations of physical ambient displays, several research projects have explored using computer monitors for communicating data, but doing so in a more peripheral manner. The InformativeArt project is closely related to our efforts, but it involves modifications of existing abstract art paintings to represent awareness information such as email server traffic [5]. Presumably, users do not have much flexibility to create scenes that are of interest to them. The Sideshow system uses a relatively small information panel with summarized, but still fairly direct representations of awareness information [1]. It can be run on the side of a person's monitor or on a PDA. One particular focus of Sideshow is on representing group information such as a team's progress on a software project. While we share many goals with Sideshow, the deployment platform we utilize in much different in nature.

## CONCLUSION

We believe that awareness displays will be of growing importance as our society continues to increasingly revolve around information. The goals of our project are to allow people to stay aware of more awareness information, do so without giving a person a sense of "information overload", and actually enhance the beauty and aesthetics of their work and home environments.

## ACKNOWLEDGMENTS

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