-- Excerpt from Milestone 6 Example, Showing Two Completed Scenarios --

2.2. Scheduling an Individual Appointment

This introductory scenario shows an individual user scheduling two simple appointments. Appointment scheduling is one of the most commonly performed operations with the Calendar system. In this scenario, the user is assumed to have just been registered in the Calendar system. Hence the user has a brand new calendar with no entries and the standard default settings for all options. Details of user registration and default calendar creation are covered in Section 2.7.

To schedule an appointment, the user selects the 'Appointment' command in the Schedule menu whereupon the system displays the dialog shown in Figure 3. The figure shows the appointment scheduling dialog that contains a number of data-entry fields for the various components of the appointment. The 'Title' field is a one-line string that describes the appointment briefly. The 'Date' field contains the date on which the appointment is to occur. The 'End Date' field applies only to recurring appointments; it is initially greyed out since the default for an appointment is non-recurring. The 'Start Time and 'Duration' fields specify the time the appointment starts and how long it lasts.

The information in the fourth row of the appointment dialog is used to specify whether, and if so how often an appointment recurs. Immediately to the right of the 'Recurring?' label is a check box. If it is checked on, then information pertinent to a recurring appointment changes from greyed-out to solid type. The recurring information

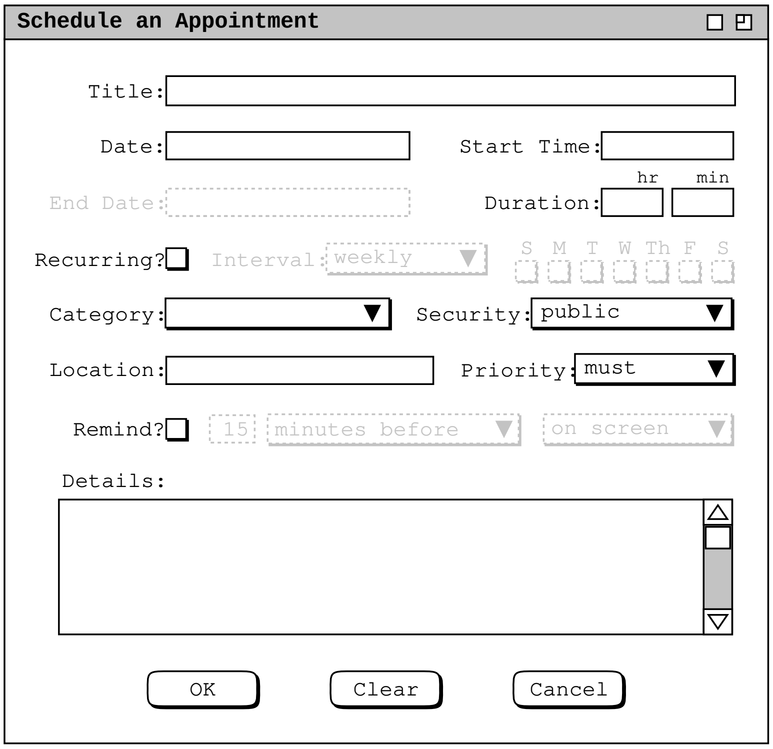

Figure 3: Appointment scheduling dialog.

is the 'End Date', the recurring 'Interval', and the seven daily check boxes to the right of the 'Interval' box.

Below the recurring information are additional data entry boxes. The 'Category' entry is a color-coded text string that categorizes the appointment for listing and filtering purposes. Appointment Security is one of four levels: 'public', 'title only', 'confidential', and private. The meaning of the four security levels is as follows:

- public -- other users can see all details of the appointment
- title only -- other users can see the title, times, and date(s) of the appointment, but no other information
- confidential -- other users can see the times and date(s) of the appointment, but no other information; the appointment title shows as "unavailable" to other users
- private -- other users can see no information at all about the appointment

The appointment 'Location' specifies where it will be held. The location value is a plain text string. The appointment 'Priority' indicates whether an appointment is a 'must' or 'optional'. The priority is used to indicate the general importance of an appointment to the user. The priority is also used in group meeting scheduling, where optional appointments can be automatically rescheduled if necessary. Meeting scheduling is discussed further in Section 2.5.

The data-entry row starting with 'Remind?' is used to enable the sending of a reminder prior to the start of the appointment. When the 'Remind?' check box is on, the other reminder information changes from greyed-out to solid. The two data-entry fields immediately to the right of the check box indicate how soon before the meeting the reminder is sent. The small box is a numeric value and the other box is one of the three alternatives 'minutes before', 'hours before', or 'days before'. To right of the time-before entry is a box for selecting how the reminder should be sent. The three choices are 'on screen', 'beep only', or 'email'. Details of these reminder formats are covered in Section 2.4.5.

The bottommost data-entry area in the appointment dialog is for writing a detailed description of the appointment. The user may enter any amount of free-form textual information in the 'Details' field.

After the dialog appears on the screen, the user enters information by a combination of typing and selecting from pre-defined choices. Figure 4 shows the result of the user having filled in information for a new appointment titled "Dentist". The dentist appointment has a date, start time, and duration, but no end date since it is non-recurring. Since this is the user's first time on the Calendar system, the only pre-defined appointment category is "Holiday". For the dentist appointment, the user decides to create a new category called 'Outside Appt'.

To create a new appointment category, the user initially selects the down arrow next to the 'Category' display box. In response, the system displays the menu shown in Figure 5. Since the user wants to create a new category, she selects the 'Edit ...' command at the bottom of the menu, whereupon the system displays the dialog shown in Figure 6. The user then selects the 'Add' button, which brings up the dialog in Figure 7. To create the new 'Outside Appt' category, the user types into the 'Category Name:' text box, and then selects 'Brown' from the color selection menu, as shown in Figure 8. The user then presses the 'OK' button to confirm the creation of the new category. To complete the edit, the user presses the ´Done' button in the still pending edit–categories dialog.

To confirm the scheduling of the dentist appointment, the user presses the 'OK' button in the main schedule-appointment dialog. At this point, the dentist appointment is added to the user's personal calendar.

The user now proceeds to create another appointment, following the same procedure as above for the dentist appointment. The resulting filled-in appointment dialog is shown in Figure 9. In this case, the appointment is recurring, scheduled for each Tuesday and Thursday between the specified start and end dates. Note that when the recurring check box is selected, the 'Date' field label is changed to 'Start Date' to clarify the display.

The user has set the priority for this new appointment to 'optional' instead of 'must'. The operative effect of selecting an 'optional' priority relates to scheduling group meetings, which is discussed further in Section 2.5. Aside from group scheduling, the meaning of 'must' versus 'optional' is purely informational, i.e., it indicates the relative importance of the appointment.

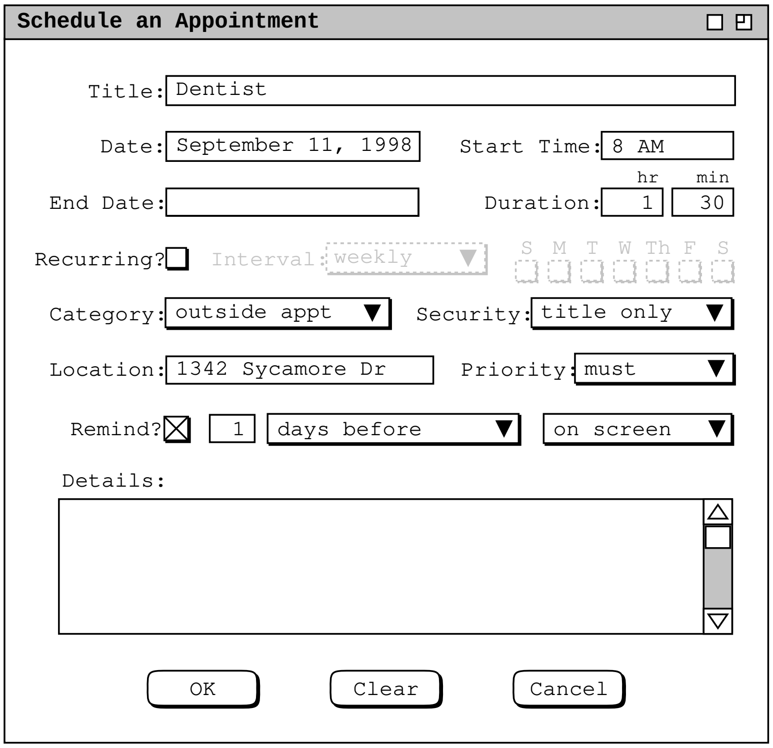

Figure 4: Scheduling a dentist appointment.

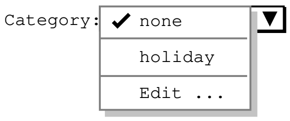

Figure 5: Initial categories menu, before Outside Appt category has been added.

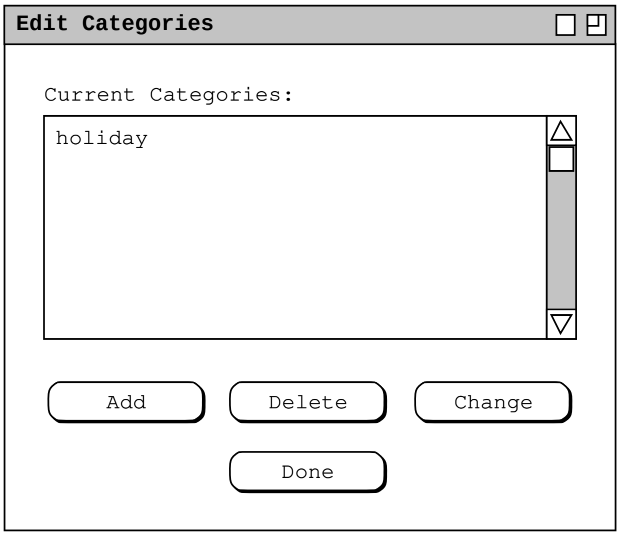

Figure 6: Edit categories dialog.

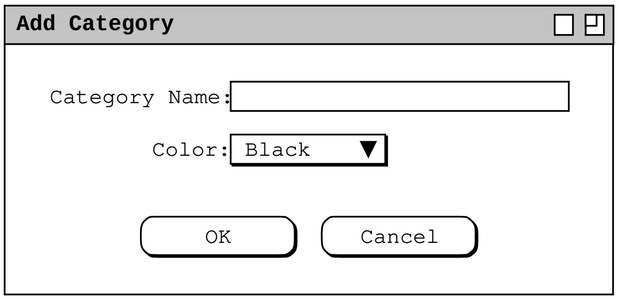

Figure 7: Add category dialog.

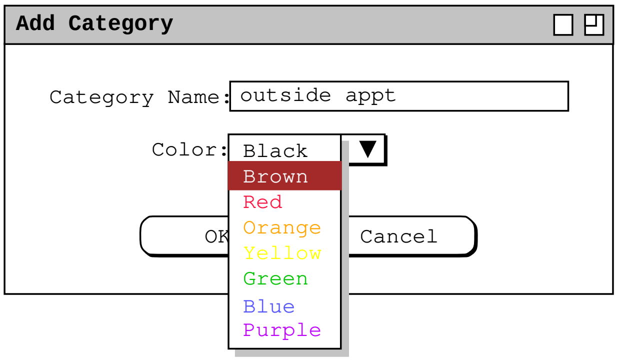

Figure 8: Creating a new category.

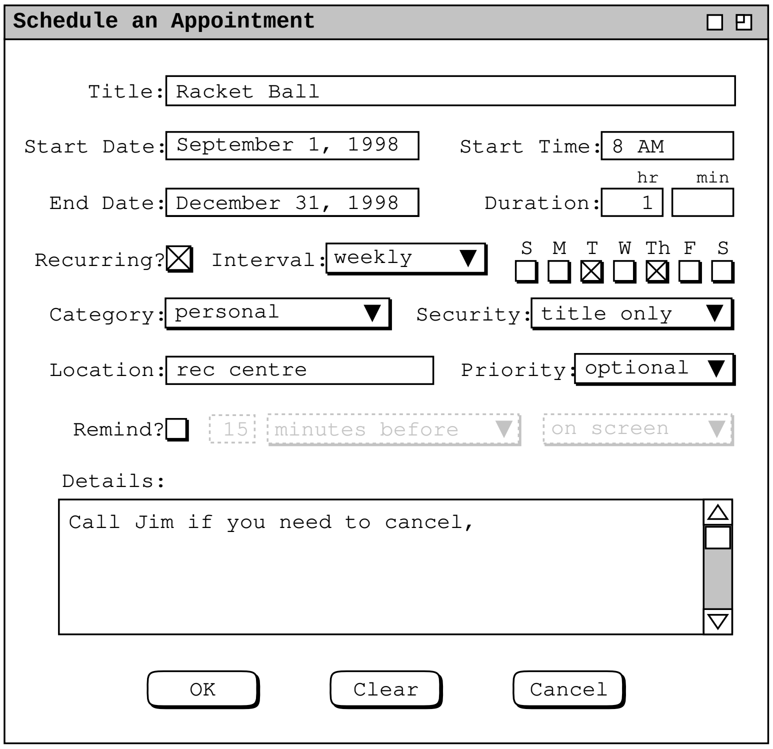

Figure 9: Scheduling a second appointment.

The information entered for a recurring appointment initially applies to all occurrences of the appointment. When the user confirms a recurring appointment with the 'OK' button, the appointment is entered into the user calendar on all of the specified dates. Subsequently, the user can change some or all of the information on a recurring appointment for some or all of the recurring dates. Details of how a recurring appointment is changed are covered in Section 2.6.

To clear all information entered in an appointment dialog, the user presses the 'Clear' button. In response, the system clears all typing areas and restores all other data-entry fields to their default states. Details of default settings are covered in Section 2.9.2 on preferences. To cancel a scheduling command entirely, the user presses the 'Cancel' button. In response, the system removes the dialog from the screen without performing any scheduling action.

After scheduling and confirming an appointment, the appointment data are entered in an online working copy of the user's calendar. In order for the appointments to be permanently saved in the calendar file, the user must invoke the 'File Save' command. The default name of the calendar file for new users is chosen by the system administrator, as described in Section 2.7. The user may save calendars on as many different files as desired. However, the filename chosen by the system administrator is the only name known to the Calendar system for group scheduling purposes. Further details of file commands are discussed in Section 2.8.

After the user presses the 'OK' button in the scheduling dialog, the dialog itself is removed from the screen. The scheduling information for a previously scheduled appointment can be reopened by selecting the 'Item' command in the 'View' menu, or by double clicking on the title of an appointment in a daily, weekly, or monthly display. Details of these displays are covered in the next section of the requirements.

2.3. Viewing an Individual Calendar

The scenarios in this section show a user viewing her personal calendar in a variety of ways, in particular:

- viewing the calendar at different levels of detail
- moving backward, forward, and to specific dates
- viewing lists of scheduled items
- filtered viewing

There is also a scenario showing how a user views the public portions of another user's calendar, including a group's "virtual" calendar. The viewing section of the requirements concludes with a scenario showing how to control multiple viewing windows, including the creation of new windows for side-by-side displays.

2.3.1. Viewing the Calendar at Different Levels

A calendar can be displayed at five levels of detail. The levels, from the greatest detail to the least are: an individual scheduled item, a day, a week, a month, and a year. The commands to show these levels are the first five items in the 'View' menu (see Figure 2). In the discussion that follows, these are referred to as the *view-level* commands.

During normal use of the Calendar Tool, the user has one or more viewing windows displayed on the screen. The most recently selected window is called *current*. When the user wants to view the calendar at a different level than is displayed in the current window, she chooses one of the five view-level commands.

Each of the five viewing levels is displayed in a separate level-specific window, sized appropriately to fit its contents. For example, if the user executes a 'View Day' command followed by a 'View Year' command, both a daily and yearly window are displayed on the screen.

By default, one separate window is used at each of the five view levels. Hence, there are up to five windows for the view-level commands, each holding the result of the most recently executed command at a particular level. When the user changes the display at a particular level, that level's display is changed and brought to the front, without a new window being created. For example, if the user moves from one day to the next at the daily level, the day-level display window is changed, with no new window created.

The user may change the default display style by enabling *multi-window* viewing mode. In this mode, the results of *every* view command are shown in a separate new window, even for commands at the same level. For example, if the user executes two successive 'View Month' commands in multi-window mode, the results are shown in two separate month-view windows. This allows the user to create side-by-side displays of as many different periods as desired. Complete details of multi-window viewing are described in Section 2.3.6.

By default, the target date for all view-level commands is today's date. The user can select another target by clicking on a desired date in the current window. For example, the user can click on a specific date in a month view and choose the 'View Day' menu item. In response, the system displays the day-level view for the selected date. Complete details of target date selection are covered in Section 2.11.4

2.3.1.1. Day View

To view the daily details for today's date, the user chooses the 'View Day' menu command. In response, the system displays a window of the form shown in Figure 10. To view the details of a day other than today, the user selects the name or date of the desired day in the current display, and then chooses the 'View Day' menu command. An interface shortcut to view a particular day is to double click on the name or date of the desired day in the current display.

In Figure 10, the user is viewing the details of Wednesday, September 9. The items shown in Figure 10 reflect a number of scheduling commands having been performed by the user, subsequent to the commands illustrated in the

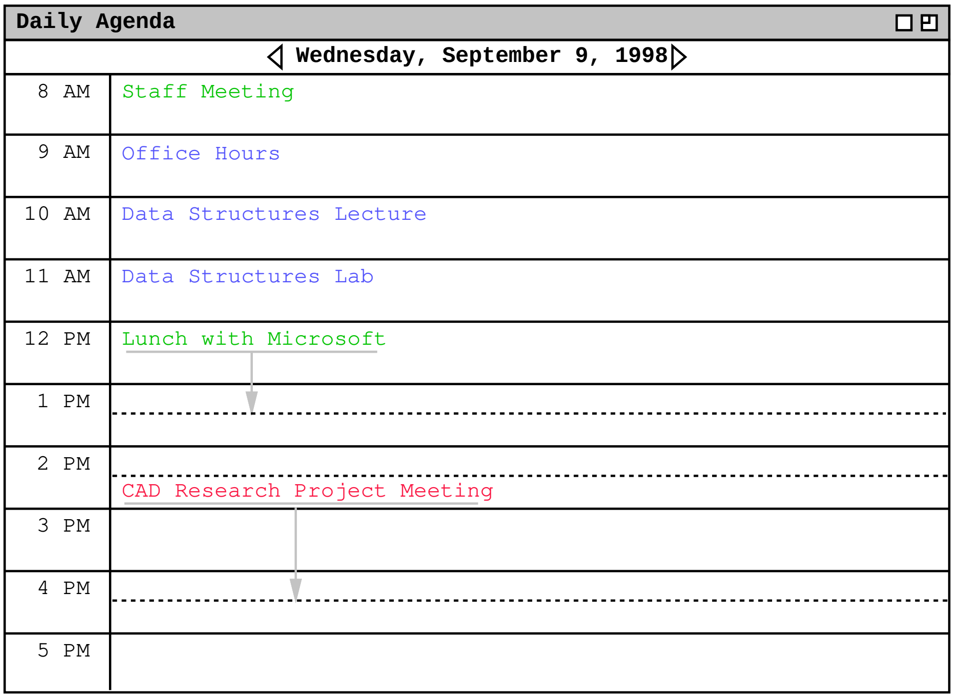

Figure 10: Day view.

scenario of Section 2.2. In particular, the user has scheduled some typical items such as meetings, lunch dates, and class lectures.

The day view shows the scheduled items for a day in abbreviated form. The column on the left lists the starting times for scheduled items. The wider column on the right shows the item titles. The displayed title for one item is always a single line high; long titles are viewed by horizontal scrolling or enlarging the display window as necessary. The following are details of how information is presented in a day view:

a. When an item starts and ends exactly on the hour, it is listed at the top of the row for the starting hour. For example, the "Staff Meeting" item shown in Figure 10 starts on the hour, and is thus displayed at the top of the 8AM to 9AM time slot.

b. When an item starts at a time other than on the hour, the text for the item is placed proportionally down from the top of the hour, with a dashed line immediately above the text. For example, the "CAD Research Project Meeting" starts at half-past the hour, and is thus displayed half way down in the 2PM to 3PM time slot.

c. When an item ends at a time other than on the hour, a dashed line is placed proportionally at the ending time. For example, the "CAD Research Project Meeting" ends at 4:30PM, and its ending time is thus displayed as a dashed line in the middle of the 4PM to 5PM time slot.

d. When an item ends in an hour after the hour in which it begins, a down-pointing arrow is drawn to the ending time. This case is also illustrated by the "CAD Research Project Meeting".

At the top of the day view is a full description of the day of the week, month, and year. Immediately to the left and right of the description are arrow buttons used to change the display to the previous or next calendar day. For example, when the user chooses the right-pointing arrow in the display of Figure 10, the display changes to that shown in Figure 11.

The following options are available to control the format of the day display:

a. *Normal time range.* This option defines the starting and ending times that normally appear in the left column of the display. The default range of times is 8AM to 5PM.

b. *Time increment.* This option defines the time increment of the left column labels. The smallest allowable time increment is five minutes, the largest is twelve hours. When the time increment is less than one hour, the time labels are shown in hour and minute format; when the increment is one hour or greater, the labels are shown as hours with no minutes. The default increment is one hour.

c. *Increment height.* This option defines the default minimum number of text lines shown in each time increment. If there are more items starting in an increment than fit in the minimum number of lines, the system automatically increases the height for that increment to a size sufficient to display all items fully. The default value is two lines per increment.

d. *Show/hide 24 hours.* This option toggles between showing a full 24 hours of display versus the normal time range only. If the 24-hour time range is shown, non-normal times are shown with a light grey background, to distinguish them from normal times. The default value for this option is to hide non-normal times.

e. *Show/hide exact time.* This option toggles between showing or not showing the starting and ending times for each scheduled item, immediately to the left of the title. This option is useful when items do not typically start or end exactly on the hour. The default value for this option is to hide the exact time.

f. *Show/hide dashed lines.* This option toggles between showing and not showing the dashed lines that appear above and below items that do not start or end on the hour. The default is to show dashed lines.

g. *Show/hide extension arrows.* This option toggles between showing and not showing the down-pointing arrows for items with end times that extend beyond the hour of the start time. The default is to show extension arrows.

h. *Proportional spacing on/off.* This option toggles between placing items proportionally down from the top of the hour based on starting time. When the option is off, the first (only) item in an hour is placed at the top of that hour and any other items starting in the hour are placed immediately below it. The default is

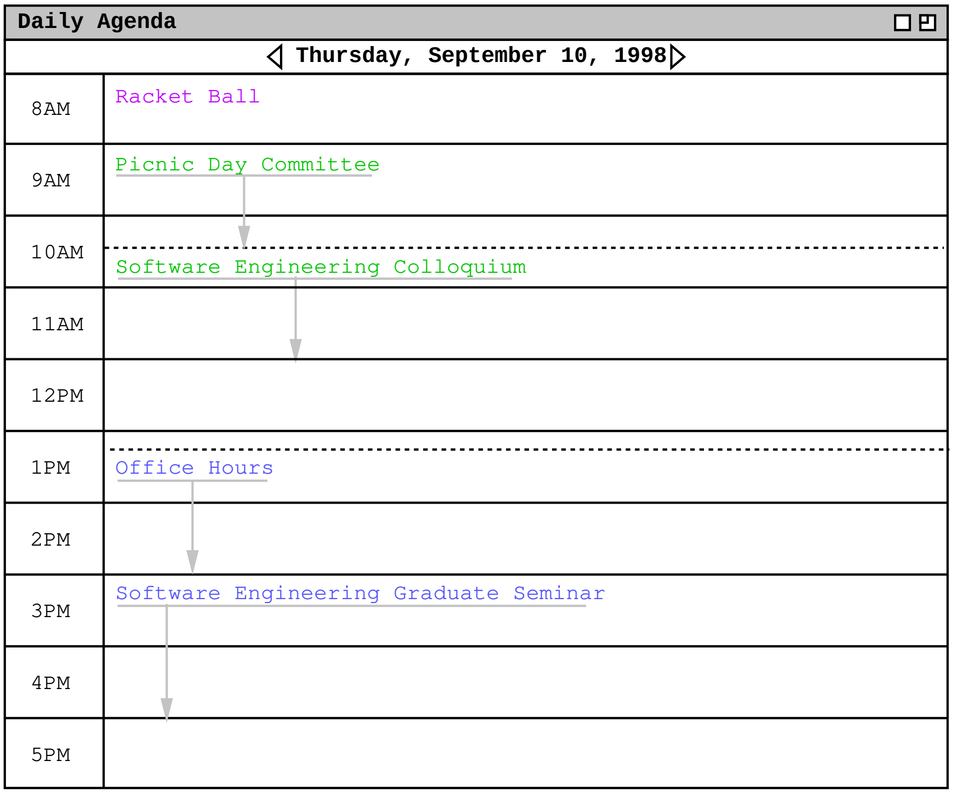

Figure 11: Result of pressing the next day arrow.

proportional spacing on.

i. *Display overlaps horizontally or vertically.* This option controls how items with overlapping times are displayed. When displayed horizontally, overlapping items appear side-by-side in separate columns of the day view. When displayed vertically, overlapping items appear on separate lines in a single column, sorted by start time, duration, and title. The default is horizontal display.

j. *Default display width* and *default display height.* These options control the default width and height of the full daily display. If one or both of the default dimensions is too small to accommodate all information in the display, the information is truncated appropriately and scrollbars are added to the display window. Details of how this truncation is performed are covered in Section 2.13.1.

The user sets these options in the edit-preferences dialog, as described in Section 2.9.2.

As an example of alternate option settings, Figure 12 shows a day view of the same information shown in Figure 10, with the following non-default option settings: normal time range 7AM to 6PM; time increment of 1/2 hour; increment height equal to one line; show 24-hour display; show exact time; hide dashed lines; and hide extension arrows. Figure 12 shows a fully expanded window, with all 24 hours of the day visible. If the user shrinks the window display vertically, a vertical scrollbar appears to allow viewing the non-visible hours. Further details on the effects of display resizing are covered in Section 2.13.1.

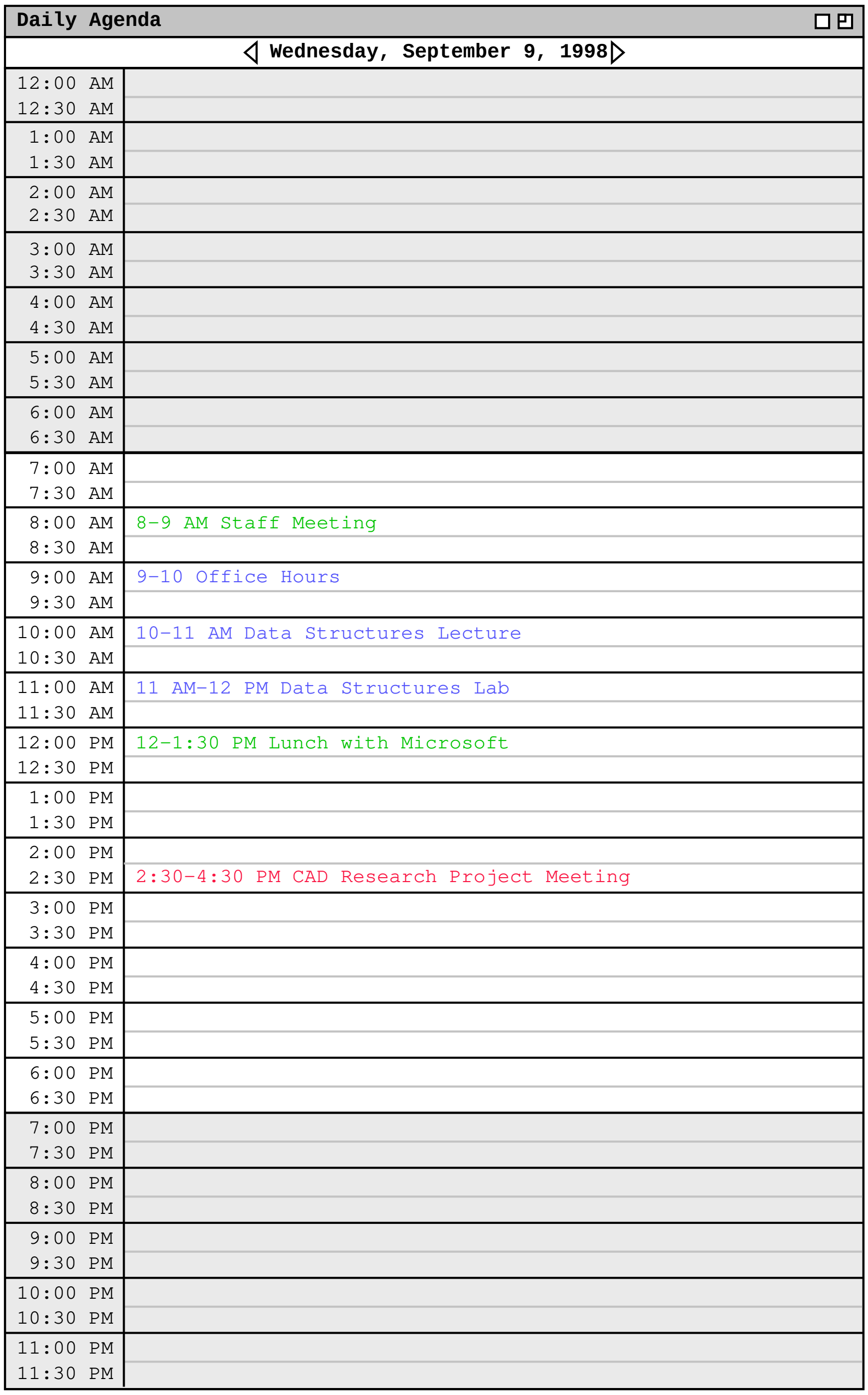

Figure 12: Day display with non-default option settings.

To illustrate the display of overlapping items, Figure 13 shows an updated version of the daily schedule shown in Figures 10 and 12. Here the user has added three new items, with times that overlap with previously scheduled items. The new items are a "TA Meeting" from 8 - 9:30 AM, a "College Meeting" from 2 - 3 PM, and a "Special Colloquium" from 2 - 3:30 PM. The overlapping items are shown in two new columns next to the items with which they overlap. The left-to-right order of items is based first on start time (earliest first), second on duration (shortest first), and third on alphabetic order of the title. Note that this ordering has placed the "CAD Research Project Meeting" in the rightmost column, even though this item was scheduled by the user before the items with which it overlaps. That is, the order of overlapping items does not depend at all on the chronological order in which the user executes scheduling commands.

The layout of overlapping items may be further complicated when three or more items do not overlap fully, for example if the user were to add an appointment from 3-4PM to the schedule shown in Figure 13. The precise layout rules for such cases are covered in Section 2.13.1.2.

In displaying overlapping items horizontally, the system attempts to display the full width of all items in one screen. If there is insufficient physical screen width to display all items in full width, the system truncates the display, leaving overlap columns of equal width. If the display window is resized, each column is resized proportionally and equally. Further exact details of truncation and display resizing are covered in Section 2.13.1.1.

Figure 14 shows the same information as Figure 13, after the user has changed the overlapping display option from *horizontal* (the default) to *vertical*. When the user selects the vertical display option for overlapping items, the system automatically turns on the *show exact times* option and turns off the *dashed lines*, *extension arrows*, and *proportional spacing* options. Turning off these three options is necessary since they are generally incompatible with the

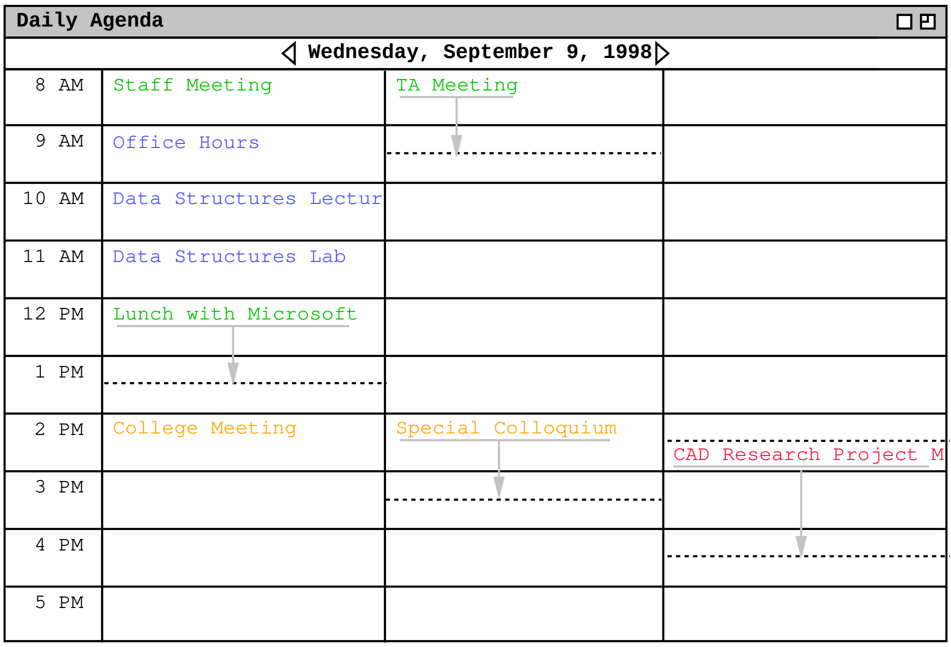

Figure 13: Day view with overlapping times.

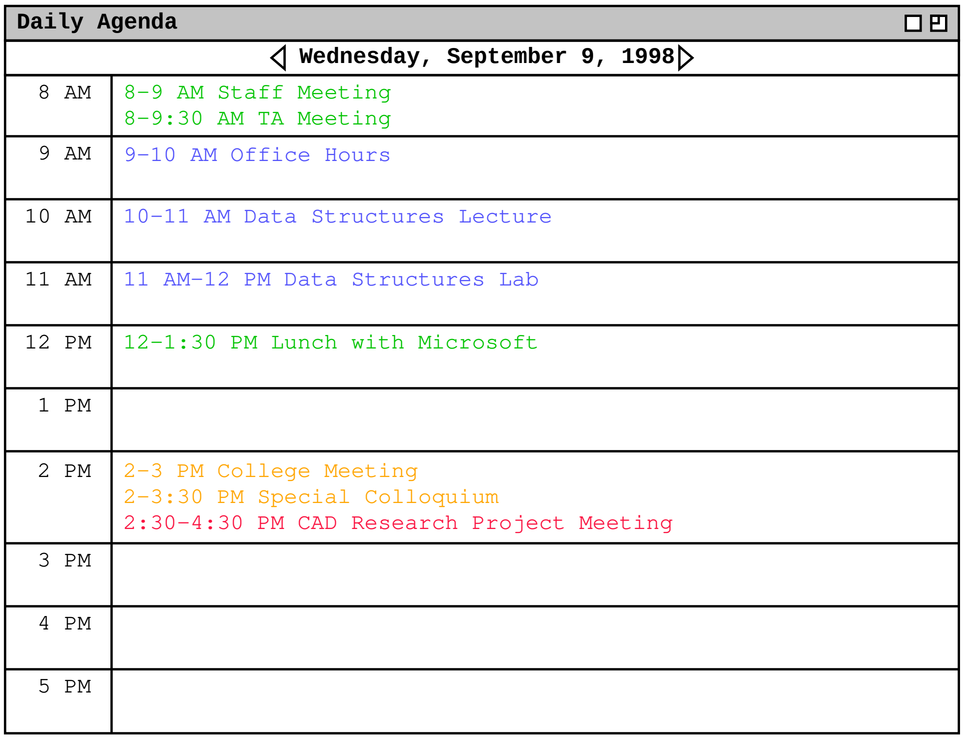

Figure 14: Day view with overlapping times, displayed vertically.

vertical display of overlaps. (The reader is invited to think this through clearly.) If the user subsequently sets the overlapping-item display option to horizontal, the system restores the settings of all automatically-set options to their values prior to their automatic setting.

Of note in Figure 14 is the automatic resizing of the 2PM time slot from two to three rows, even though the current setting of the *increment height* option is 2. Whenever the number of items in a time increment is greater than the current increment height, the system automatically increases the height of the affected increment to show all items that start in that increment. This automatic height increase is performed as necessary for any time increment in a day view, not just for increments with overlapping items.

2.3.1.2. Week Views

After the day view, the next larger-grain level of viewing is a week. There are two choices for the format of the week view: table and lists. These choices are available on a submenu when the user chooses the '`Week`' command from the '`View`' menu. When the user chooses the table–style week view, the screen appears as shown in Figure 15.

When the user chooses either style of week view, the displayed week is the one that contains the most recently selected day. Here for example, the user is viewing the week that contains the most recently viewed day of Wednesday, September 9. The current date, that is today's date, is highlighted with a darkened border in the week display. In this scenario, for example, the current date is Wednesday, September 9.

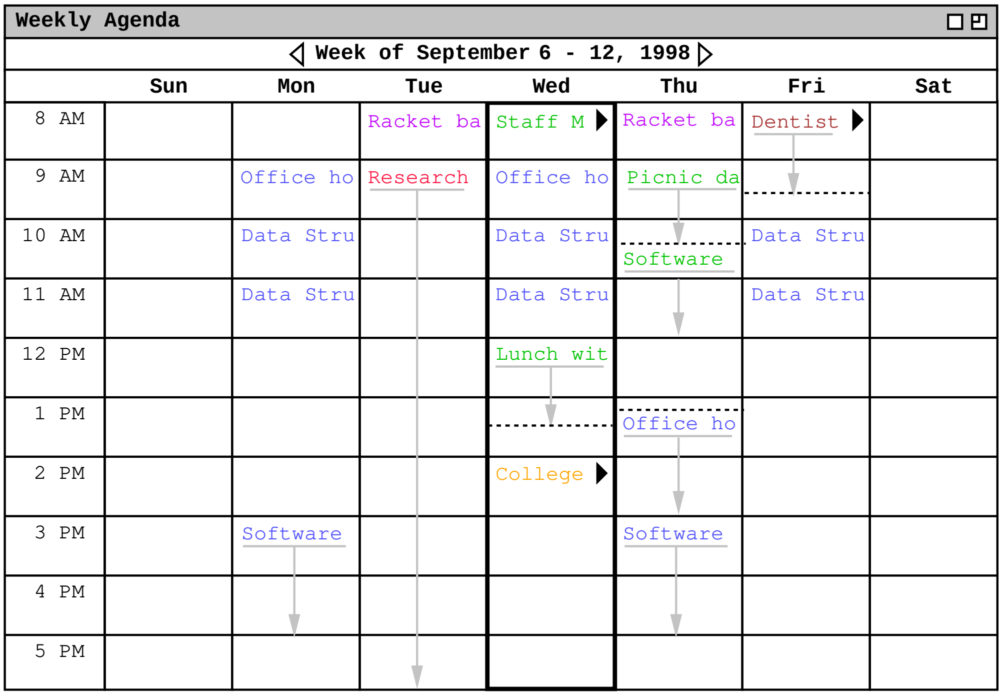

Figure 15: Table-style week view.

The table-style weekly view shows items in the same format as the day view, except with narrower columns to accommodate all the days of the week. Each item is shown with as much of the title as fits horizontally within its display area. The columns of the weekly table view are all of equal width. If the display window is resized, each column is resized proportionally and equally. At the top of the weekly view is the exact description of the week, with arrow buttons to go to the previous and next weeks.

A notable aspect of the weekly table view is the display format for days that contain overlapping items. In the example shown in Figure 15, there are three overlapping appointment times. These overlaps are indicated by solid right-pointing arrows wherever overlap occurs. When the user presses a right-pointing arrow, the display for the column scrolls to the left to allow overlapping items to be viewed.

Figure 16 further illustrates the display of overlapping weekly table items. The figure shows four excerpts of the weekly table view for the week of September 6, illustrating four stages of viewing overlapping items. In Figure 16a, three right-pointing arrows appear at Wednesday 8 AM, Wednesday 2 PM, and Friday 8 AM. Each arrow is positioned vertically at the start time of an overlapping item.

When the user clicks on the right-pointing arrow at Wednesday 2 PM, the list of 2 PM overlapping items scrolls to the left. The result is shown in Figure 16b, with the changed item circled.

Figure 16c shows the result of the user clicking on the right-pointing arrow at Wednesday 8 AM. The display change is again circled. Of note in Figure 16c is that the Office Hour item at 9 AM has been removed from the display. When overlap scrolling in a weekly view, the system displays only complete overlapping items, no partial items. That is, the system removes all items from the display with which a scrolled-to item fully or partially

a. Overlapping items to the right.

b. Pressed right arrow at Wed 2 PM.

c. Pressed right arrow at Wed 8 AM.

d. Pressed right arrow at Fri 8 AM.

Figure 16: Clarification of overlap in a weekly table view.

overlaps.

Figure 16d shows the result of the user clicking on the right arrow at Friday 8 AM. This change again illustrates how only one overlapping item is displayed at a time. That is, the Dentist appointment at 8 AM is not displayed at all in 16d, even though it would fit partially in the display. Figure 16d also illustrates that the left-pointing arrow always appears at the top of the item that is displayed. Hence, the left-pointing arrow in 16d appears next to the 9 AM office hour appointment, not in the empty 8AM slot where the Dentist appointment previously appeared.

When necessary, a left-pointing arrow appears to allow scrolling back. Examples of left-pointing arrows are shown in Figures 16b, 16c, and 16d. The 2 PM item in Figures 16b-d has both left- and right-pointing arrows, since there are overlapping items on both sides. When there are no further overlapping items, the left- or right-pointing arrow disappears, as appropriate. Disappearance of the right-pointing arrow is illustrated in the Wednesday 8 AM item in Figure 16c and the Friday 9 AM item in Figure 16d.

All of the display options available for the day view are also available for the table-style week view. In addition, the following display options are available for the week view only:

a. *Show/hide title*. This option toggles between showing or not showing the title for each scheduled item. When the user selects to hide item titles, the system automatically turns on the *show exact times* option, if it is not on already. This prevents both the exact time and title from being hidden simultaneously. The default value for the show/hide title option is to show the title.

b. *Normal day range*. This option defines the starting and ending days that appear along the top of the display. The default range is Sunday through Saturday, inclusive.

The display of a list-style weekly view is shown in Figure 17. The Figure shows the same week as in the table-style view in Figure 15. In the list-style weekly view, the exact time for each item is always displayed, since there is no

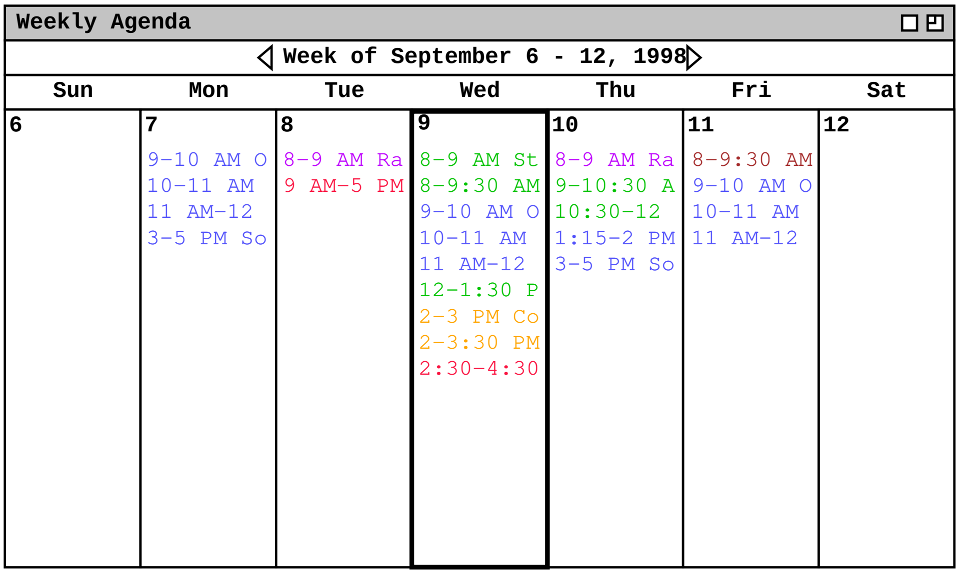

Figure 17: List-style week view.

times column as in the table-style view. The display sizing constraints for the list-style view are the same as for the table-style view. Specifically, each item is shown with as much of the time and title as fit horizontally within its display area. The columns of the list-style view are all of equal width. If the display window is resized, each column is resized proportionally and equally.

For each day of the week, the items for that day are listed consecutively in the column for that day. The items in each daily list are sorted first by start time (earliest first), second by duration (shortest first), and third by alphabetic order of the title. No further sorting criteria are necessary, since the system disallows multiple scheduled items with exactly the same values for start time, duration, and title. This and other scheduling restrictions are discussed further in Section 2.11.

A subset of the table-style display options are applicable for the list-style weekly view. These options are:

a. *Normal day range*.

b. *Show/hide title*.

c. *Default display width* and *default display height*.

Each of these options has the same meaning and defaults as for the table-style weekly view.

2.3.1.3. Month View

An example of the month view was shown originally in the initial screen configuration, since the month view is the standard default. It is chosen explicitly with the '`Month`' command from the '`View`' menu. Figure 18 shows the result of the user making this selection for the month of September 1998. The Figure shows the scheduled items that have been added during the course of the scenarios up to this point. The current date is highlighted with a darkened border. At the top of the view is the name of the month, with arrow buttons to go to the previous and next months.

In the month view, the display format for an individual day is the same as the list-style weekly view. That is, the time and title for each item are displayed in a vertically-formatted list, sorted by start time, duration, and title. Since the height of each day in the month view is considerably shorter than in the week view, a transient vertical scrollbar is provided when the number of items in a day is greater than fits vertically in the display box for a day. "Transient" for the scrollbar means that it only appears when the user clicks within a day for which scrolling is necessary. For example, if the user clicks within the display box for Wednesday September 24 (in Figure 18), the scrollbar appears as shown in Figure 19. The scrollbar appears since there are more items scheduled for September 24 than fit in the current size of the September 24 box. If the user clicks within a day where scrolling is not necessary, such as September 22, no scrollbar appears. A displayed transient scrollbar for any day disappears when the user clicks anywhere outside of the day in which the scrollbar appears.

A subset of weekly list-style display options are applicable to the month view. These options are:

a. *Show/hide title*.

b. *Default display width* and *default display height*.

These options have the same meaning and defaults as for the list-style weekly view.

2.3.1.4. Year View

The largest-grain calendar view is a year, as shown in Figure 20. The current date is highlighted with a rectangular border. At the top of the view is the year number, with arrow buttons to go to the previous and next years.

Unlike the smaller-grain views, the yearly view shows no information about scheduled items. The user may select any date as the target of another view command to show item details.

2.3.1.5. Scheduled Item View

The user may view the full scheduling details for an item shown in any day, week, or month display. To do so, the user selects the item time or title and then chooses the '`View Item`' menu command. A short cut to view item

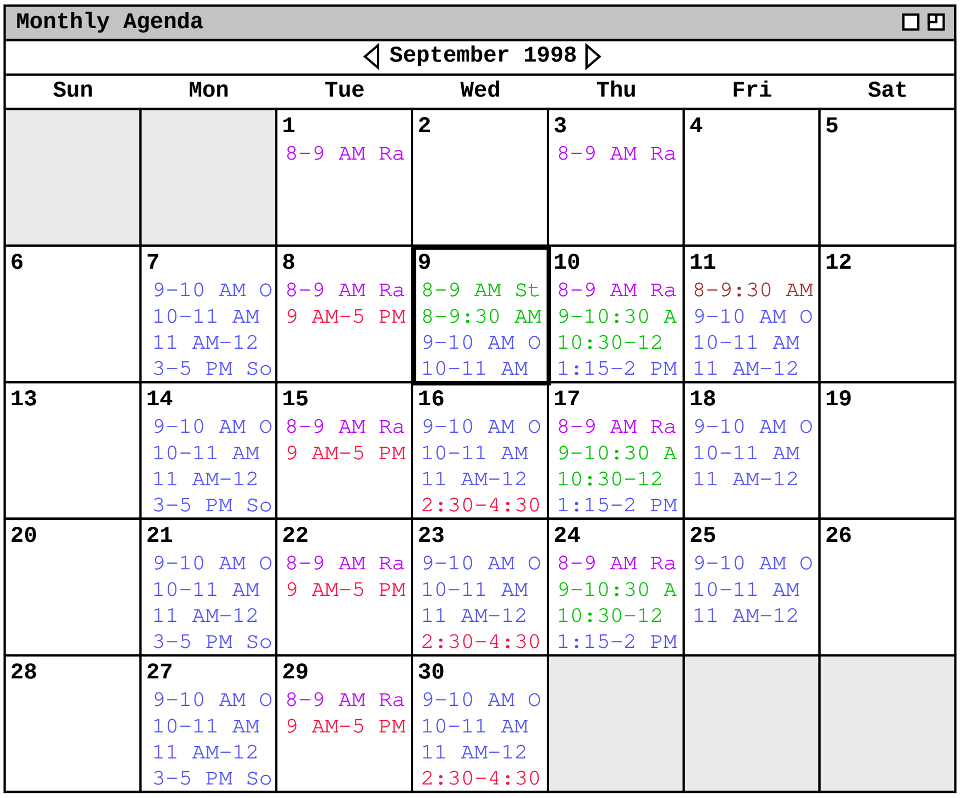

Figure 18: Month view.

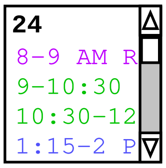

Figure 19: Transient scrolling in a month view.

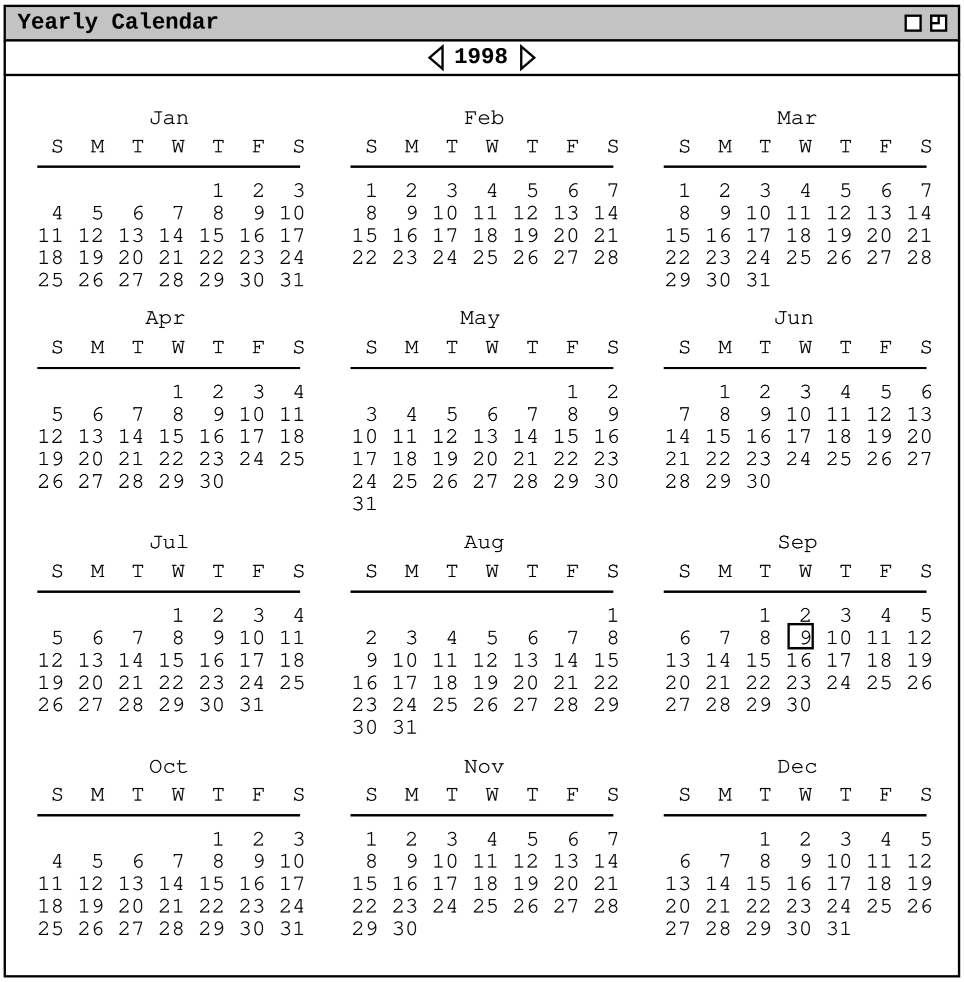

Figure 20: Year view.

details is to double click on the item time or title in any larger-grain view. Figure 21 shows the result of the user having selected to view the item for 8 AM September 11. The information displayed for the item is editable by the user. This editability distinguishes the item-level view from the larger-grain daily, weekly, and monthly views. That is, none of the larger-grain displays allows the user to edit any of the displayed item information.

The item-level display has the same data fields as the scheduling dialog shown in Figure 3. The item display differs from the scheduling dialog in the command buttons along the bottom of the dialog window. Specifically, the scheduling dialog has only '`OK`', '`Clear`', and '`Cancel`' buttons. In the item display there are buttons to '`Change`' the item, '`Delete`' the item, and '`Clear`' the dialog. There are also '`Previous`' and '`Next`' buttons to view the chronologically previous and next scheduled items.

To change the displayed item, the user makes one or more changes in the item data fields and then presses the '`Change`' button. If the user presses '`Change`' without having performed any data-field editing, the system responds with an explanatory error dialog. To delete the displayed item, the user presses the '`Delete`' button. The system responds with a confirmation dialog. If the user confirms affirmatively, the system deletes the scheduled item

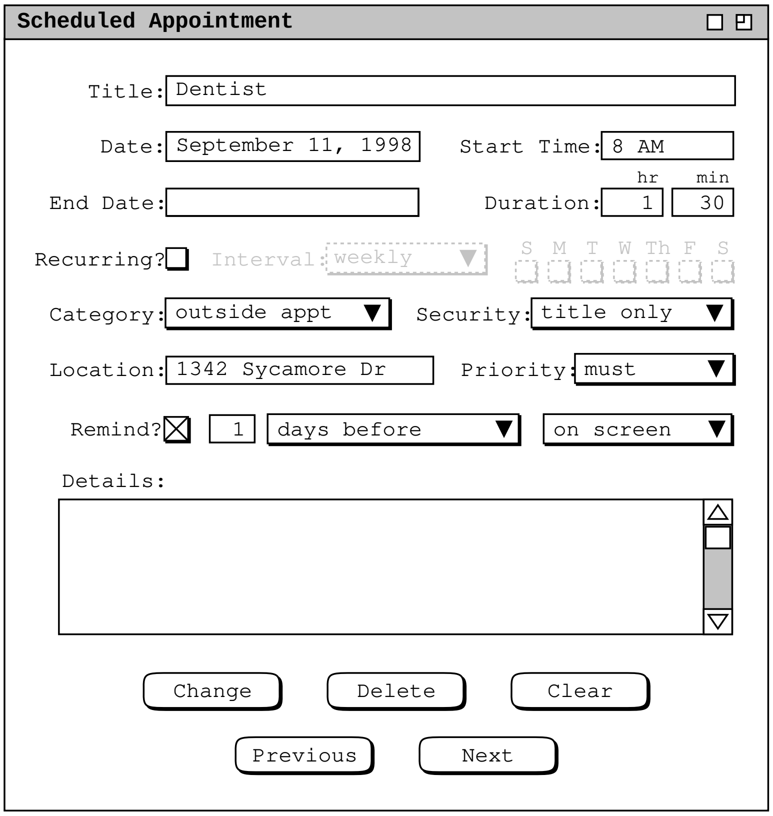

Figure 21: Details of selected scheduled item.

and removes the display from the screen.

The effects of the change and delete commands are potentially wide-ranging, particularly for recurring items or meetings with multiple attendees. Complete details of item change and deletion are covered in Section 2.6.