



FEMZIP DATA COMPRESSION REDUCES READ-IN TIMES FOR CRASH DATA IN GNS ANIMATOR

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Challenge

Crash simulations generate a vast amount of simulation data, which need to be analyzed, exchanged among engineers and archived for future reference and re-analysis. The challenge is to cope with this large data volume in a time and storage saving way.

Solution

The Fraunhofer Institute for Algorithms and Scientific Computing SCAI has developed the compression tool FEMZIP to solve this data challenge.

FEMZIP compresses crash simulation data by up to factor 10 without significant loss of accuracy. Furthermore, compressed files can be directly read in by a growing number of pre- and post-processing tools.

The software is available for the compression of LS-DYNA™, PAM-CRASH™ and MSC Nastran™ results.

The Volkswagen AG uses FEMZIP in its standard work flow for data compression of PAM-CRASH™ results (FEMZIP-P). The advantage of the data compression is not only a reduced amount of disk and archive storage, but also faster times for transfer and post processing of result data.

For maximal efficiency, the post processor should integrate the decompression functionality best possible.

GNS (Gesellschaft für numerische Simulation mbH) accomplished the integration of the decompression tool FEMUNZIP into GNS Animator 3 and 4 in various steps, with increasing levels of optimization.



Michael Taeschner, Volkswagen AG:

“At Volkswagen we use FEMZIP to compress most of the crash simulation results. Compression rates of up to 10x help us to minimize storage and archive resources. We worked with GNS and Fraunhofer SCAI to streamline the integration of FEMZIP into Animator. The result is a significant improvement of data import, allowing our engineers to spend more time analyzing results”.

Stefan Hanson, GNS mbH:

„We integrated the decompression of FEMZIP-compressed data in our postprocessor Animator 4. The effect was a reduction of the read-in times of compressed PAM-CRASH files by more than 50%. Data compression with FEMZIP combined with built-in decompression in Animator 4 increases the productivity of our customer’s engineers”.

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Benchmark process

Volkswagen carried out benchmarks with real data and measured the times for reading displacements and functions in detail.

- GNS Animator versions:
 - A3 1177 with no optimization
 - A4 1162 with partial optimization
 - A4 1176 with full optimization
- Hardware: 2 Intel Xeon X5355 quad core systems (8 cores total), 2.66 GHz

The time was measured separately for

- processing in the GUI
- processing in the reader
- reading from disk

Results

The results of the measurements are shown in the graphs. Figure 1 shows the total read-in time for a smaller model, for original and compressed data. Reading displacements (disp) and nodal elements (nod10) is 2-3 times faster for FEMZIP compressed data.

The effect of the optimized integration of the decompression into Animator is shown in figure 2 with a larger model. While the first optimization step (A4 1162 vs. A3 1177) reduced the GUI processing time, the second optimization step (A4 1176 vs. A4 1162) significantly lowered the processing time in the reader. The combined effect was an improvement of the read-in time of a factor 2.5 for displacements and a factor 4.5 for nodal elements.

Figure 1: Effect of data compression with FEMZIP-P on read-in times

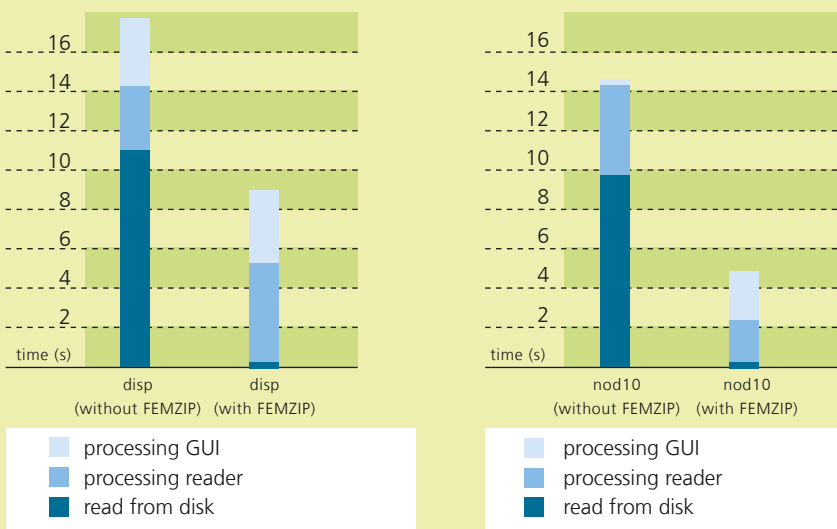
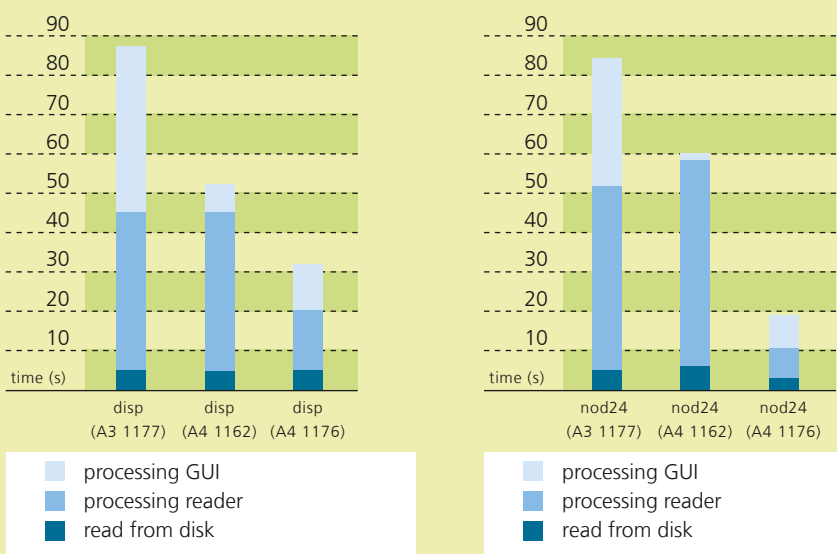


Figure 2: Effect of better integration of decompression in GNS Animator



1 Feedback of our partners from Volkswagen and GNS on the usage and implementation of FEMZIP.