PixelTools

MpegRepair™

Software Encoding and Repair Utility

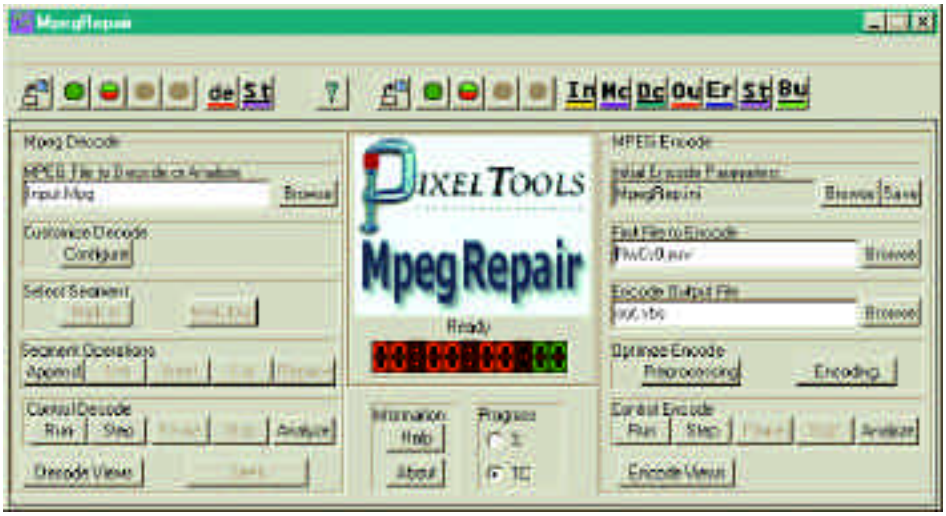
MpegRepair integrates fully featured encoding, analysis, decoding, demuxing, transcoding and stream manipulations into one powerful application. MpegRepair is a versatile MPEG encoding utility designed to both ease the difficulty of MPEG encoding and to assist in the repair of troubled video streams. MpegRepair is composed of four tightly integrated applications:

High Quality, Flexible Encoder – MpegRepair produces fixed or variable bit-rate MPEG-1 or MPEG-2 streams and gives the user with the ability to adjust every important parameter of the encoding process. Image sizes from larger than HDTV to thumbnail Internet are supported.

High Resolution Decoder – MpegRepair displays full resolution MPEG-1 or MPEG-2, DVD, HDTV or transport streams and can store individual frames on a disk for analysis or transcoding.

Stream Analyzer – MpegRepair provides graphical and textural visibility into MPEG video streams, encoding decisions and header byte offsets.

Video Stream Manipulator – MpegRepair performs GOPand byte accurate *cut*, *paste*, *trim*, *append* and *replace* functions on troubled video streams. Beginning or ending segments can be *cut* or *trimmed*.



MpegRepair Increases Productivity

MpegRepair provides encoding for **HDTV**, **DVD**, **Internet**, or virtually any MPEG application. Specialized processing is easily configured for custom applications and can run in an un-attended batch mode. Time is saved by compressing video frames directly from a disk source rather than layering the frames onto tape and then running the video tape into a real-time encoder. MpegRepair can insert and replace video elements in an encoded stream, eliminating the need to re-encode the entire video

Scenario

Perhaps you've just encoded a 2-hour movie, and have discovered two sections that are not acceptable. A scene, at the start of the video, has bad blocks and jitter on title text. Later, in the middle of the video, a detailed high action scene has turned into blocks.

Using the MpegRepair analyzer, you advance to the troubled scenes and verify the quality problems frame by frame. The analyzer presents in text and graphical detail, the original encoding decisions that have resulted in the problems. With this information, you now have an idea why the problems have occurred.

Next, using the MpegRepair decoder, you mark the section of badly encoded frames. MpegRepair automatically records the required splicing information.

The powerful MpegRepair pre-processing and encoding engine is next used to re-encode original video frames (or those frames saved during the decode process). Preprocessing filters can be applied to problem areas within frames or to the entire video. The MpegRepair encoding engine allows you to add more or fewer bits to problem areas within frames. The encoding of the small clip can be accomplished interactively improving the quality on each pass. And the small size of the problem areas means that the encoding is accomplished within a few seconds. The resultant video clip will have the exact length and VBV buffer states so that it can precisely replace the bad MPEG section. Finally, with the click of the replace button, MpegRepair will replace the original bad video scene with the new repaired video. That's all it takes.

Samples of additional tasks MpegRepair can accomplish

Transcoding
Converting MPEG-2 video into low bit-rate, small frame size MPEG-1 for Internet streaming.

Still or Motion Menus or Titles
Converting a single image or small sequence of images into a MPEG stream for DVD menus or movie titles.

Properties Display
Displaying encoding properties of any MPEG stream.

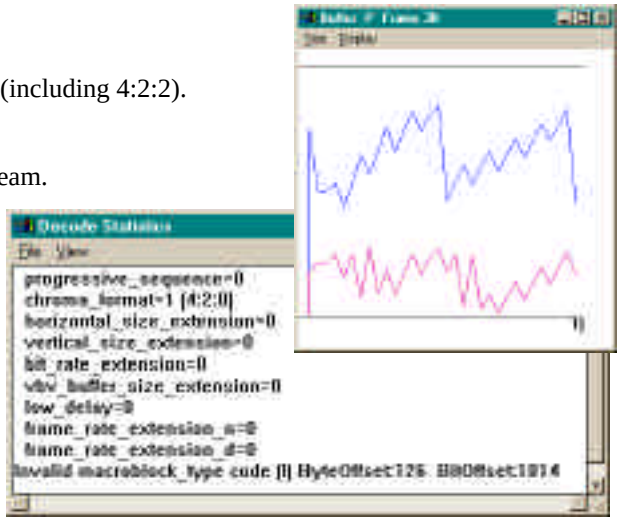
HDTV Encoding
Compressing large frames into any of the 18 HDTV formats or larger (including 4:2:2).

Demuxing
Extracting video or audio tracks from a program,VOB or transport stream.

Video Compliance
Highlighting MPEG encoding compliance problems.

Pan and Scan or Progressive Frame headers
Adding or setting headers in an encoded stream.

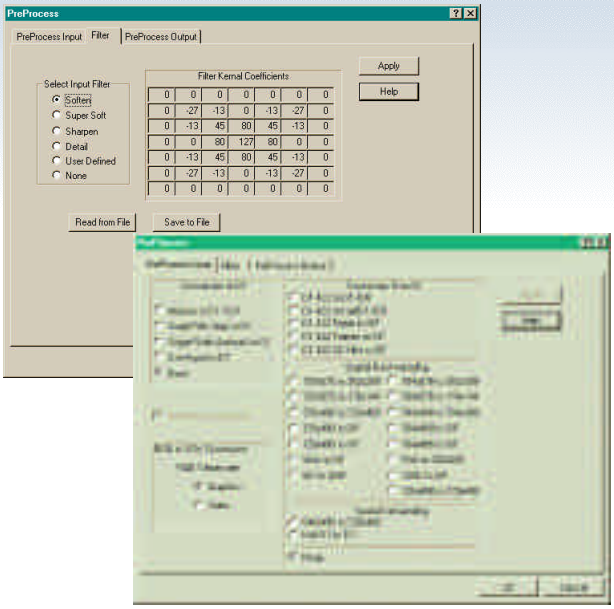
Trim
Removing frames or video headers from the start or end of a video sequence.



MpegRepair Encoder

Variable Bit-rate Encoding

MpegRepair provides the ability to change the encoding bit-rate scene by scene throughout an encoding session. This capability provides more bits (resulting in higher quality) in scenes that are more difficult to encode, and fewer bits in those scenes that are easy to encode.



Variable Quantization Encoding:

The quantization values, which determine the amount of compression per encoding block, can also be modified on a scene basis, frame basis, or sub-frame basis. Pre-defined or user-defined quantization tables can be changed on scene or GOPboundaries. Quantization tables customized for specific bit-rates and encoding complexity are provided with MpegRepair. These tables can also be used as templates for building complete custom tables for specific encoding situations. In addition, the quantization within each frame can be modified to increase or decrease the amount of data that is discarded in that region.

Bit Rate Analysis:

The optional analysis pass details the actual encoding difficulty of the video content. The resultant bit-rate profile and scene change analysis is printed in a text file and plotted on a chart. It is not often obvious which scenes are more or less difficult to encode. The analysis pass provides encoding complexity information. Encoding complexity, combined with knowledge of the relative importance of each scene, provides a good guideline for the allocation of bits for the video and graphics components of a DVD disk.

Automatic Scene Change Detection:

MpegRepair can detect scene changes throughout a video and force the start of a new encoding block (GOP) coincident with the new scene. This produces the highest quality video by keeping the I blocks (MPEG key frames) as far apart as possible. I blocks consume the largest number of bits.

Scene Adaptation:

An Edit Decision List (EDL) file, containing parameters that will be changed throughout the encoding session and the frames at which the changes occur, is read by MpegRepair. Variable GOP structures can be specified in this file to support frame accurate GOP entry points for DVD authoring. Slight or significant quantization adjustments can be made to user defined areas within user defined frames. MpegRepair EDL operations include a powerful set of preprocessing options as well. User defined filters can be applied to selected scenes, frames, or even to user defined regions within a selected frame!

Spliceable Segment Encoding:

MpegRepair can encode a segment or a scene with specified starting and ending buffer states. Segment sizes can be of any length. This allows scenes or segments to be removed, moved, and re-inserted to create legal MPEG video without re-encoding. This also prevents buffer over-flow or under-flow in DVD jumps between segments.

Region or Frame Filtering:

User defined or included standard filters can be applied to a designated region of a specified sequence of frames. The MpegRepair preprocessing engine can apply the selected filter inside or outside the user selected region. This feature is used to enhance a region of interest within frames or to minimize artifacts outside of the region of interest.

Pre-Processing:

MpegRepair includes extensive frame resizing and frame conversions in a pre-process operation prior to MPEG encoding. MpegRepair inputs frames directly from digital disk recorders and frame grabbers. Pre-processing options include chroma down-sampling from 4:2:2 to 4:2:0, D1 to SIF, VGA to SIF, and SIF or QSIF format conversions. The output of the pre-process operation can be saved to files or just viewed without encoding.

Closed Caption Insertion:
Closed caption data (or any other data) can be inserted into designated sections of the video stream in the user data MPEG field.

Overlay Mixing:
MpegRepair can mix a logo bitmap or an animation with the underlying MPEG. The logo can be placed in any location within the MPEG video frame and with any mix level.

Enhanced for speed on all Pentium Processors:
Computationally intensive components of MpegRepair are written in low level code that is optimized for speed on the Pentium MMX processor. MpegRepair high level control is written as threads that take advantage of multi-processor environments.

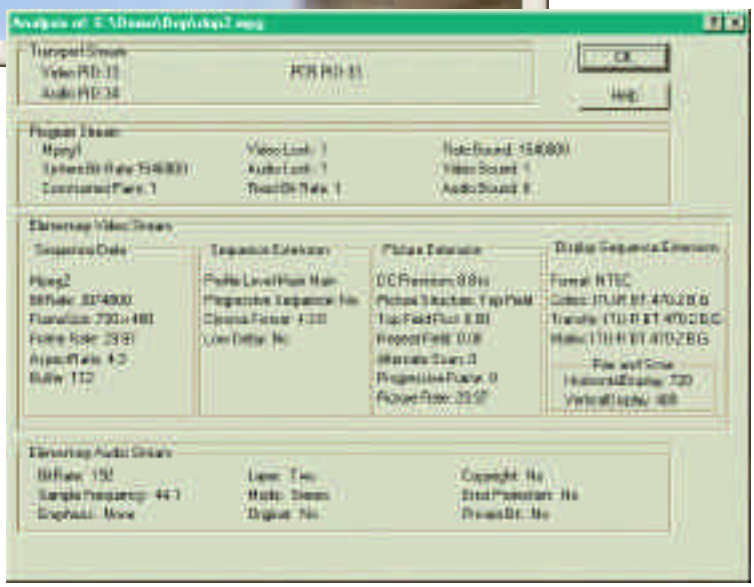
Batch Mode Operation:
Batch mode operation of MpegRepair provides for automatic encoding or decoding of multiple MPEG files and allows interactively with PixelTools companion products.

MpegRepair Decoder

- Decodes and displays virtually any MPEG file
- Converts MPEG files into a sequence of video frames
- Stores video frames in BMP, YUV or TGA formats
- Decodes with full floating point accuracy
- Facilitates transcoding with different parameters
- Decodes low to high profiles
- Decodes MPEG files into WAV audio

MpegRepair Analyzer

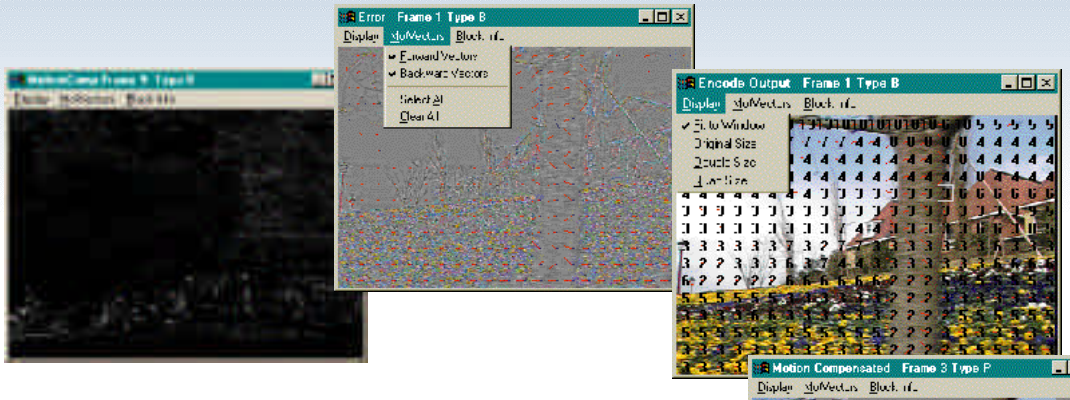
- Presents key encoding parameters
- Presents user selectable overlays of
  - Motion Vectors: forward and backward
  - Encoding Blocks: I, forward, backward, interpolated, not coded, skipped
  - Numerical Block values: M Quant value
- Displays 24 Bit color with Image Zoom and Roam
- Provides Motion Compensated Error Window
- Provides plots of reported and actual buffer states
- Provides details decoding of all headers:
  - Video, Audio, System, Transport
- Stores selected stream characteristics in a log file
- Includes detailed quick view of stream properties

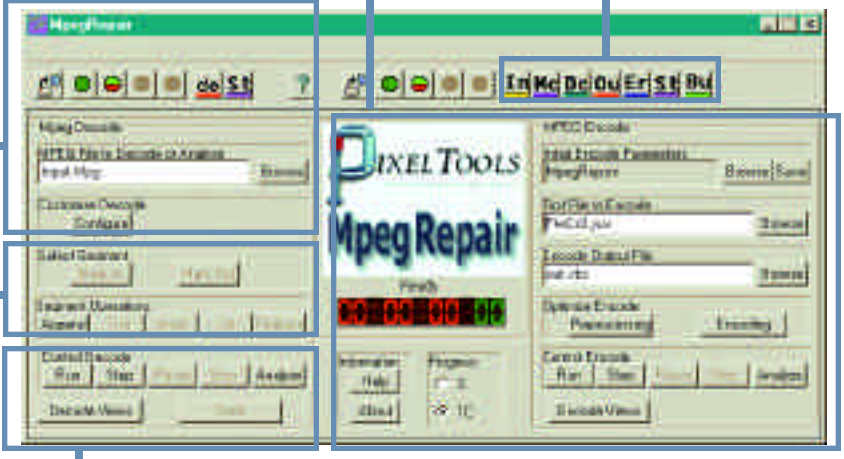


MpegRepair Stream Manipulator

- Provides replace function that is integrated with the analyzer to identify GOP boundaries and the encoder to re-encode replacement sections.
- Provides cut and paste of MPEG video data at GOP boundaries (as identified in the analyzer) or at user selected byte offsets
- Provides trim and append of all file data at GOP boundaries (as identified in the analyzer) or at user selected byte offsets

MpegRepair is the one tool that integrates fully featured encoding, analysis, decoding, demuxing, transcoding and stream manipulations into one powerful application.





MPEG Encoder

- MPEG-1 or MPEG-2 constant or variable bit-rate
- Flexible user adjustments for bit-rate, frame size, profile and level
- Access to most encoding parameters
- Force quantizations within regions of frames
- Filter inside or outside of regions of frames
- Extensive preprocessing capabilities
- Area and region filters with user definable filters
- User definable quantization tables
- Segment encoding
- Encode WAV or AVI to MPEG
- Encodes from simple to high profile streams

MPEG Decoder

- MPEG-1 or MPEG-2 decoding of elementary transport, system, VOB, or DVD streams
- Floating point precision MPEG decode onto computer monitor window
- Stores frames to BMP, TGA, or YUV file formats.
- Separated elementary video and audio from transport, DVD or system files
- Decodes High-Low Profile, and 4:2:0 to 4:2:2
- Inserts pan and scan information headers
- Decodes MPEG audio into WAV

MPEG Stream Editor

- Provides *trim*, *cut*, *replace*, *append* and *insert* operations on GOP segment boundaries or user selected byte offsets
- Utilizes segments encoded to specific GOP buffer boundaries
- Encodes section to specific buffer endpoints at GOP segment boundaries to be used with stream operations
- Integrated with MPEG-2 decoder and segment MPEG-2 encoder
- Accomplishes instantaneous replacement of segments within huge MPEG files
- Includes byte accurate advance and stream editing features

MPEG Analyzer

- Provides a quick view of MPEG video, audio, and stream properties
- Provides detailed graphical views, frame by frame, of encoding decisions
- Zoom and roam on decoding windows
- Displays quantization and motion vectors
- Decodes user selectable video and system headers into a text window and into a log disk file
- Plots reported and actual buffer states
- Records syntax violation errors in a text window and to a log file
- Audio analysis

Specifications

Video Capture Equipment

Integrates with all DV boards, frame grabbers,digital disk recorders, video editors and animation programs

Encoding Speed

SIF format (352x240) 24 frames/sec encoding at 2x real time on Dual Pentium 650

D1 format (720x480) 24 frames/sec encoding at 9x real time on Dual Pentium 650

Operating Systems:

Runs under WindowsNT, Windows2000, Windows98

Manages files larger then 8 Gbytes

Processor

Runs on any 386 or greater processor

Optimize for MMX and dual processors

Encode Video Input

BMP, YUV, Y-U-V, TGA, AVI, DIB, D1, ABEKAS, and PPM

Fields and frames in sizes from 16x16 to 16384 x 16384 pixels

Single frame or frame sequence to produce a longer stream

Sequences stored on multiple drives

Initialization file containing session specific parameters

EDL file describing scene by scene parameters

Scene Change file containing known scene changes

Encode Preprocessing:

Standard or user defined 7x7 kernel filters

Full frame or regional filtering

D1, VGA, or SIF downsampling or upsampling

Logo or graphic animation mixing with video

Video or graphics RGB conversion

Encoding:

High, Main, and Low Level encoding

High, Main, and Simple Profile encoding

Optional MPEG-2 transport packetizing

8-11 bit selectable DC precision

Zig-Zag and Alternate DCT scan

Dual Prime, field and frame motion estimation

Temporal down-sampling to 1 frame per second

Adjustable IPB frame patterns (ie, M and N values)

Selectable sequence header insertion rates

Modifiable start time code

Target decoder buffer sizes from 1 to 1000 vbv

Constant bit-rate or constant quantization

4:2:2 and 4:2:0 Chroma formats

Optional end with I Frame

Supports all 18 HDTV formats

Scene by scene bit-rate change capability

Automatic or manual GOP forcing

Segment encoding to specified buffer states

Encoding precision control

Control of regional quantization within selected frames

Closed caption text insertion

Precision control for high quality or high speed encoding

Encodes audio from WAV or AVI

Encode Video Output:

Bit-rates from 1Kbits/sec to 168 Mbits/sec.

Frame rates from 1 frame/sec. to 60 frames/sec.

IPB, IP, or I-frame only streams.

Results of pre-processing without encoding

Recommended bit-rate to log file in analysis mode

List of detected scene changes to scene change file

Encoding statistics to log file

Current parameter configuration

Multiplexed program, system, VOB, or transport stream

Decoding:

Precise computations with MPEG-2 color accuracy

MPEG 1 or 2, DVD, VOB, or transport bitstreams

Stores frames as YUV, TGA, or BMP files

Analysis:

24-bit color frame windows with zoom and roam

Frames and fields visible at input, motion compensated, DCTed, compressed, and error states

Graphic display of buffer fullness and encoding statistics

Motion vectors, block decision types, quantization values

Stream Repair:

Inserts sequence display extensions into encoded MPEG

Sets progressive frame flag in encoded MPEG,

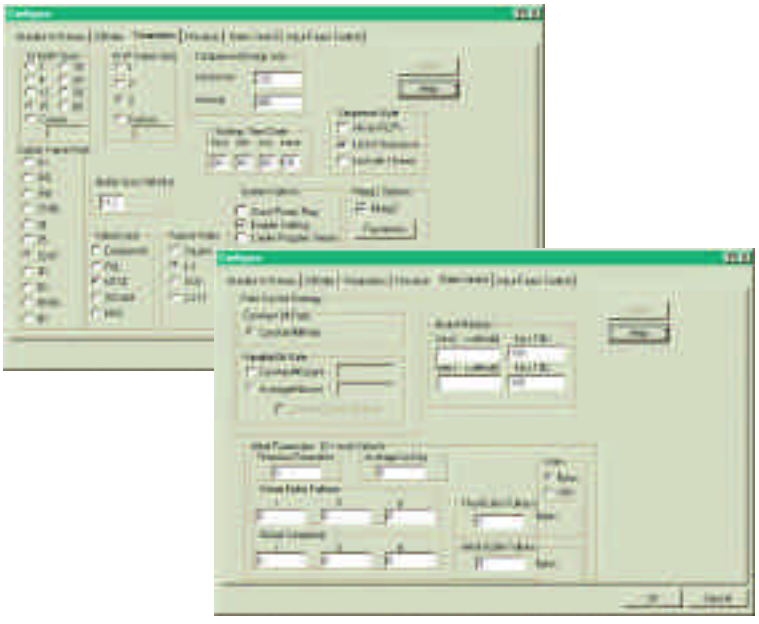
User Help Facilities:

Fly-over Hints

Comprehensive Users Manual with expert encoding hints

Specification update:

See PixelTools home page at www. pixeltools.com for latest specification update on MpegRepair.



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The Mpeg Experts

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