

NCSA Audible Collage for Microsoft Windows version 1.2 BETA 1



Introduction

NCSA Audible Collage for Microsoft Windows is a visualization and sonification tool for use in the Microsoft Windows 3.x environment. Collage can load and display HDF raster images in MDI display windows. HDF animations may also be loaded and displayed. A variety of mouse-exploration and animation-driven sonification options have also been implemented. The following sections of this document detail how to use the features currently available in Collage.

Loading a File or Animation

Currently, Collage only loads data from files in NCSA's Hierarchical Data Format (HDF). To load a raster image, animation, or SDS from an HDF file choose the **Open** option from the **File** menu. This option pops up a standard Windows file requestor, from which you may choose an HDF formatted file to load. After selecting a file, click OK and an HDF Browser window will pop up, allowing you to select the raster image, SDS, palette, or animation you are interested in. (If you select more than one raster image, it is assumed you want to open the rasters as subsequent frames of an animation.) Either double-click on the object, or click on Open Publicly or Open Privately. If you select a raster image and a palette, Collage will load the raster image with the selected palette, instead of the default palette for that image.

Displaying an animation forward or backward is controlled from the Animation buttons in the toolbox, or from the menu items (under the Tools menu). Animations may take several seconds to load, because the images are all loaded when the animation is opened - the raster frames are all being loaded and flipped when you open the file. (HDF files store images with the origin at the top, and Windows displays images with the origin at the bottom).

The File menu also allows loading Variate Data sets. This basically allows the user to load an "invisible layer" of data into a window, letting

you use the sonification tools on the hidden layer while viewing the top layer. This feature is not currently useful for purposes other than sonification. Open your top-layer window first, then select it and load in the variate data. Use the Swap Variate and Use Variate items in the Sonification menu for control.

The File menu also contains the About box (self-explanatory), and a Publish item. The Publish item is used when you want to show other people in your Collage session a file that you either 1) originally opened as Private, or 2) opened before you joined the Collage session (or before they joined the Collage session.)

Edit Menu

The Edit menu allows the user to copy and paste images and palettes.

Currently, images (DIBs and DDBs) cannot be pasted into Collage, although they can be copied from Collage. Palettes may be copied and pasted between image windows in Collage.

Tools Menu

The Tools menu gives access to the Text Editor, Whiteboard, Screen Capture, Histogram and Icon Toolbox tools, as well as the ability to generate and interpolate raster images from SDS windows and control animations. The Screen Capture tool allows you to share images outside of Collage with other Collage users. The Histogram tool gives you a graphical histogram of a rectangular area in an image. (be sure to check Area Selection in the Select menu). Generate Raster and Interpolate Raster will only be enabled if you have an SDS window selected in the MDI window.

Collaborate Menu

The Collaborate menu gives you the options for joining and quitting Collage sessions, and displaying/hiding the Participants window, which displays who else is joined into your Collage session.

Window Menu

The Window menu gives you the standard items for controlling MDI windows - Tile, Cascade, Arrange Icons, and Close All.

Overlay Menu

The Overlay menu controls the Overlay Plane on top of image windows.

The only items currently active are the Draw and Clear items. The Draw item give you a selection of which type of pen you want to use. The Clear

menu only
works with clear all.

Select Menu

The Select menu allows you to decide what type of selections you will make - points, lines, areas, etc.

Sonification Menu

The Sonification menu allows access to the sonification features, described in detail below.

Sonification

The sonification extensions made to Collage for the PC release function primarily as mouse exploration tools. Selections may be captured, sonified in a number of ways, and replayed at will. Selections may also be sonified during an animation, resulting in a data-created "soundtrack." This section will outline how to utilize the sonification extensions.

Hardware

There is only minimal support for the PC's built-in speaker in Collage. The built-in speaker is incapable of producing all but the simplest of sounds with acceptable sound quality, and the monophonic nature of the PC speaker makes it incapable of producing the sort of multi-dimensional sound the sonification extensions are intended to create. For this reason, MIDI (Musical Instrument Digital Interface) was chosen as a relatively low-cost (but flexible) sound-production mechanism- in particular, Roland's MT-32 and its successors, the LAPC-1 and the CM-32L synthesizers are supported. Actual development was done using a CM-32L. These synthesizers are capable of producing up to nine tracks of sound at a time, with 32 voices playing simultaneously. Any multi-timbral MIDI synthesizer may be used with the sonification extensions; however,

configuring a system using a different synthesizer may require considerable knowledge on the part of the user. A Roland MPU-401 (or compatible) interface is required to connect the MIDI synthesizer to the computer for use in MS-Windows 3.0, or any supported MIDI interface in Windows 3.1.

Sonification Tools

The sonification tools are accessible from both toolboxes and menus. There are four toolboxes: the **Sonify** toolbox, which selects the sonification tools, the **Statistics** toolbox, which selects which statistics will be sonified, the **Patch** selection toolbox, which allows selection of alternate patches on the MIDI synthesizer, and the **Icon** toolbox, which allows access to all the functionality of the Sonify and Statistics toolboxes and more with a icon-driven interface.

These toolboxes can be made visible from the **Sonify** menu, present at the top of the main window. If no MIDI interface is present, the **Patch** menu is unavailable.

The **Sonify** toolbox contains the basic interface to the sound tools: the first panel, labelled **Capture**, contains the radio buttons for the type of selection to be captured. Only **Captured** selections (paths and areas) may be **Replayed**.

Point - the captured selection is a point, represented by a large dot. Only the pixel in the center of this dot is sonified. The point is captured when the left mouse button is pressed in an image window.

Freehand - a line may be traced out with the mouse freehand. The line contains all points the mouse cursor passes over while the left mouse button is pressed. The mouse cursor is constrained to only move one pixel at a time, so that a continuous line will be drawn.

Polyline - a polyline may be drawn with the mouse. The path contains all points in the polyline. Click the left mouse button once in the image window to begin a polyline, and then click the left button again at each additional vertex. Click the right button to terminate the polyline.

Area - an area can be captured for statistical analysis. Click the left mouse button and drag the rubberbanding box around the area to be analyzed.

None - No selection will be captured. The cursor will move freely through the image and produce sound, sonifying sampled data beneath the cursor. Even though the path is not being captured,

Sound, all of the sound tools except Anim and Stats are available. If **None** is selected, it is impossible to **Replay** the selected since the data is not being captured for playback.

The next panel is the **Sound** panel, which uses checkboxes to identify the selections available for sonifying data. These tools may be used in any combination: only one may be turned on, two may be turned on, or all of them

may be turned on if desired. If none are selected, no sound will be heard.

Note that some selections are not available for some Capture types;

unavailable selections are greyed out in the selection panel. The selections are as follows:

Discrete - The sound produced is a standard "note" - i.e., G sharp, C, etc., which is played for a short time interval. The data is mapped across a range of 64 note values.

Continuous - The data is mapped across a four-octave range, and

the
creating a
than the

pitch of the synthesized voice is varied across this range,
smooth frequency change, with much greater resolution

Discrete sound tool.

Gradient - This tool produces a high-pitched "click" if the data has increased from the last data value, or a low-pitched "click" if

the
no sound

data value has decreased. If the data value is unchanged,
is produced.

Contour - The data range (that is, the range of the palette - 0-255)

is
(the
boundaries ,
entered is

divided into eight equal "regions" - whenever the data value
point underneath the cursor) crosses one of the seven
a sound which is pitch-mapped to the data range being
played.

Animation - When this box is checked, animations will be sonified. This has various effects, depending on which **Capture** type is currently selected. For **Point**, the sound is a pitch-mapped note which represents the value, equivalent to the **Discrete** tool. If **Freehand**, **Polyline**, or **Area** is selected, any of the statistics which are checked will be heard (See the section on the **Statistics** dialog box for more information on this.)

Statistics - This function sonifies (and displays) one or more of the following statistics: Minimum, maximum, mean, median, and mode. A sonic "histogram" may also be selected. These selections are made in the Statistics toolbox, or from the menu.

Underneath these two panels are buttons marked **Replay**, **Replay Evenly**, and **Stop**. These buttons allow the user to repeat the sonification of a path, point or area selection with the same settings, or even to alter the sound tools selected and replay the captured selection. For example, a **Freehand** line captured with the **Gradient** tool selected will sonify the increases and decreases in the data. Then, the **Gradient** tool could be deselected, the **Continuous** tool selected, and the **Replay** button pressed. The captured path will be sonified as if the user had re-traced it with the **Continuous** tool selected instead of the **Gradient** tool. The **Replay Evenly** option differs in that the path is traversed with a set time interval between data values. This time interval may be set from the **Mapping Controls** dialog box (see the last section, which explains the **Mapping Controls** dialog box). **Stop** will halt any selection currently being replayed. The **Hide** button will hide the **Sonify** dialog box.

The **Statistics** dialog box contains the selections for statistics to be

sonified, both statically and during animations. The first selection, **Histogram**, allows a "sonic histogram" to be heard- this histogram will play through all the data values present in the area or path, playing a sound that is pitch-mapped to each data value and volume-mapped to the number of occurrences of that data value in the area or path. This means that a value with a low frequency count will be played much more softly than a data value which occurs many times. Any values that do not occur in the captured section will not be played at all. The other five selections in this dialog box (**Min**, **Max**, **Mean**, **Median**, and **Mode**) will play a note that is pitch-representative of that particular statistic in the captured selection. Any number of these options may be selected. If a static image is being analyzed, selected statistics will be heard, with gaps of .5 seconds between each note being turned on. As each statistic is sonified, the mouse cursor will change to represent the statistic currently being added to the chord. If statistics are being played during an animation, there will be no gaps between the beginning of notes, and the notes will sound like a single chord per frame of animation.

The **Patch** selection dialog box will only be available if a MIDI interface is present. This dialog box allows selection of any of the preset patches to be selected for the following tools: **Discrete**, **Continuous**, **Contour**, **Histogram**, and **Statistics**. The default values are the voices which we have chosen for the MT-32 series. NOTE: the **Contour** and **Histogram** tools do **NOT** send MIDI "note off" messages, so the patches for these tools should have a fast attack and a quick decay if the patches are changed from the default values. The **Mute** button is provided to send the MIDI "All Notes Off" message on all channels, which will silence any errors in patch selection.

The **Mapping Controls** dialog box is used for options that usually do not need to be accessed on-the-fly - currently, the only functional options are **Speed** and **Output**. **Speed** allows you to select the number of milliseconds between path locations when **Replay Evenly** is pressed: for example, if a larger number is selected, a path that is **Replay Evenly**'d will play back more slowly. The **Output** box allows the user to select whether the output is sent to the PC's internal speaker or a MIDI interface (if present). If no MIDI interface is present, the user will not be able to select **MIDI**.

The **Icon** toolbox allows the user to access all the tools from an icon-driven interface. It is accessed from the Sonify menu. The icons in the box, from left-to-right, top-to-bottom, are as follows:

Toolbox window management:

Move - allows moving the toolbox around Hide - hides the toolbox

File commands:

Open File Open Animation Exit program

Tool commands:

Text Window Overlay toggle Clear Overlay
Replay Sonify Blank Blank
Histogram Window Blank Blank

Animation commands:

Play forward	Stop	Play backward
Capture type:		
Point	Freehand line	Polyline
Area	None	Blank
Sonification:		
Discrete	Continuous	Gradient
Contour	Animation sound	Statistics
Statistics:		
Min	Mean	Mode
Max	Median	Histogram

Notes for Use

Currently, the only tool that functions properly on the PC speaker is the **Continuous** tool, using the **None** Capture type. Most of the other functions are not yet implemented on the standard PC hardware - this may be implemented if demand warrants.

All functions available from the sonification dialog boxes are also available from the **Sonify** pull-down menu.

Please send bug reports and enhancement requests to softdev@ncsa.uiuc.edu.

-Chris Wilson cwilson@ncsa.uiuc.edu
-Dan Simms dsimms@ncsa.uiuc.edu