MacPAG / WinPAG
Programmable Audio Generator
Version 1.2.0 - December 4, 2005
©2004-2005 Black Cat Systems
http://www.blackcatsystems.com/software/pag.html

Introduction
MacPAG and WinPAG - Programmable Audio Generator - are programs for creating audio files containing a series of tones, as well as for producing audio tones in real time.

Why would you use it?

PAG is useful for creating files of test tones, for testing audio software, or equipment. Let's say you wanted to make a file of DTMF (Touch Tone) tones to test out some equipment. You can use PAG to generate such a file.

You can also use PAG to play audio of a single tone (frequency) in real time (see Frequency Generator further down in this document), and create a sequence of tones to play (see Frequency Schedule further down in this document).

Producing an Audio Recording File

PAG reads in a text file to define what audio to produce. There are four sections to the file:
1. File format
2. Defintion of tones
3. Macros
4. Tones to send

Below is an actual file, let's take a look at it:

```
#format WAVE 44100 16 1 dtmf.wav
1 0.2 697 50 50 1209 50 50
2 0.2 697 50 50 1336 50 50
3 0.2 697 50 50 1477 50 50
4 0.2 770 50 50 1209 50 50
5 0.2 770 50 50 1336 50 50
```

```
6 0.2 770 50 50 1477 50 50
7 0.2 852 50 50 1209 50 50
8 0.2 852 50 50 1336 50 50
9 0.2 852 50 50 1477 50 50
* 0.2 941 50 50 1209 50 50
0 0.2 941 50 50 1336 50 50
# 0.2 941 50 50 1477 50 50
A 0.2 697 50 50 1633 50 50
B 0.2 770 50 50 1633 50 50
C 0.2 852 50 50 1633 50 50
D 0.2 941 50 50 1633 50 50
s 0.2 1 1 1 1 1 1
#macros
h 8675309
#start
0s1s2s3s4s5s6s7s8s9s0sAsBsCsDs*s#s
h
```

The first line defines the format of the file to produce:
`#format WAVE 44100 16 1 dtmf.wav`

The format of the this line is:
`#format fileType sampling bits channels fileName`

fileType can be one of: WAVE, AIFF, AU
sampling is the sampling rate in Hz, such as 44100, 11025, 8000, etc
bits is the sample size, only 8 and 16 are allowed
channels is 1 or 2, for mono or stereo
fileName is, as expected, the name of the file to produce

Next come the definitions for the tones. Each tone is assigned to a character, whenever that character appears in the fourth section of the file (tones to send) it is produced. A tone can actually be defined to produce more than one frequency at a time, which is necessary in cases like DTMF where two tones must be played at the same time for each button on the phone. For example, the definition for the 1 button:

`1 0.2 697 50 50 1209 50 50`

The definition of this line is:
character length freq1 ampL1 ampL2 ... freqN ampLN ampRN

The first letter in the line is the character assigned to that tone. Any printable or non printable character may be used, except for the tilde ~ which is actually mapped to the space character, since it is more likely you will want to define the space than the tilde. That is, you use the tilde here to define the tones to send when the space character is encountered. Hopefully that isn't too confusing.

The second value is the length (in seconds) that tone should be played for.

Next, we take values in blocks of three, such as 697 50 50 in that line. The 697 means to play 697 Hz, the 50 50 means to set the amplitude to 50% for both the left and right channels. The next set of three values is 1209 50 50 which means we want to play a second tone at the same time, of 1209 Hz, also 50% amplitude in each channel. You can have different amplitudes for each tone and channel of course, but for a given channel, the sum of all the amplitudes for all the frequencies should not exceed 100%, or distortion will result.

You can define up to ten frequencies for each character. You must specify all three values for each, including both amplitudes, even if the sound file is monophonic.

After all of the tones are defined, you define the macros, preceeded by the line:

`#macros`

You must include this line, even if no macros follow.

Macros are easy to define, in our example, we have one macro definition:
`h 8675309`

This means that whenever the character h is encountered, to substitute the characters 8675309 instead. Don't define a macro using a letter already assigned to a tone.

After the macros have been defined, there should be the following line:

`#start`

And following this, the text to be converted into tones. In our example:

```
0s1s2s3s4s5s6s7s8s9s0sAsBsCsDs*s#s
h
```

In this case we are sending each tone tone button's tone pairs, with a space between them, as s was defined to be a 1 Hz tone of amplitude 1%, making it inaudible. Then we have the letter h, which is a macro, which means that the tones for buttons 8675309 are sent.

We do have returns in our data portion, but as we have not defined them to map to any tones, they cause no additional output.
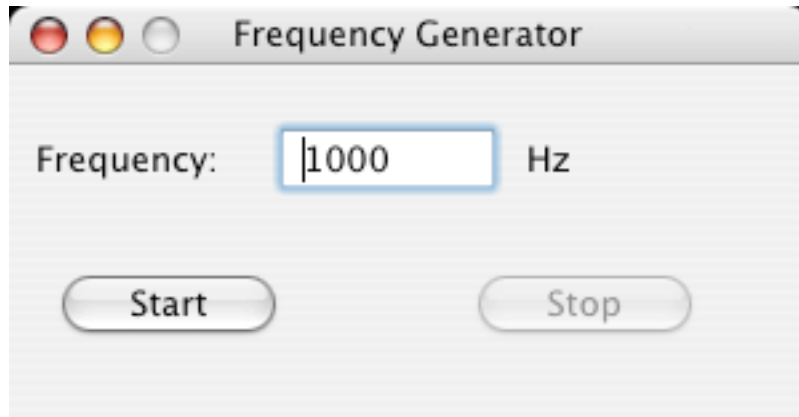
That's really about it.

There is a text editor in the program, or you can use your own, like BBEdit on the Mac, or even NotePad on Windows. TextEdit that comes with Mac OS X doesn't always save in a plain text format.

After you have your text file opened in PAG, select Process File from the File menu. It may take a few seconds (or more!) depending on the length of the sound file being produced. After it is done, it displays a second window with some debugging results (which are also contained in three text files it produces). You can send this to us (along with the input file!) if you're having difficulties, it may help determine the problem.
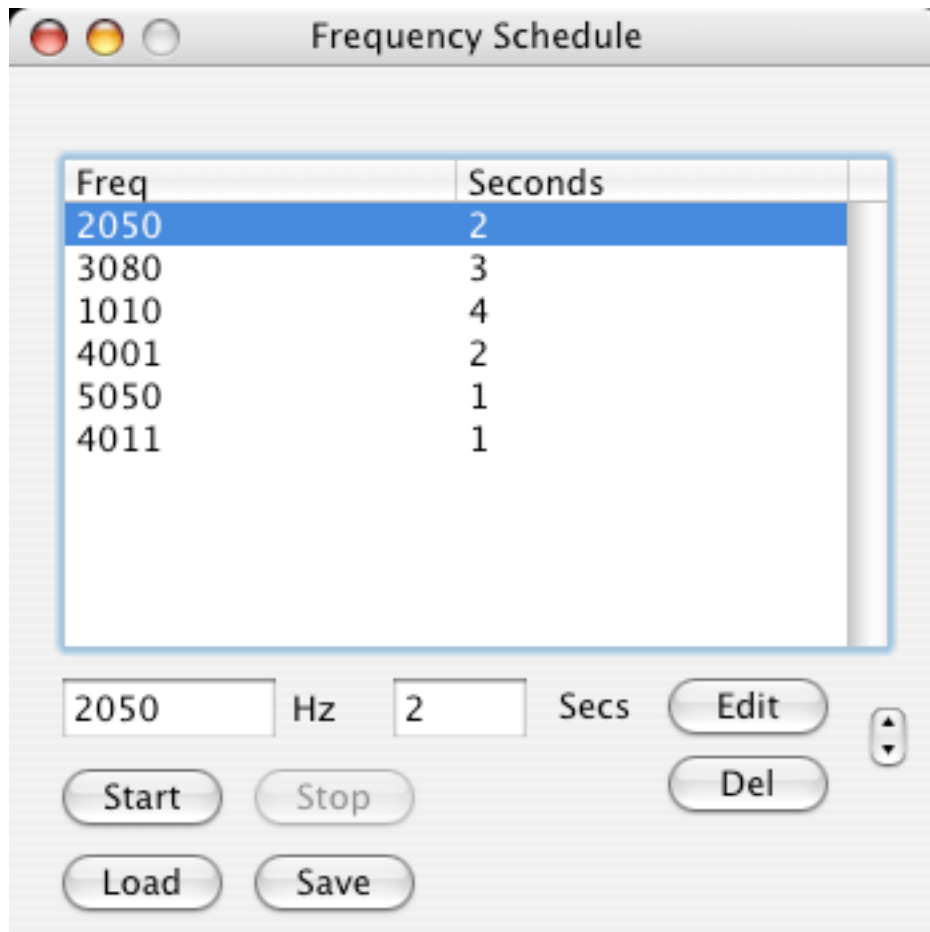
Frequency   Generator

Open this window by selecting it under the Windows menu:

Enter the frequency in the text box, and click on the Start button to begin producing the audio. Click on the Stop button to stop the sound generation.

Frequency Schedule

Open this window by selecting it under the Windows menu:

The Frequency Schedule is a sequence of frequencies and durations. In the example shown above, 2050 Hz is generated for 2 seconds, then 3080 Hz is generated for 3 seconds, then 1010 Hz for 4 seconds, then 4001 Hz for 2 seconds, etc.

You can use the tools in the window to create/edit a schedule, or you can create your own using a text editor by creating a series of lines, each containing the frequency, then a comma, then the duration in seconds, then a return (if you go this route, the file must be saved as a plain ASCII text file, not as a RTF file).

You can add an entry to the schedule by first making sure that an existing line in the schedule is NOT selected, and then typing in the frequency and

duration into the boxes, and then clicking the Add button. If you have a line selected, as shown in the screenshot above, the Add button will instead say Edit.

To Edit an existing line, select it in the list, change the frequency or duration, then click the Edit button. To delete an entry, select the line in the list, then click the Del button. You can save a schedule by clicking on the Save button and then entering in a name for the schedule file. Likewise clicking the Load button will let you load a file you have previously saved.

Click the Start button to start the schedule playback. Click Stop to stop it. You can skip entries in the file by selecting the first entry you wish to play, and then click Start.

The small up/down arrows to the right of the Edit and Del buttons will move the selected line up or down in the listing.

Obtaining Mac/Win PAG

OpYou can download the latest copy of PAG from this URL:
http://www.blackcatsystems.com/software/pag.html

Please feel free to write to us with any questions or comments you may
have: support@blackcatsystems.com

Buying Mac/Win PAG

PAG is distributed as shareware. If you find PAG useful, please buy your copy. Your purchase
helps us continue work on future version of PAG. You can buy your copy for just $19.99. You
can quickly and easily pay online, visit http://www.blackcatsystems.com/register/pag.html to
do this. Or you can print out an mail the check/money order form that came with the download
(or the one in this documentation on the next page), and send that in to us with your payment.

Thanks for your support!

Buying by Check or Money Order Form

To order by check, please fill out and mail the following form, along with your payment. You can pay with a wide variety of cash from different countries but at present if you pay via check, it must be a check or money order drawn in US Dollars. While there is the risk of loss in the mail, currency is also OK, including foreign currency.

Please make sure you include your email address with your payment. That way we can send the registration code to you. If you do not send us a valid email address, we have no way to send you the code.

I would like to order _____ copies of PAG at $19.99 US each.

_____ If you'd like a copy on CDROM along with our other programs, check here and add $10.

Name: _____

Address: _____

City: _____   State/Province:_____

ZIP/Postal Code: _____   Country: _____

Email Address: _____

Operating System Version: _____

Maryland residents please add 5% sales tax.
Enclosed, please find my check / money order / cash in the amount of $_____

Mail this form, along with payment, to:

Black Cat Systems
4708 Trail Court
Westminster, MD 21158
USA

PAG Version History

1.2.0 December 4,2005
Added Frequency Generator.
Added Frequency Schedule.

1.1.0 May 7,2005
Added MDI interface for Windows version.

1.0.0 August 30,2004
First release version.

0.1.0 May 6, 2004
First beta version.

Software License Agreement

This is a legal agreement between you and Black Cat Systems. covering your use of PAG (the "Software"). Be sure to read the following agreement before using the Software. BY USING THE SOFTWARE (REGARDLESS IF YOU HAVE REGISTERED THE SOFTWARE OR NOT), YOU ARE AGREEING TO BE BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, DO NOT USE THE SOFTWARE AND DESTROY ALL COPIES IN YOUR POSSESSION.

The Software is owned by Black Cat Systems and is protected by United States copyright laws and international treaty provisions. Therefore, you must treat the Software like any other copyrighted material (e.g., a book or musical recording). Paying the license fee allows you the right to use one copy of the Software on a single computer. You may not network the Software or otherwise use it or make it available for use on more than one computer at the same time. You may not rent or lease the Software, nor may you modify, adapt, translate, reverse engineer, decompile, or disassemble the Software. If you violate any part of this agreement, your right to use this Software terminates automatically and you must then destroy all copies of the Software in your possession.

The Software and its related documentation are provided "AS IS" and without warranty of any kind and Black Cat Systems expressly disclaims all other warranties, expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Under no circumstances shall Black Cat Systems be liable for any incidental, special, or consequential damages that result from the use or inablility to use the Software or related documentation, even if Black Cat Systems has been advised of the possibility of such damages. In no event shall Black Cat Systems's liability exceed the license fee paid, if any.

This Agreement shall be governed by the laws of the State of Maryland. If for any reason a court of competent jurisdiction finds any provision of the Agreement, or portion thereof, to be unenforceable, that provision of the Agreement shall be enforced to the maximum extent permissible so as to effect the intent of the parties, and the remainder of this Agreement shall continue in full force and effect.

The Software and documentation is provided with RESTRICTED RIGHTS. Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subdivision (b)(3)(ii) of the Rights in Technical Data and Computer Software clause as 252.227-7013. Manufacturer is Black Cat Systems., 4708 Trail Court, Westminster, MD 21158, United States of America.

The name "Black Cat Systems", "WinPAG", and "WinPAG" are trademarks of Black Cat Systems.

MacPAG / WinPAG is ©2004-2005 by Black Cat Systems. All rights reserved worldwide.