NCSA Audible Image for Microsoft Windows



Introduction

NCSA Audible Image for Microsoft Windows is a

visualization

tool for use in the Microsoft Windows 3.0 environment. Image can

load and display Windows BMP and HDF raster images in a MDI

display window. HDF animations are also able to be loaded and

displayed. This current release is considered an alpha release, and

may be quite buggy (but probably should run fine). A 80386 or greater CPU is required, as is a graphics board capable of displaying 8

bits per pixel. The following sections of this document detail how to

use the features currently available in Image.

Loading a File or Animation

To load an individual file (as opposed to an animation,

which

is composed of many files) choose the **Open** option from the **<u>File</u>**

menu. This option pops up a standard Windows file browser, from

which you may choose a BMP or HDF formatted file to load into

Image. Image defaults to loading HDF formatted files currently. To

change the file format to load, click on the *Format* button and choose

the new format from the options presented. When the correct file and

file format is selected in the browser, press the **Open** button and the

image file will be loaded into an Image MDI window.

To load an animation, choose the *Animation* option from the

<u>File</u> menu. This option also pops up a standard file browser, but the

method for selecting the file to animate is slightly different. All the

files to animation must be the same resolution, stored in individual

HDF files and also be stored in the same directory. To load an animation into a window, select one file from the files to animate

and

make certain that the HDF format is chosen, then press the

Open

button. This action will load all the files in the directory the file was

selected in. The files in the directory are alphabetically ordered in the

animation to be displayed. Displaying the animation forward or backward is controlled from the Animate menu (documented in

а

further section).

Edit and Vis Menus

Currently, these menus are not connected, and may

produce

strange results if the copy and paste options are selected from the Edit

menu.

Animate Menu

The **Animate** menu controls all the animations displayed

on the

screen. To make animations progress forward through the

frames

loaded, choose the *Forward* option, and likewise choose the

Backward option to progress backward through the animation frames.

These options can also be used while an animation is in progress to

reverse the frame direction. Choosing the **Stop** option stops all the

animation displays.

The animation frame rate will initially be quite slow,

because

the files are being loaded and flipped (HDF files store images from the

top down, and Windows displays images from the bottom up). After

all the animation frames have been loaded, the animation frame rate

speeds up quite a bit, usually a factor of two or so.

Sonification

The sonification extensions made to Image 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.

<u>Hardware</u>

There is only minimal support for the PC's built-in speaker in Image.

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 (<u>M</u>usical

Instrument

<u>D</u>igital <u>Interface</u>) was chosen as a relatively low-cost (but flexible) soundproduction 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.

Sonification Tools

menus. The sonification tools are accessible from both toolboxes and There are three toolboxes:

the *Sonify* toolbox, which selects the sonification tools, the *Statistics* toolbox, which selects which statistics will be

sonified,

and the **Patch** selection toolbox, which allows selection of alternate patches on the MIDI synthesizer.

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 <u>Capture</u> , contains the radio buttons for the type of	
to be c Replay ed.	aptured. Only Capture d selections (paths and areas) may be	
	<i>Point</i> - 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	v. <i>Freehand</i> - 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	o only move one pixel at a time, so that a continuous line will be	
drawn.	<i>Polyline</i> - 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	
	<i>Area</i> - 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 cound conificing compled	
data	beneath the surger. Even though the noth is not being	
captured,	beneaur the cursor. Even though the path is not being	
Course d	None is selected, it is impossible to Replay the selected	
Sound,	since the data is not being captured for playback.	

The next panel is the <u>Sound</u> 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	te				
that some selections are not available for some Capture types;					
unava	llable				
	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.				
41	Continuous - The data is mapped across a four-octave range, and				
the	pitch of the synthesized voice is varied across this range,				
creatir	ng a				
	smooth frequency change, with much greater resolution				
than th					
	<i>Gradient</i> - This tool produces a high-pitched "click" if the data has				
the	increased from the last data value, or a low-pitched "click" if				
lne	data value has decreased. If the data value is unchanged,				
no sol	is produced.				

ic	<i>Contour</i> - The data range (that is, the range of the palette - 0-255)
15	divided into eight equal "regions" - whenever the data value
(the	point underneath the cursor) crosses one of the seven
boundaries ,	a sound which is pitch-mapped to the data range being
entered is	nlaved
Thie	Animation - When this box is checked, animations will be sonified.
	has various effects,depending on which <i>Capture</i> type is
currently	selected. For <i>Point</i> , the sound is a pitch-mapped note
which	represents the value, equivalent to the <i>Discrete</i> tool. If
Freehand,	Polyline , or Area is selected, any of the statistics which are
dialog box	checked will be heard (See the section on the Statistics
alalog box	for more information on this.)
	following statistics: Minimum, maximum, mean, median, and
selections	mode. A sonic "histogram" may also be selected. These
	are made in the Statistics toolbox, or from the menu.
Underi Eveniv .	neath these two panels are buttons marked Replay , Replay
and St	op . These buttons allow the user to repeat the sonification of a
or area	a selection with the samer settings, or even to alter the sound tools
and re	play the captured selection. For example, a <i>Freehand</i> line
captured with th	e Gradient tool selected will sonify the increases and decreases in
the data. Then,	the Gradient tool could be deselected, the Continuous tool
selected, and	nlay button pressed. The captured path will be sonified as if
the user	traged it with the Cantinuous teel
Gradient tool	Selected instead of the
The R e set time	eplay Evenly option differs in that the path is traversed with a

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 occurences 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 patchs 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.

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.

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