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# SpiraClock: A Continuous and Non-Intrusive Display for Upcoming Events

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## ABSTRACT

In this paper, we present SpiraClock, a new visualization technique for nearby events. SpiraClock fills a gap between static calendar displays and pop-up reminders by giving the user a continuous and non-intrusive feedback on nearby events. Events are displayed inside an analog clock that can be used as a regular computer clock. We used SpiraClock for displaying bus schedules, and collected user feedback.

### Keywords

Information Visualization, Interaction Technique, Clock, Scheduling, Spiral.

## INTRODUCTION

Software organizers all have global and static calendar displays that are useful for building, organizing and consulting schedules. However, they can't be continuously displayed on the screen, and accessing them has a cost. Users consult them at intervals, and have to rely on their prospective memory -- or external artifacts such as post-it notes -- for performing the right tasks as the events are becoming current [1].

Most organizers additionally provide customizable reminders that pop-up a given amount of time before the event actually occurs. Those reminders are useful but intrusive and do not allow the user to anticipate events in a natural way. For example, as an event is approaching, the user will typically have to make decisions on which tasks to perform, including completing his current work or starting preparatory activities related to the event. Pop-up reminders are not suitable for such continuous time management tasks.

The SpiraClock visualization technique we present in this paper allows the user to anticipate upcoming events in a natural way. It gives the user a feedback on nearby events by displaying them inside an analog clock that can be used as a regular computer clock. SpiraClock uses a continuous spiral display and takes advantage of people ability to monitor time without interrupting their tasks.

Figure 1 is a real example showing two bus lines that one of the authors could use to come home from his work. The next "red" bus will leave at 9:45 and five minutes are required to get to the stop whereas the next "green" bus will leave at 10:30 and requires leaving 20 minutes before. By looking at the clock, he can see no other busses will leave soon and choose the red or the green depending on his current assignments.

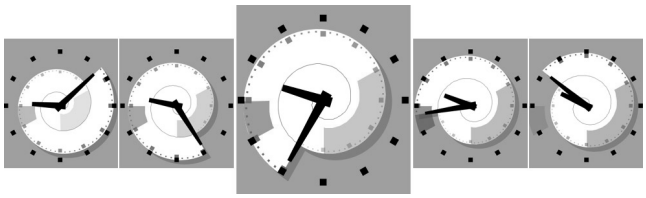

Figure 1: A SpiraClock shown at different times. The middle picture shows that the short event will occur in five minutes (9:40) and the other one in 35 minutes (10:10).

## SPIRACLOCK VISUALIZATION AND INTERACTION TECHNIQUES

SpiraClock is an analog clock with a white spiral inside representing the near future. Events are depicted on the spiral as colored sectors (see figure 1).

Events in decreasing imminence order are read clockwise, starting from the current extremity of the minute hand (i.e. present time). Sector edges coincide with minute marks according to the event starting and ending time. Events occurring in less than one hour can therefore be directly read on the outer branch of the spiral. Besides, each further revolution of the spiral shows events of the following hour.

As time moves forward, the spiral unwinds and event sectors move in a radial way (see figure 1). Events are highlighted as they come closer, eventually fading out when they cross the minute hand.

Whereas transparency provides additional indication on events imminence, color can be used to differentiate event categories. Using ToolTips, the user can also display short textual information on events.

SpiraClock additionally provides a small set of navigation techniques. More distant events or past events can be temporarily displayed by dragging minute or hour hands. The user can also adjust the number of spiral revolutions (i.e. visibility of future events) by dragging the spiral towards its center or towards its border. Future visibility can range from one hour to several days.

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## APPLICATIONS

SpiraClock is most profitable when also used as a regular computer clock. It is therefore mainly intended to people already using a computer clock as a primary time-monitoring device, or who could reasonably do so. This includes regular users of desktop computers, such as people working in an office.

SpiraClock is not suitable for every types of events. For example, having an event like 'April 20-25, CHI Conference' displayed in a clock is not very useful. Good candidates include events with small granularity and occurring in a close spatial context, such as meetings, appointments or lectures occurring in the scope of a university. First, those events are more likely to be forgotten. Second, showing their real-time progression is more relevant to the user. Periodic but dense time-tables like class or bus schedules are also very appropriate.

We have developed three applications that use SpiraClock to display events : *BusClock*, *ShuttleClock* and *CalendarClock*.

- *BusClock* displays schedules of busses going from the Ecole des Mines de Nantes to another main station. In the default mode, each event starts and ends around bus departure time, with predefined offsets accounting for the minimum and maximum time needed to walk to the bus. In another mode, events are displayed using bus departure and arrival times.
- *ShuttleClock* displays schedules of the University of Maryland shuttles. It allows users to choose among ten shuttle services, as well as leaving and arrival stops. Time offsets are customizable.
- *CalendarClock* is a synchronization tool with existing calendars. It currently allows the user to import events using the vCalendar exchange format.

The two first applications have been distributed to testers from respectively the Computer Science lab of the École des Mines de Nantes and the HCIL lab at the University of Maryland.

## USER FEEDBACK

As we write this paper, 14 users have been using BusClock and ShuttleClock for a week to a month.

Though minimum explanation was required, users quickly got familiarized with the spiral display. At first, most of the users were seduced by the idea of using a spiral inside a clock to display schedules, and found it both appropriate and fun. Most of them also liked and played with the 'hand turning' technique.

After one week to one month of use, users still find the program worthwhile and use it regularly. SpiraClock has evolved to the current version thanks to user comments, especially those of early BusClock users.

We are still in the process of collecting user feedback, yet we have had interesting observations. For example, it turned out that moving far forward or backward in time using clock hands (e.g. for finding a distant event) was confusing. Calendar displays are obviously more appropriate for finding remote events and viewing global schedules. Other users also pointed out the need for auditory or pop-up alarms. Those comments confirm our opinion that SpiraClock is not to replace traditional event display techniques, but is rather a beneficial complementary tool.

## RELATED WORK

Carlis and Konstan [2] thoroughly investigated the use of spirals to visualize continuous and periodic data. Their main concern was exhibiting periodic patterns in data. SpiraClock display is very close to the examples given by Carlis and Konstan, although it deserves different purposes.

Other tools like [4] display temporal data using a spiral. [3] describes a 3D focus/context browsing technique that displays calendar event windows using a spiral layout. Yet as far as we know, no tool uses a spiral display within an analog clock coordinate frame.

## CONCLUSION AND FUTURE WORK

We have described a new visualization technique for upcoming events that uses the analog clock metaphor. Unlike conventional event displays, SpiraClock gives the desktop computer user a continuous outlook on nearby events without interrupting him in his work.

As our first applications, we have developed two bus timetable viewers, and a tool for importing calendar events. We are still in the process of collecting user feedback on bus applications. However, informal discussions suggest a wide user acceptance of SpiraClock display technique.

Future work includes more extensive usage studies on SpiraClock, especially the way it may combine with other organizer tools. We also plan to investigate the use of this technique in PDAs.

## ACKNOWLEDGMENTS

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## WEB SITES

ShuttleClock applet and application are available at *http://www.cs.umd.edu/hcil/spiraclock*. BusClock applet and application, and CalendarClock early distribution are available at *http://www.emn.fr/spiraclock.*

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