Pegase

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Pegase

1.1 Pegase

Pegase : mPEG Audio Stream Encoder
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As my native language is french, and not english, this documentation might be unreadable for most of you because of some mistakes. Do forgive me for that.

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DISCLAIMER

NO WARRANTY, IMPLICIT OR EXPLICIT, WILL BE DUE BECAUSE OF THE USE OF THIS PROGRAMM. ANY DAMAGES, DIRECT OR INDIRECT, CAUSED BY THE INSTALLATION OR USE OF THIS PROGRAM WILL NOT BE IMPUTABLE TO THE AUTHOR. YOU, WHEN INSTALLING THIS SOFTWARE, ASSUME THE LIABILITY OF ALL RISKS TIED TO THE INSTALLATION OR USE OF THIS PROGRAM.

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Pegase is an MPEG audio encoder, optimized for 68000/PPC familly processors It needs OS 2.0 or above to run. The PPC version requires WarpOS.

Due to the patents that cover mp3 encoding, Pegase will never support Layer 3. However, the layer 2 algorithm gives really good results in a short time, making Pegase usefull for anyone. At least, I hope so.

Pegase is EMail-ware.

1.2 Presentation

PRESENTATION

Although it is based upon the original version of Musicin (ISO/MPEG), only the principle on which things work is identical. The whole source code has been rewritten, with the Amiga spirit in mind, in order to provide a fast encoder without sacrifying the quality.

The first motivation comes from a simple finding : Musicin PPC appears to be slow compared to the CPU power, so slow that I was convinced that it was a quick port which misuse this processor.
Then, I wanted to show what a foolish 68060 is able to do, demonstrating that a PPC might be useless when it is not used as it should be. I must admit that the result goes far away than what I expected.

MPEG files produced with Pegase are as good as the ones created with the Amiga version of Musicin (at least the first versions, as the latest ones seem to be not as good). But Pegase is a lot faster : Encoding of a stereo AIFF file, 44.1 KHz, 160 kbits/s, requires roughly two times the sound duration (68060/50). A 68040/40 is able to encode the same file at five times the sound duration.

Pegase is able to encode IFF-AIFF, IFF-MAUD and RIFF-WAV files. These files can be mono or stereo. RAW format, and CDDA (CD Audio) are also supported. The samples must be 16 bits wide, and the sample frequency must be close to 32 KHz, 44.1 KHz or 48 KHz.

You can create MPEG files using the Layer I or the Layer II algorithms. Stereo songs can be encoded using the joint-stereo mode.

1.3 Distribution

DISTRIBUTION

Pegase can be freely redistributed as long as the following conditions apply

- The package must come from Aminet (Internet or CD) and nowhere else. An archive obtains elsewhere must not be spread again. This ensure that every user can get easily any new update.

- The package must not have been modified in any way. It must be strictly the same as the one present on Aminet.

- There must not be any financial charge, direct or indirect, bind to the distribution of this package. This forbid, for instance, sells of freeware stuff, and BBS (unless their access is free of charge).
  This doesn't concern Aminet which gain the right to distribute Pegase on any CD. This doesn't apply either to magazines that are exclusively related to the Amiga, but only when this package is available with the magazine itself. All other situations require a prior authorization.

These rules were work out in order to restrict the sources of distribution. This will make my life easier when it will be support time.

1.4 Installation

INSTALLATION

There is no need for an Installer script, and installation by hand is not that difficult. Simply copy Pegase where you want, that's all.

The default language is english (or something similar to :-)). When a translation is available for your country, you can also copy the catalog file to your LOCALE: directory, as usual.

1.5 How to use

HOW TO USE

Pegase could be run from Shell as well as from Workbench. In both cases, it examines its icon in order to alter the default settings. Then, CLI parameters are taken into account and override these settings.

You can stop Pegase by pressing "CTRL-C" or "CTRL-D". The former only stops the file being processed. If there are some files waiting in the queue, Pegase starts to encode the next one. The latter, on the other side, stops the whole process. Remaining files are ignored, and partial encoded files are never deleted.

Pegase only supports one psycho-acoustical analyzer, which is refered to as "psycho #2" in Musicin.

Starting from a Shell :

Pegase sticks to the standard rules of Shell commands. Options are given on the command line.

As usual, "Pegase ?" causes the Shell to display the command line

pattern. If you answer this pattern with another question mark, then Pegase shows its extended help :

```
Usage :
 FROM       Input sound files or directories to encode.
 TO         Output file name, or destination directory.
 LAYER      Layer number (1 or 2). Default = 2.
 FREQ       Sampling frequency (Hz). Default = 44100.
 BITRATE    Total bitrate (kbits/s). Default = 160.
 MONO       Mono encoding.
 JSTEREO    Joint stereo encoding.
 COPYRIGHT  Mark as copyright.
 ORIGINAL   Mark as original.
 CRC        Add error protection.
 PRIORITY   Change Pegase's priority.
 VERBOSE    Verbose output.
 MOTOROLA   Motorola byte order/PIPE switch.
 INTEL      Motorola byte order/PIPE switch.
```

Don't bother about the stack size. Pegase will be happy with a standard 4 kb stack.

Starting from Workbench :

The default settings, as said above, can be changed using the icon's tool types :

```
 TO         Output file name, or destination directory.
 PATTERN    File requester's pattern.
 LAYER      Layer number.
 FREQ       Sample frequency.
 BITRATE    Total bitrate.
 MONO       Mono encoding.
 JSTEREO    Joint stereo encoding.
 COPYRIGHT  Mark as copyright.
 ORIGINAL   Mark as original.
 PRIORITY   Change Pegase's priority.
 CRC        Add error protection.
```

There's also some tool types that allow you to set the default settings of the file requester :

```
 FR_SOURCE  Default directory.
 FR_XPOS    Default X position.
 FR_YPOS    Default Y position.
 FR_WIDTH   Default width.
 FR_HEIGHT  Default height.
```

The console settings can be changed with an environment variable named "PEGASE_WBCONSOLE". Use the "SetEnv" command to create it, and don't forget to copy it to "ENVARC:" to make it permanent when you are done.

1.6 File Requester

File requester

If you start Pegase from the Workbench by clicking on its icon, or when you don't provide source files on the command line, Pegase pops up a file requester. You can select multiple files at once, but they must reside in the same directory.

1.7 FROM

FROM : Source(s).

Specify one or more file and/or directory names. When no source is specified, Pegase open a file requester where you can pick up several files at once (multi-selection).

When one entry, at least, is a directory, Pegase analyzes all files inside this directory, and selects the ones that can be assumed to be audio files. This automatic selection is helpful, but it is too simple to be very accurate. For instance, any unknown file might be assumed to be a RAW audio file. Don't expect anything useful if you encode such a file ! ;-)

By now, Pegase only handles these file formats :

- AIFF : Mono/stereo, 16 bits, uncompressed.
- MAUD : Mono/stereo, 16 bits, uncompressed.
- WAV : Mono/stereo, 16 bits, uncompressed.
- CDDA : Always stereo, 16 bits, 44.1 KHz. The byte order (Intel/Motorola) is determined automatically by some magic.
- RAW : Mono, 16 bits (might be the default format for any unknown file type). Motorola byte order is expected for the samples.

The sampling frequency used by the coder comes from the audio file header's if it is available there (AIFF, MAUD and WAV). CDDA files always use 44.1 KHz sampling rate.

Note that only 16 bits sample files are supported. Sample frequency must be close to those allowed by the encoder algorithm (32 KHz, 44.1 KHz or 48 KHz, +/- 4%).

NB : The byte order determination is based upon a statistical method so it can give wrong results in some case.
See also MOTOROLA/INTEL .

1.8 TO

TO : Destination.

This define the output file name, or the directory where to save output files. When no destination is given, ouput files are saved along with the input files. If a filename extension already exists, it's replaced by an

".mp?" like extension.

You are not allowed to define an explicit output file name when there are multiple sources. Otherwise, Pegase will go back to its default setting and save output files in the source's directory.

When the destination is a directory, Pegase saves all output files there, after having replaced any existing extension with ".mp?". This extension depends on the layer number (".mp1" for layer 1, or ".mp2" for layer 2).

NOTE :

By now, Pegase doesn't check if it can write the output file before starting the encoding. Also, an already existing destination file is overwritten, without any warning.

1.9 LAYER

LAYER : Layer number.

By now, Pegase only supports layer level 1 and 2. Layer 2 gives the best results, and it is faster than layer 1.

The default setting is layer 2.

1.10 FREQ

FREQ : Sample frequency.

Pegase use the sample frequency specified in the input file header's (AIFF, MAUD or WAV), or select 44.1 KHz in case of a CDDA file encoding.

Then, you only need to define this frequency for RAW format audio files.

In all cases, the sample frequency must be close to 32 KHz, 44.1 KHz or 48 KHz (+/- 4%).

1.11 BITRATE

BITRATE : Output bit rate (kbits/s).

This value determines the size (and quality) of the MPEG file. Several values are allowed, for each layer.

Even though the default bitrate is set to 160 kbits/s, this is not sufficient. 192 kbits/s provides near Hi-Fi quality in most cases and should be used instead.
Anyway, the best method to determine the best bitrate to use remains the good old "trials and errors" method.

You don't need to learn each of these values as the encoder selects one that is lowest when the specified value is not allowed. Thus, giving 200 as bitrate causes Pegase to select 192 kbits/s.

Known bitrates are (layer 1/layer 2) :

32, 64, 96, 128, 160, 192, 224, 256, 288, 320, 352, 384, 416 and 448.
32, 48, 56, 64, 80, 96, 112, 128, 160, 192, 224, 256, 320 and 384.

Having the sample frequency and the number of channels, you can compute the MPEG file size. In example, for a 35 Mb CDDA file, using 160 kbits/s output bitrate, we have :

Source :
44100 x 16 x 2 = 1411200 bits/s
(freq) (bits per sample) (channel)

1411200 / 160000 = 8.82 (ratio)
(bitrate)

35 x 1024^2 / 8.82 = 3.97 Mb = Output file size.

The bitrate has no noticeable effect on the encoding speed. Slower bitrates give a slightly extra speed, but that's all.

1.12 MONO

MONO : RAW file format.

As RAW files are assumed to be mono files, this option does nothing for now.

1.13 JSTEREO

JSTEREO : Use Joint-Stereo mode.

Input file(s) must be stereo. This option gives some liberty to the encoder, which can progressively mix samples to mono on a subband basis. Thus, the coder gets more bits to encode the samples, which improve the quality when you use a (too) low bitrate.

This mix is done dynamically, for each frame, whenever it is necessary. The number of mixed subbands varied also from frame to frame, and some frames can be encoded in full stereo mode. Then, your decoder/player can forget to tell you that there are some j-stereo frames in the MPEG file.

1.14 COPYRIGHT

COPYRIGHT : Mark as copyright.

This is an information telling that the audio stream is copyrighted.

1.15 ORIGINAL

ORIGINAL : Mark as original.

This is an information telling that the audio stream is original.

1.16 CRC

CRC : Add error protection.

Compute a checksum of each MPEG headers.

1.17 PRIORITY

PRIORITY : Change Pegase's priority.

Priority values must be in the range [-128; 5].

1.18 VERBOSE

VERBOSE : Verbose output.

Display global settings.

1.19 PATTERN

PATTERN : File requester pattern.

Define the pattern used to display files in the file requester.

Default setting : ~(#?.info)

1.20 CDDA byte order and PIPEs

MOTOROLA : Motorola byte order.

This switch forces ALL input files to be handled as CDDA files, in which samples are recorded in Bit Endian mode (Motorola).

INTEL : Intel byte order.

This switch forces ALL input files to be handled as CDDA files, in which samples are recorded in Little Endian mode (Intel).

PIPE support :

If you use one of the switches mentionned above, Pegase bypasses its automatic file type recognition in order to allow you to encode files from a PIPE.

The "queue.handler" which comes along with the Workbench seems to be broken in some ways. As far as I know, you MUST provide a big buffer to your PIPE, otherwise you could get some noise at random places in the MPEG file.

Something like the following should work :

```
COPY file.cdda TO PIPE:input/250000
PEGASE PIPE:input TO RAM: MOTOROLA
```

1.21 Problems

PROBLEMS

- Output files overwrite silently existing files.
- Pegase doesn't check if it can write to the destination file or directory. Thus, encoding something from a CD requires that you define explicitly a destination ("TO" option or Tooltype).
- Pegase doesn't check if there is enough room on the destination disk. A partial MPEG file resulting of this is not erased.
- RAW files are assumed to use the MOTOROLA byte order.

These long standing problems will not be fixed because Pegase is nothing more than a test bed now.

1.22 Future

FUTURE

Several news have make me to change my mind since the last public release. First of all, Fraunhofer and Thomson have claim they hold some patents that forbid anybody to provide a Layer 3 encoder without having to

buy a license.

Beside that, I'm not satisfied with my standalone encoder. Thus, Pegase will become "pegase.library" which should be more usefull.
From now on, I'll use Pegase as a test bed to experiment new techniques, so don't expect new updates soon. The real thing will be the shared library, and I'll do my best to improve the quality and the encoding speed, especially for the PPC version.

Last but not least, I only got nearly 210 e-mails. This is not enough to motivate myself to continue such a hudge project like the one I was thinking of.

1.23 Support

SUPPORT

Support is available by sending an EMail to :

kakace@pacwan.fr

Please, don't forget to prepend the subject with "[PEGASE]". This will help me to setup an automatic sort for these mails.

I reply to everybody, so don't think that this support is useless.

Pegase homepage is up. It provides a FAQ, some benchmarks, a file area, and some other nice things.

http://perso.pacwan.fr/kakace/pegase/

1.24 History

HISTORY

V1.0, Pegase 37.712 (18.8.98) :

First public release.

V1.1, Pegase 37.756 (5.9.98) :

- Bug fix. The encoder might output random bits in some circumstances.
- Enhance high tones quality.
- Display local file settings.
- Display an error when the source file doesn't exist.

V1.2, Pegase 37.759 (6.9.98) :

- Bug fix. Conversion from Intel byte order to Motorola byte order was

completely broken. WAV files should be usable now.

V1.3, Pegase 37.762 (7.9.98) :
- Removed enhancement done on high tones in V1.1. According to some reports it produces "crispy" high tones or some sort of echo.
- As I'm sometimes stupid, I forgot to link Pegase with my ASM optimized routines. This release has them, for sure. Looks like I need a break...

V1.4, Pegase 37.827 (27.9.98) :
- Removed a random bug that might disturb the sound quality.
- Removed a bug in the progress indicator, that couldn't reach 100% when encoding big files (longer than 8 minutes).
- Restore the change removed in V1.3. It didn't work because of the random bug fixed in this release.
- Added the PRIORITY argument, and the corresponding ToolType.
- Misc enhancements concerning displayed informations.
- Speedup (about 10% on 68060/50).
- Removed a FPU emulated instruction in the 68040 version.

V1.5, Pegase 1.45 (6.6.99) :
- Some little changes and bug fixes.
- Important speedup.
- Experimental PPC version.

V1.6, Pegase 1.60 (17.6.99) :
- Some little changes that could improve the speed (68030).
- Up to date PPC version. It should be a bit faster (remember that I don't have a PPC to test it, so be careful).
- Fixed a bug that prevent Pegase to run from the Workbench.
- Misc changes in the doc.
- Bumped the version to math the release number.
- Some changes in the byte order detection routine which should give more accurate results now.

V1.7, Pegase 1.61 (15.8.99) :
- Fixed a bug that caused the progress bar to be shown for the first file only (batch mode).
- Pegase now deletes any existing filename's extension before adding ".mp?" unless you provide a destination filename.
- Added a workaround to avoid a crash when FPU versions are ran on machines without FPUs (untested).
- New keywords MOTOROLA and INTEL to deal with CDDA files and PIPEs.
- Special 68020 version (without FPU) for the ones who wanted it.

Current benchmark (68060/50) :
AIFF file (5'50), 15435000 samples per channel, 160 kbits/s.

Mode	Encoding time	Ratio
Stereo	12'41	2.2:1
Mono	9'12	1.6:1
J-Stereo	12'57	2.2:1

1.25 Thanks

THANKS

I'd like to thank all those who make this experience become so good :

Motorola, who give 68k user's manual.
Haage & Partner, for their StormC C++ compiler.
Dietmar Eilert, because I can't live without GoldEd :-)
HiSoft, who made Devpac.

I don't forget those who encouraged me, or tested this "thing" :

Thierry Sillis
Johann Girard-Cheron
Eric Giguère
"Rafo"
Georges Goncalves (aka "spectrum analyzer" :)))
The CdBS Software group.

I also thank the translators for the catalog files, MORB (CdBS) who has compiled the first PPC version, and all those who have sent me an e-mail.

Finally, many thanks to Thierry "Pumpkin" Schmitt who drew this beautiful icon for me, and to Patrick Beerhorst for his help on Pegase homepage.

1.26 MP3 Royalties

This is an abstract of the licensing terms found on :
http://www.iis.fhg.de/amm/legal/index.html

2.2. MPEG LAYER-3 SOFTWARE ENCODERS

While most of the distribution of MPEG Layer-3 software decoders is free of charge, for all MPEG Layer-3 encoders a license is needed and royalties have to be paid. ~

2.2.1. Software Encoders not developed by Fraunhofer IIS ~

If you have developed your own software encoder or acquired a software encoder from another developer than Fraunhofer IIS to run MPEG Layer-3, you have to get a "patent-only" license from THOMSON multimedia; the following royalties apply :

```
      1 -   1,000 encoders   US$ 25.00 per unit
  1,001 -   2,000 encoders ~ US$ 20.00 per unit
  2,001 -   3,000 encoders ~ US$ 15.00 per unit
  3,001 -  10,000 encoders ~ US$ 10.00 per unit
 10,001 - 100,000 encoders ~ US$ 5.00 per unit
 > 100,000 encoders ~       US$ 2.50 per unit
```

US$ 15,000 annual minimum, payable upon signature and each following year in January, fully creditable against annual sales. ~

The royalty does not include any on-going support from Fraunhofer IIS. This agreement does NOT cover the right to sell MPEG Layer-3 encoded data (e.g. in "pay-audio" and "broadcast" systems). These rights are covered by the licenses described under 2.4. and 2.5.