

ADINA System Newsletter

Volume 2, Issue 1

September 1999

It has been a busy and eventful summer for us here at ADINA R & D. We hope that you also have had a good summer (or winter for those in the southern hemisphere). In this newsletter, we would like to share some of the recent major events with you, including the 12th ADINA Conference and the release of ADINA System 7.3.

ADINA System 7.3 Released

One of the key issues for us and our users in the release of ADINA System 7.3 was that the PC Windows version should be released together with the Unix version. We are glad to have achieved this objective. We list here the minimum operating system (OS) required for the ADINA System 7.3.

Platform	Minimum OS level
DEC	Digital Unix 4.0
HP	HP-UX 9.07 ¹ , 10.20
IBM	AIX 4.1.4 ² , 4.2.1
SGI	IRIX 5.3
SUN	Solaris 2.5.1
PC	Linux kernel 2.0.35 ¹
PC	Windows 95, NT 4.0

- 1 No ADINA-M capability.
- 2 No NASTRAN translator and cyclic symmetry capabilities.

For Version 7.4, to be released next year, we will no longer support HP-UX 9.07, AIX 4.1.4, IRIX 5.3, and Solaris 2.5.1. The minimum OS requirements planned for the ADINA System 7.4 are:

Platform	Minimum OS level
DEC	Digital Unix 4.0
HP	HP-UX 10.20
IBM	AIX 4.2.1
SGI	IRIX 6.2
SUN	Solaris 2.6
PC	Linux kernel 2.0.35
PC	Windows 95, NT 4.0

Some exciting new features in the ADINA System 7.3 are highlighted in the following sections.

Delaunay Mesher

The default 3D automatic mesher is now the Delaunay mesher. Benchmark tests have shown our Delaunay mesher to be faster and more robust than our advancing front mesher. As an example, we meshed the SolidWorks part shown here using both methods.

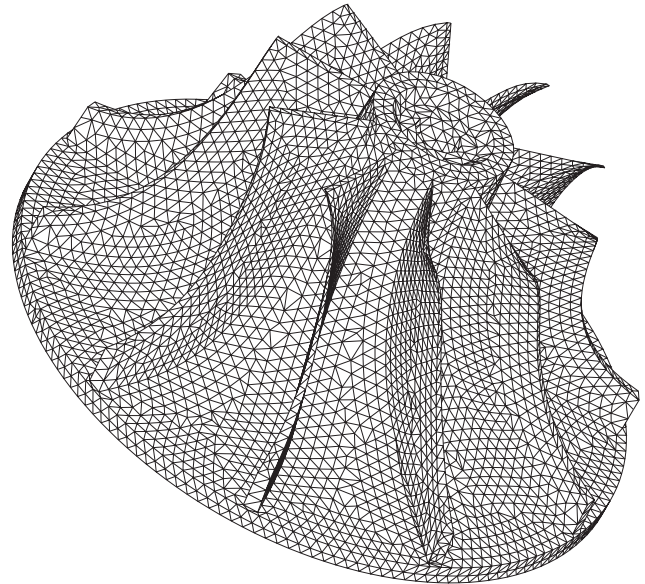


Figure 1: Delaunay mesh on a SolidWorks part

Training Classes

The next ADINA/AUI training course will be held at ADINA R & D on November 11-12, 1999.

INSIDE THIS ISSUE

- 1 ADINA System 7.3 Released
- 2 12th ADINA Conference
- 3 Special 900 Nodes Version
- 4 Animation CD

Comparison of the CPU time based on an SGI Octane machine is given below.

Mesher	No. of Elements	CPU Time
Delaunay	76,000	88 sec.
Adv. Front	68,000	196 sec.

The Delaunay mesher has an integrated mesh quality optimizer that eliminates or reduces the number of sliver elements (i.e. poorly shaped tetrahedral elements) generated. Another interesting feature is the ability of the program to automatically resolve fine features in the geometry by placing enough subdivisions on the problem edges before proceeding with the mesh generation. This can save the user substantial effort and time when meshing a complicated geometry.

CAD Interfaces

The following is an update of the CAD interfaces for Version 7.3.

- The ADINA Modeler (ADINA-M) supports import of Parasolid version 10.1 (or below) files.
- TRANSOR for I-DEAS is now available on the PC. The PC version of TRANSOR has the same capabilities and graphical user interface as the Unix version. I-DEAS Master Series 3, 4, 5, 6, and 7 are supported.
- TRANSOR for PATRAN (only on Unix) supports MSC/PATRAN versions 8.0 and 8.5.
- The Pro/ENGINEER interface has a new module which converts Pro/E parts and assemblies to ADINA-M (Parasolid) parts. Hence, on Unix platforms, the Pro/E interface now has 2 modules — the interface to AUI and the ADINA-M converter. On the PC, only the new ADINA-M conversion module is offered.
- An AutoCAD interface is provided for the PC Windows version. This interface works with Mechanical Desktop and converts solid parts to ADINA-M parts. This interface is accessed from within AutoCAD.

- The IGES interface can now “sew” up translated surfaces to form a solid part.

Details of installing and accessing the CAD interfaces are described in the ADINA Installation Notes for Unix and Windows.

On-line Manuals

The following ADINA manuals are now available on-line in Acrobat Reader format.

- ADINA System 7.3 Release Notes
- AUI Users Guide
- AUI Primer
- AUI Command Reference Manual Volume IV
- Theory and Modeling Guide, Volume I: ADINA
- Theory and Modeling Guide, Volume II: ADINA-T & ADINA-F

If you do not have Acrobat Reader on your system, you can install it from the ADINA System CD-ROM.

Note that all the ADINA manuals will be available on-line in Version 7.4.

Other New Capabilities

The ADINA System 7.3 also includes the following major new capabilities.

- AUI: ADINA-M bodies can be subdivided using planar sheets. Mapped meshing can be generated directly on simple ADINA-M bodies which are topologically equivalent to AUI volumes.
- AUI: Options to extrude multiple volumes in a single command.
- AUI: Porthole files can be loaded into the ADINA-IN database. Geometry data can then be accessed during post-processing.
- AUI: ADINA and ADINA-F portholes can be loaded into the same database. You can then post-process results from both models together.
- ADINA: Modeling of “tied” contact when contact

is always maintained and there is no sliding between 2 contact surfaces.

- ADINA: Cam-clay material model for soil mechanics analysis.
- ADINA: Capabilities for sheet metal forming using the orthotropic plasticity model.
- ADINA-F: Modeling of uniform flow conditions and angular velocity flow conditions.
- ADINA-F: Grouping of specular boundary conditions resulting in more efficient solutions.

If you are interested in more details of these or other new capabilities, please refer to the ADINA System 7.3 Release Notes or contact us.

ADINA Conference

The 12th ADINA Conference *Nonlinear Finite Element Analysis and ADINA* was held on June 9-11, 1999 at the Massachusetts Institute of Technology. Once again, we would like to thank HP for sponsoring the Conference dinner and SGI for sponsoring the cocktail.

At the Conference, about 30 papers were presented on the analyses of structures, fluid flows and fluid flows with structural interaction. Some of these presentations have been included in an ADINA animation CD we have just made (see below for more information). As in the past, the proceedings of the Conference are published in a special issue of the international journal *Computers and Structures*, Volume 72, pp. 1-456, June 1999.

Some of you may be aware that this 12th Conference was the last ADINA Conference. In its 22 years history (the 1st Conference being held in 1977), many excellent and interesting ideas have been presented by users of ADINA. No doubt, some will be sad to see the conference series end.

However, there is something new we can all look forward to — the 1st M.I.T. Conference on Computational Fluid and Solid Mechanics, to be held at

M.I.T., June 12-14, 2001. This Conference promises to be a major and very exciting event. It will attract industry and academia working in computational solid and fluid mechanics, and on fluid-flows with structural interactions. Other software vendors and their users will attend, and of course, we would be pleased if you would come to the Conference to report on your work with ADINA. Please plan for attending this Conference — mark the date already on your calendar!

Special 900 nodes version

We are offering a special 900 nodes version package for as little as US\$120. This special version is only available for PC Windows. It does not require any password and you can install it on as many PCs as you like. Please check out our web site for details on how to order.

Animation CD

We have produced an animation CD which features some interesting applications using the ADINA System. It shows some of the unique strengths of ADINA in the solution of highly nonlinear contact problems with large strains, fluid flow with structural interaction problems, fluid flow and heat transfer with specular radiation problems, and frequency analysis problems. Almost all the problems shown are taken from actual industrial applications.

If you would like to obtain a copy of the animation CD, please let us know. All you need to view the animations is an internet browser (Internet Explorer 4.0 or Netscape 4.0 or higher versions).

Application Showcase

The advance of finite element and computer technologies has enabled ADINA to solve more and more complex problems. One exciting area of development is the solution of very large systems. Recently, we performed some benchmark solutions on the analysis of an engine block that test the ability of ADINA in handling problems with millions of equations. We list here 2 of the cases solved.

Case	No. of Equations.	No. of Processors	CPU Time
1	2,570,933	16	1.14 hrs.
2	2,597,678	4	11.43 hrs.

Case 1 is for a linear static analysis and case 2 is for a nonlinear static analysis with 7,152 contact equations.

The solution times are for an SGI O2000 computer using the sparse solver.

User Hints

What is the difference between contactor surface and target surface?

- 1) Contactor nodes cannot be slave nodes, and cannot have prescribed displacements.
- 2) Contactor nodes cannot penetrate a target surface while target nodes can penetrate a contactor surface.
- 3) Orientation of nodes on contactor surfaces is not important if the constraint-function method (default) is used, but is still important if the segment method is used. Correct orientation of nodes on target surfaces is always important.
- 4) In dynamic analysis using implicit time integration, the contactor nodes can have zero mass (i.e. material assigned to the element group that the nodes are attached to have zero density).

Whereas, a target node must have mass unless it has a prescribed displacement or is fixed.

Creating a GIF animation file

The following method can be used to convert a AUI movie file in Postscript format to a GIF animation file. We assume here that we want the image size in the final GIF animation file to be 640x480 pixels.

- 1) In the AUI, go to File → Snapshot/Movie Setup (Unix: Screen Plot Setup) → PostScript. In the dialog box, set the paper size to custom (Unix: Direct Input), width 6.4 inches, height 4.8 inches. Also, under placement, set the width and height to 100% and Offsets to 0%. Then, click the [OK] button.
- 2) Create the AUI movie and save it to PostScript format.
- 3) Use GhostScript (from www.cs.wisc.edu/~ghost) to convert the PostScript file to PCX format. See commands below*.
- 4) Use GIF Construction Set Professional (from www.mindworkshop.com) to convert the PCX files to an animated GIF file. Choose File → Animation Wizard and follow the instructions for conversion.
- 5) Once you are happy with the animation, save it and open it using a browser (e.g. Netscape or Internet Explorer) to view it.

* PC: `gswin32c -dNOPAUSE -sDEVICE=pcx256 -g640x480 -r100x100 -OutputFile=<file>.%04d.pcx <file>.ps`
 Unix: `gs -dNOPAUSE -sDEVICE=pcx256 -g640x480 -r100x100 -sOutputFile=<file>.%04d.pcx <file>.ps`



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