Sound and Image Toolbox

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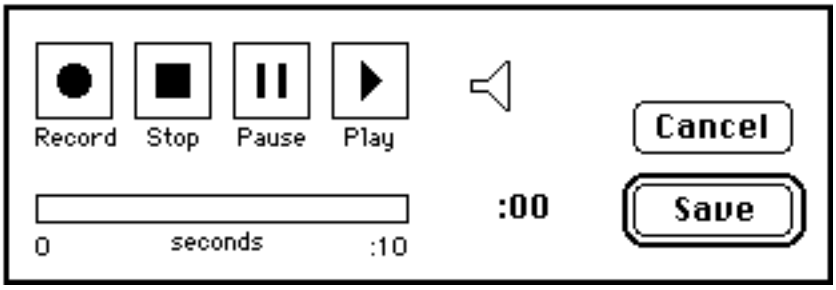

Introduction

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This is the Apple MATLAB Sound and Image Toolbox. This toolbox is subject to change as bugs are fixed and enhancements are added. Note, the code included in this toolbox has been designed to work with MATLAB 4.0 or 4.1 on both Macintosh and other computers.

This report describes a collection of tools that to make it easier for MATLAB users to work with sound and images. Several of the tools are designed to make it easy for Macintosh users to get sounds and images in and out of MATLAB. The remaining sound file routines are useful on all machines.

The following routines are included in this package. They are documented in the pages that follow.

Audio (Macintosh Only)

PlaySound	- Play a sound with the Macintosh sound output system
RecordSound	- Records a sound with the Macintosh sound input system

Sound File I/O

ReadSound	- Reads a sound file
WriteSound	- Write a sound to disk in ADC, AIFF or MacRecorder format

Imaging Routines (Macintosh Only)

GrabImage	- Convert clipboard image into array
ShowImage	- Show an image without axis which can be copied to the clipboard

GrabImage

Purpose

Convert clipboard image into array

Synopsis

a=grabimage;

Description

This MEX function converts a PICT on the clipboard into an array of numbers. Only the luminence of the image is converted; all color information is lost. The result is an array with one array element per pixel in the PICT. Black pixels in the original picture are set to zero in the result; bright pixels (white) are set to 255. This MEX function is only available on a Macintosh computer.

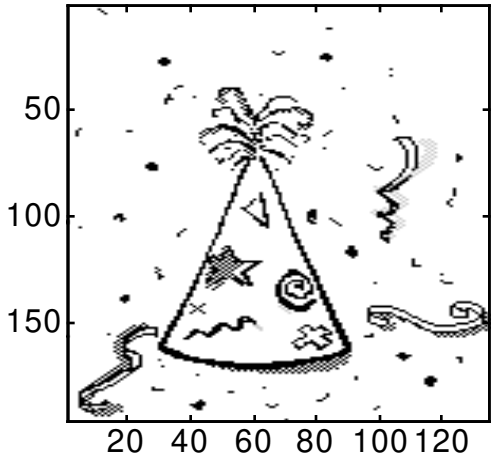
Examples

The Macintosh scrapbook comes with an image of a party hat. Select this image from the scrapbook and type command-C to copy the PICT onto the clipboard. The command

```
a = grabimage;
```

converts the image into an array which can be displayed with either the built in image command

```
»colormap(gray)
»image(a*length(colormap)/max(max(a)));
```



or with this toolbox's showimage command (which preserves the original aspect ratio of the data).

```
»showimage(a)
```

PlaySound

Purpose

Convert an array into a sound on Macintosh Computers.

Synopsis

PlaySound(data [,samplerate [,'dontscale']])

Description

PlaySound plays a data array through the speaker at the given sampling rate. If the data array is either a row or a column vector then it is played monaurally. Arrays that are either Nx2 or 2xN are assumed to stereo and will play that way on Macintosh computers with external stereo speakers.

The sample rate defaults to the standard Macintosh hardware sample rate of 22254.545454Hz. Other values can be specified but linear interpolation is used to resample the data.

The 'dontscale' option tells PlaySound to not scale the data. Normally the data is scaled so that the maximum value in the array will be just short of clipping. If the 'dontscale' option is specified then the data is assumed to fall between 0.0 and 255.0.

Note, the functionality of this command is duplicated by the builtin ‘sound’ command.

Examples

The command

```
PlaySound(sin((0:10000)/22254.545454 * 440 * 2 * pi))
```

gives a 440 Hz tone. If you have stereo speakers or headphones connected to your Macintosh try

```
»b(2,10001:20000)=sin(1:10000);
»b(1,1:10000)=sin(1:10000);
»playsound(b)
```

ReadSound

Purpose

Read a sound file

Synopsis

[a,sr]=readsound(filename)

Description

The readsound routine is used to read in many common speech sound formats.

The format for the file is determined by the file's suffix. The following file types are supported:

.adc	ADC Format
.dac	DAC Format (ADC Format with the bytes swapped)
.wav	TI Wave Format
.aif	AIFF Format
.m22	MacRecorder (22kHz) Format
.m11	MacRecorder (11kHz) Format
.m7	MacRecorder (7kHz) Format
.dy22	Dyaxis (22kHz) Format
.dy11	Dyaxis (11kHz) Format
.snd	NeXT Format
.irc	IRCAM Format
.macspeech	MacSpeech Format

Examples

The statement

```
a=readsound('apple:tap.aif');
```

returns an array (either one or two column) of sound samples.

See Also

writesound (Apple), sound (MathWorks), auread (MathWorks), wavread (MathWorks)

RecordSound

Purpose

Record a sound with the Macintosh Sound Input System

Synopsis

a = RecordSound;

Description

This command uses the Macintosh Sound Input Manager to record a sound and then returns the resulting waveform in a one dimensional array. The sampling rate is determined by the Sound input manager; generally it will be 22254.545454… Hz.

Examples

This command is dependent on the Macintosh Sound Input System. If you open the “Sound” control panel you should see a button that lets you add a new Alert. Press this button and you should see a small dialog box like the one show below. If your microphone is plugged in and working, you should see a number of arcs coming out of the speaker.

The following commands can be used to record and then play back a sound

```
»a = RecordSound;
»sound(a)
```

ShowImage

Purpose

Show an image without axis, allow copying to clipboard

Synopsis

ShowImage(a)

Description

This command renders a two dimensional array as a black and white gray-scale image. This command is only available on Macintosh computers.

If differs from the MATLAB builtin commands *image* and *surf* in a number of important ways. Most importantly, the image can be copied to the clipboard using the Command-C key. Once it is on the clipboard it can easily be transfered to other programs for publishing or other analysis. The image is automatically scaled so that black is the most negative portion of the array, and white is the most positive.

This command is more limited than the builtin commands. No axes are shown, and there is no ability to manipulate the colormap. Images are always rendered 1-1 and there is no ability to resize the image.

Any keyclick or mouse click dismisses the image dialog box.

Examples

The following commands are used to display a sine-wave grating.

```
»i=-32:32;
»x=ones(65,1)*x;
»y=x';
»r=sqrt(x.*x + y.*y);
»image=sin(r);
»ShowImage(image)
```

WriteSound

Purpose

Write a sound file to disk.

Synopsis

writesound(array,sample_rate, filename [,max])

Description

The writesound() routine saves a data array on disk. The format of the file is determined by the file suffix and the following types are currently supported:

.adc	ADC Format
.aif	AIFF Format
.m22	MacRecorder (22kHz) Format
.m11	MacRecorder (11kHz) Format
.m7	MacRecorder (7kHz) Format

Examples

```
writesound(data, 22222.5454, 'foo.aif')
```

See Also

ReadSound (Apple), sound (MathWorks), auwrite (MathWorks), wavwrite (MathWorks)