# The AVS to Video Connection

Terry Myerson, International AVS Center

With millions of video tape recorder's installed in the United States alone, video is proving to be the most portable presentation medium for computer graphics, and more specifically scientific visualizations. The process of recording computer graphics to video is a complicated one, that requires both hardware and software support. On the hardware side, sequences of digital frames need to be translated into interlaced analog signals for recording - but this is an issue for another article - another day. This article is intended to address the current module support for recording AVS visualizations to video tape.

There are currently 4 modules, with source code, available to the AVS user to assist in the video creation process. Brian Kaplan of the University of Indiana has submitted a module to the International AVS Center module repository called **Record** which supports recording with a Lyon Lamb Mini-Vas, or separately to a Sony Videodisc Recorder. The Lyon Lamb module support was originally developed at Stardent, but has been greatly enhanced in the **Record** module. The Lyon Lamb device is an animation controller that allows frame accurate recording to a large number of video tape recorders. This device requires an encoder and sync generator to complete the hardware requirements for recording. The Sony Videodisc Recorder is an analog frame storage device which accepts Red-Green-Blue analog input similar to a workstation monitor - but at NTSC scan rates. The Sony device would need a sync generator and scan converter to complete the hardware requirements for recording. The Lyon Lamb setup would cost approximately $5,000, while the Videodisc setup would cost approximately $12,000.

Wade Smith of Convex has submitted a module named **output A60** that writes images directly to an Abekas A60 digital disk recorder. This module is the successor to Ian Currington's **write abekas**, and Terry Myerson's **write A60 yuv** module - both of which also support the Abekas A60 device. The A60 accepts frame files over a TCP/IP network, does not require external sync, and can playback to any commercial or industrial grade video tape recorder with no degradation of image quality. The hardware setup which this module supports is approximately $65,000.

Included with the AVS 4 Animation Application, there are two modules which support the video creation process : **output VideoCreator**, and **output ImageNode**. These modules are both distributed with source code, and thus do not require the separate licensing of the Animation Application. The **output VideoCreator** module supports the Silicon Graphics VideoCreator product which includes several components in one product : frame buffer, scan converter, encoder, sync generator, and animation controller. The **output ImageNode** module supports the Diaquest ImageNode product, which just like the VideoCreator includes several components in once product: encoder, sync generator, and animation controller Neither of these products require any external hardware support for video production. Each of these systems would run approximately $10,000.

For the AVS user, each of these modules allows the visualizer to hook up a module within an AVS network, and output a frame sequence directly to a video tape ( Mini-Vas, Video Creator, or Image Node ) or output a frame sequence to a frame storage device for later playback to video tape (Videodisc or A60 ) assuming you possess among the other hardware peripherals, a video tape recorder!!

The modules listed above are all that are currently available at the International AVS Center - the hardware they support is not specifically endorsed by the center. If there are AVS users out there, who have written modules to support other video hardware, submitting them to the module repository would make the video creation process simpler for everyone.

Figure 1 - 4
Shown here are four frames at different time steps from a computer simulation of an underwater explosion bubble broaching the free surface. The darker isosurfaces on top are the air water interface as seen through air, while the lighter isosurfaces on the bottom are the same interfaces seen from the water side. This data was generously supplied by Dr. Jay Boris from the Laboratory of Computational Physics and Fluid Dynamics at NRL.



*Figure 3*



*Figure 4*

## Module Submission Criteria

We encourage modules of all types. We are not looking for perfect code, but rather code that is used everyday and would be useful to users. Several users have said they did not think their code was good enough or would be useful to the AVS user community. This is not true. We have many different levels of users - from the total novice to the experienced professional - and code is needed for all levels. All we require is source code, a makefile and either a readme or man page. Data, networks, etc are strictly optional.

**Source file and Makefile** - Source code and Makefile must accompany all modules submitted. We encourage extensive commenting and ask that port-specific lines be so commented.

**Module description** - A detailed description of the module must be included with its submission. This may be in the form of a man page or ASCII text format (as in a README file). Module description is one of the most important criteria for submission. Please note if multiple modules are in one source code file. The International AVS Center staff will rewrite the documentation as necessary.

**Data** - If your module uses a nonstandard data format, you must include an example (not necessarily real) of that data. Explanations of how to read the data should be placed in the required manual or README file.

**Miscellaneous** - You are requested to provide sample networks and scripts when appropriate.

To submit modules, ftp to **avs.ncsc.org** and cd to the SUBMIT directory. You will be prompted in how to create a directory. The directory itself will be invisible so that others may not inadvertently copy over your files. When you are in your directory, use standard ftp protocol to submit your modules and associated files. Information on using ftp for basic submission and retrieval can be obtained by sending a request to **avs@ncsc.org**.

You also can submit modules and associated files by email to **avs@ncsc.org** and by tape (tape will be returned if requested) to the **International AVS Center, 3021 Cornwallis Road, RTP, NC 27709**.

# Animating Time Dependent 3D Data Using AVS

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In the process of conducting day-to-day research, scientists frequently need to visualize events that unfold over time. Animation is a powerful tool that helps scientists to visualize these dynamical processes. Instantaneous visualization provides information about a particular time step in the simulation, while animation of these events can supply valuable information about the dynamics of the process.

Typically, a scientist runs a long simulation on a supercomputer to accumulate a large database of time-indexed results. The data is then transferred to a visualization platform for animation. Major difficulties in executing these tasks are portability of the data to different computer architectures and complexity of creating the animation. Developing tools and methods that perform these steps conveniently and efficiently can result in the savings of valuable research time.

The Scientific Visualization Laboratory at the Naval Research Laboratory is addressing these issues by developing a variety of tools for creating animations. In the previous issue of AVS Network News (Winter 1992) we announced an AVS module that animates data from Molecular Dynamics simulations. Below we describe an AVS module for animating 3D time dependant data.

We have developed an AVS module, **animate hdf volumes**, that uses an HDF (Hierarchial Data Format developed at NCSA) file with multiple frames. In practice a scientist runs the simulation on a supercomputer and saves frames at a desired frequency to an HDF file. The AVS **animate hdf volumes** module can then read the file and output single frames to be used by other modules such as **isosurface** or **orthogonal slice**. The toggle button, "run", in the module, can be used for continuous output while the "step" button can allow one to step frame by frame. The current coroutine supports only uniformly gridded data. NCSA's HDF turns out to be the best possible choice for data format since it is portable and available on both supercomputers and a variety of workstations. You can contact NCSA directly or login to their anonymous ftp site at ftp.ncsa.uiuc.edu to download HDF and the appropriate documentation.

One major difficulty encountered in creating animations is the relatively large amount of data which needs to be handled. Frequently scientists cannot save every time step in the file. As an alternative we added the capability of performing interpolation. Although this method may generate excessively diffused intermediate data, one can use it as a compromise solution when disk space is limited. Interpolation can result in an unphysical pulsating effect in the animation, which is reduced if the two datasets used for the interpolation are chosen to be more closely spaced in time.

*Figure 1*

*Figure 2*

The visualization in this application is mainly concerned with mixing the various layers of data to be displayed. This is done by a module especially programmed for this purpose. Any color images (five in this case) generated by various data are converted into an image using the alpha value of the individual pixels being used as a degree of transparency. This “alpha value” can be defined separately for each color class. An AVS color module assumes this task, allowing an interactive definition of the color values (alpha, red, green, blue) of the individual color classes. The color classes are defined in a legend containing for each requested color number, a name and threshold value which are the link to the coverage information. After having read such a file, a legend is set up on the basis of the names and the associated colors to indicate color classes and values to the user. The threshold value is used by other AVS modules, also reading this file to give the required color to the data. Thus, a user-friendly, interactive, and flexible application could be developed on the basis of AVS. Thanks to the use of AVS, the development effort for this application could be restricted to 5 man-months, which is only a small percentage compared to the traditional programming effort.

**Outlook**

At present, two implementations of the AVS application are used by TELEKOM. The application is of help in planning the broadcasting coverage for East Germany. The first version of the application was presented to experts on the occasion of the Radio and Television Show (Funkausstellung) held in Berlin in 1991. Currently, details of the system are modified and interconnected with another database containing the numbers of inhabitants of states, districts, communities, etc. After having integrated these data into the system, it shall be able to evaluate and display the supply of a certain area with reference to population density. Due to its flexibility and the standardized data interfaces, the use of the application for any future radio planning procedures (DAB, HDTV) is ensured. The system can be extended by using other local graphic computers, so that planning activities will no longer be a central task.



*Figure 7*

*Figure 8*



*Figure 9*

**Visualization and optimization of broadcasting coverage** - For visualization of the coverage situation of the project area, the predictive data of the required transmitters calculated by means of the wave propagation model, are loaded into the application using the **load transmitter** module and are superimposed on the other data selected, such as maps. They are displayed in a 2D window, the contents of which is then additionally mapped as a texture onto the terrain model in the 3D representation (Figure 6). By the selection of various transmitters or planning variants, it is possible to show their influence on the coverage of the project area (Figure 7). With the appropriate dial made available by AVS, the power of the transmitter under consideration can be modified with its predictive data being adjusted accordingly and visualized at once. Furthermore, it is possible to modify the pattern of the transmitter under consideration with the antenna characteristics, the field strength values of the field strength prognosis being updated in the relevant angular ranges (Figure 8). The representation can be influenced by a wide variety of control parameters. Changes of the planning situation are immediately obvious. In addition, the user can see segments of the area of coverage by mouse control (zooming) or can display or suppress additional information.

**Explicative display** - The color pattern of the representation is determined by the color definition making it possible for the user to optionally select legend and colors (Figure 9). In order to get a hard copy of the results of visualization, a high-quality printer is connected to the system, printing out the images selected by the user in “photo” quality. Furthermore, the system produces a text file, containing information on the project and the transmitters selected.

**Use of AVS**

One of the main purposes of this application is to provide the user with a clearly arranged interface which is also easy to handle. An AVS module was developed, transmitting commands (CLI commands) to the AVS-kernel to control the display and suppression of the requested menu and to create or delete any required display windows. This module has a permanently displayed information window, continuously providing the necessary information to the user. All AVS modules were programmed in such a way that their information



*Figure 5*



*Figure 6*

texts will also be transmitted to this information window (by sending appropriate CLI commands).

To grant the required interactivity in the application, an X11-based picking module was programmed. This AVS module shows an incoming image in an X11 window and registers any mouse events in this window. It is possible, for example, to draw a line or a box (rubber band), the end points of which are then available at the output port where they can be picked up by other modules as XY pixel coordinates. Zooming into the project area shall serve as an example for that. After having selected the zoom area by drawing a rubber band in the 2D display window, its corner coordinates are sent to the upstream module generating the 2D image. It converts pixel coordinates to user coordinates (in this case geographical longitude and latitude) to generate the image for the zoomed area. These coordinates are required, e.g. for re-loading the map at its maximum resolution when zooming the requested section.

Altimetric and land usage data, scanned map material, and political and economic data form the basis for the definition of a planning project by means of the system described. After a suitable location has been found and other technical parameters of the transmitter station (transmitting power, operating frequency, antenna characteristics) have been specified, the theoretical coverage is ascertained with the aid of a wave propagation model. Field strength and coverage data are calculated for each segment of the area under consideration. They are then superimposed on other available information and then visualized. The representation should be in such a manner, that it is easy to modify and understandable to non-professional viewers.

**Description of the Application**

The graphically supported planning system comprises the following stages, which can be performed with the help of the AVS application:

**definition of the planning project**
**simulation of the site inspection on the basis of the digital terrain model**
**visualization and optimization of the coverage situation**
**explicative display**



*Figure 3*



*Figure 4*

The intuitive structure of the implemented AVS menu is intended to support the planning engineer in his/her work. They activate the necessary stages for the planning of broadcasting transmitters by selecting the appropriate sub-menu (Figure 1). The various planning stages are performed as described in the following:

**Definition of the planning project** - The planning project is defined by the coordinate frame of the area of coverage under consideration. Supplementary data or coverage is loaded into this frame, if required. After definition of these *project parameters* (Projekt Parameter module) by the planning engineer they are stored in a file and are available for further use (Figure 2).

**Simulation of the site inspection on the basis of the digital terrain model** - To become acquainted with the surrounding terrain and its influence on the wave propagation, the planning engineer can cut out terrain profiles (Gelandeschnitt module). With the help of the mouse, they define a line within the project area. The altimetric profile along this line is then displayed in an additional window (Figure 3). In another window, a 3D projection of the digital terrain, including map and coverage information, is displayed. This 3D representation can be optionally rotated with standard AVS tools and demonstrates planning problems (Figure 4). The visibility concept (Einsehbarkeit module) allows a first approximation at the coverage by the transmitter site. After having selected one potential transmitter and the relevant geographical conditions, those areas being in sight of the transmitter are marked by means of TELEKOM's altimetric database. Now the planning engineer is able to make a first useful selection of the transmitter site, since it is highly probable that visible areas are also covered areas (Figure 5).

# Development of a VHF/UHF Broadcasting Planning and Visualization System on the basis of AVS

Walter Schmeing, VISTEC Software GmbH and Franz Rothe, DBP-TELEKOM FTZ

**Summary**

Deutsche Bundespost TELEKOM (Technical Engineering Centre in Darmstadt) has developed a broadcasting and visualization system to simplify and accelerate the planning of broadcasting transmitters. The coverage situation of broadcasting transmitters is visualized by this application program in connection with other data, such as maps or geographical information. For the optimization of the coverage situation, various technical parameters of the transmitter site are used. The changed situation of coverage, resulting from this, is immediately visualized. This interactive planning system is based on AVS.

## Introduction

### Basic Problems with Broadcast Planning

Before a transmitter station can be put into operation, the following technical problems have to be solved, during the planning stage of broadcasting transmitters and transmitter networks:

**selection of location**
**frequency ascertainment**
**assessment of the coverage situation to be expected**

When searching for the most favorable location for the transmitter station, a detailed knowledge of the surrounding terrain in the future area of coverage is required. This can be achieved either by site inspections or by inexpensive computer simulations on the basis of a digital terrain model.



*Figure 1*

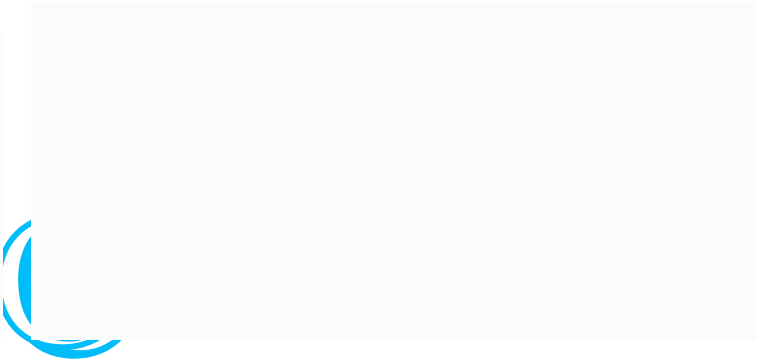

*Figure 2*

In the case of simulation, the planning engineers can use their computer to perform all necessary investigations, e.g. variations of the transmitter site or antenna height. Moreover, they are able to find out whether there are any geographical impediments which can obstruct the view of the selected area of coverage. They can take advantage of mountains surrounding the area of coverage by using them as a protection against interfering influences. An efficient simulation close to reality is, however, dependent on the quality of the basic data applied.

There are three methods to submit modules. Each of these is discussed in detail in the file AVS_README:

1) Standard ftp protocol
2) email (no binaries)
3) Sending tapes to:

**The International AVS Center**
**P.O. Box 12889**
**3021 Cornwallis Road**
**Research Triangle Park, NC 27709**
**USA**

If you are having any problems making use of the module repository after reading the file **AVS_README**, please send email to **avs@ncsc.org**, and your questions will be promptly answered by one of the IAC staff.

# What's New?

There is now an archive of all traffic on comp.graphics.avs at the International AVS Center ftp site avs.ncsc.org ( 128.109.178.23 ). Thus if you know of anyone, whom does not have news access, they can download the files in the COMP.GRAPHICS.AVS directory. These files are in the standard mailbox format so that anybody can peruse these files using any mail utility with the -f command.

For example: Mail -f May_92. If a "message" in this mailbox is replied to, then a message is sent back to the poster of the article - but it is not replied to the newsgroup. The files will be stored in a separate mailbox for each month: May_92 Jun_92.

Also, if you know of someone who does not have ftp access, then there is a sister mailing list to the newsgroup established now as well. This mailing list is being maintained by the listserv utility. Users can add and delete themselves from the mailing list at will through this utility. If a user wishes to be added to this mailing list, they should send email to listserv@avsusers.ncsc.org with a body of one line: HELP. This will return email on a large number of AVS mailing lists, including the avs_newsg mailing list. All postings to the newsgroup will be forwarded to this list; however, separate postings to this mailing list are not currently being posted to news. If anyone has any suggestions on improving these utilities or any other IAC facility, please let us know.

There is now a shadow ftp site in the United Kingdom. This is being maintained courtesy of Steve Larkin from the United Kingdom. You can access this site by ftp at hpb.mcc.ac.uk (130.88.200.7).

It is no longer necessary to send a Submission Release form when donating modules. Wording in the headers and licensing of the site has changed to take care of this issue.

The Automated Porting Tool is up and running in beta mode. It currently has an 80% sucess rate for the platforms ported.

*Figure 1*



*Figure 2*

**Creating contour lines in a 2d scalar field**

The filter module **contour** was supplied to the International AVS Center's ftp repository by the former Stardent Computer Inc. It can be used to create contour lines on a black background within a "field 2D scalar byte" extracted from image data. The user is supplied with two dial parameters. With the "threshold" dial, the level of the contour lines being created is set. With the "new" parameter, the color index used for the contour lines can be selected.

The algorithm in **contour** is straightforward. For each pixel in the new image, the corresponding pixel in the original image and the 3 pixels above and to the right are examined. If among these 4 original pixels, there is at least one pixel with a value above the threshold, and at lease one with a value less than or equal to the threshold, then the new pixel becomes part of a contour line. Otherwise, the new pixel is set to black. This module can be can be found in the directory "FILTERS/contour".

**Using the module repository**

To obtain detailed information about the International AVS Center (IAC), send any email message to avsemail@ncsc.org. You will automatically receive two replies: the latest copies of AVS_README and AVS_CATALOG. AVS_README discusses what the IAC is all about, and AVS_CATALOG summarizes the currently available modules. There are three methods for obtaining modules discussed in detail in AVS_README:

1) standard ftp protocol using anonymous ftp to **avs.ncsc.org**
2) automated email module retrieval for users without the ftp protocol, via an "order" message sent to **avsorder@ncsc.org**
3) batch tape requests mailed to the International AVS center

The IAC has recently implemented the Automated Porting Tool (APT). This enables "push button" porting of submitted modules across the hardware platforms at the IAC. Now that this infrastructure is in place, you are strongly encouraged to submit your AVS modules to the IAC. Donating a module to the IAC benefits the entire AVS user community by facilitating further use of AVS to visualize complex scientific phenomena. Any module that is not donated may be rewritten elsewhere, wasting valuable time and hindering further development of other module capabilities for everyone's benefit.

# International AVS Center Module Highlights

Steve Thorpe, International AVS Center

**Abstract**

This article highlights several useful modules freely available to the AVS user community from the International AVS Center's module repository. It also reviews the procedure for obtaining or submitting AVS modules.

## Introduction

The modules **fast_animate**, **color_legend**, and **contour** are briefly described and demonstrated. For further information on obtaining these and other modules please see the section , "Using the module repository".

## Animating a sequence of geometries

Keith Refson, of Oxford University has written a module called **fast_animate**. This coroutine module reads a sequence of geometries into memory, then fires these objects to its output port in rapid succession. Since the geometries are stored in memory, the speed of the animation is significantly improved as compared to reading each file just before firing that geometry. Given sufficient memory, the animation rate will remain the same regardless of the number of geometries.

A user with a sequence of geometry files to animate within AVS would typically follow the file naming convention of "rootN.geom" where "root" would be some base name for that sequence, "N" an integer representing the frame number for that particular geometry, and ".geom" the default suffix for these geometry files. A mechanism for other naming conventions is provided via printf format characters such as %d, %o, and %x. Supplying these within a name to **fast_animate**'s file browser will enable the module to handle more arbitrary file names.

Incorporating **fast_animate** into an AVS network is quite trivial (see figure 1). Simply connect its output port to the geometry viewer and you have a complete network. Entering the min and max frame numbers for the appropriate parameters, selecting one of the files in the sequence with the file browser, then clicking on the "go" widget will cause the entire sequence to be read into memory. At this point, clicking on "go" will toggle the cycling of the animation. The "min" and "max" parameters can be used to select a subset of the sequence for viewing; the "step" and "back" buttons allow the user to single step through the sequence. This module can be found on the International AVS Center's ftp site in the directory "DATA/fast_animate".

## Generating a color legend

Wes Bethel of the Lawrence Berkeley Laboratory has provided the AVS user community with a useful module called **color_legend**. This mapper module accepts a colormap as input, and generates a legend suitable for rendering with the geometry viewer. The entire range of colors in the colormap is shown as a smoothly shaded color bar, which can be labeled and oriented using **color_legend**'s widgets.

From **color_legend**'s control panel, the user can choose whether to include a 1 pixel thick border around the bar, adjust this border's gray scale, and choose the number, size, font, gray scale and precision of the labels. The user can choose a vertical or horizontal orientation for the color bar, reverse the order of the colors, and toggle whether boundary lines are shown on the color bar at the location for a particular label.

The example network shown (see figure 2) creates a visualization of the sample AVS dataset called hydrogen.dat, which depicts the probability of an electron being found around the nucleus of a hydrogen atom. Other modules used in the network include arbitrary slicer and volume bounds. This module can be can be found in the directory "MAPPERS/color_legend".

# Obtaining Modules

Modules may be obtained by two basic methods. The first is the standard ftp protocol. When you ftp to avs.ncsc.org, a menu will come up that will guide you in using the ftp site and point you to the AVS_README and the AVS_LICENSE files. The AVS license agreement must accompany all modules obtained and is self-explanatory. The AVS_README file provides considerable information on the site and how to obtain and submit modules. There is a new AVS_CATALOG file that is updated daily and printable and there is also a PostScript version of this catalog.

When you login to the AVS directory at avs.ncsc.org, you will see subdirectories called DATA, FILTERS, MAPPERS, RENDERERS, MISC, and SAMPLE_DATA and SUBMIT. Some modules have multiple purposes and will be placed in the most appropriate directory. SAMPLE_DATA will be for data that is donated but has no associated modules. When you cd to the subdirectory, you will see many makefiles, such as make.convex or make.dec — one for each port of the module and its associated files. This will include source code, help files, README files, scripts, sample networks, etc.

The second method for obtaining modules is through standard email. When you send an email message to avsemail@ncsc.org, you receive an automated listing of all available modules along with a request form and copy of the AVS Catalog (updated daily). When you return the request form to avsorder@ncsc.org, you receive the modules and associated files (subject to size considerations) through normal email channels. Full information on this procedure is sent with the initial automated mail response.

While this ftp site presently is not too difficult to peruse, it quickly will entail a large maze of directories. With the large number of anticipated modules this will make it difficult to traverse through all of the directories. Therefore, we have provided a X interfaces and a command line program using WAIS protocol (client). There is a WHAT_IS_WAIS file you can download and read for more detailed information. This is also available as an AVS module called awais. This is a hypertext search-and-query program that enables you to type a sentence in standard English language (e.g., <Show me all the filters that are related to molecular modeling.>) and receive a listing of everything relating to that particular request. You then can read the man pages or look at the source code and decide what you want. You will be able to click on a window and have the modules and their associated files or any subset ftp'd to you automatically (not currently available, expect by end of summer). You also will be able to use the WAIS interfaces for exploring information from AVS newsgroups and other AVS related topics.

If you do not have network capability, you may request a tape via U.S. mail. Send a tape and a $5 postage-and-handling fee along with your request. You should state the vendor type, machine type, and operating system. We then will send you all available files in those categories, such as DEC, DEC5000, and OS4.0. If you do not provide a tape with your order, you must include tape cost. Tapes will not be available from the Center until its porting facility is completed and tape needs and module-to-tape downloading time have not been determined. As additional order information becomes available, it will be posted to the AVS newsgroup, included in AVS Network News, and made available through your AVS vendor. Special requests for tapes of modules can be made to avs@ncsc.org and will be handled on an individual basis for now. An automated procedure to be completed by Summer 1992, will accelerate this process.

## TRADEMARKS IN THIS ISSUE

AVS is a trademark of Advanced Visual Systems Inc.
CONVEX is a registered trademark of CONVEX Computer Corporation
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Originally, we had anticipated about 50 participants at the conference. This was not from lack of interest, but rather from lack of time. We started putting pen to paper in October and by the time we got the advance registration forms back from the printers and out in the mail it was mid-December. With only 6 to 8 weeks to respond and in the middle of the holidays, 50 seemed like the most we would be able to reach. Unsure of what the first audience would be, we opted for a 50/50 approach for both new and advanced users and also a 50/50 approach for academia versus Industry/laboratory. Surprise! Registration quickly grew to 80, 100, 125 and we had to make alternate arrangements for locations of our lectures and add additional computers to the tutorials and workshops rather quickly. Including attendees, speakers and vendors, we passed out 240 registration packets on the first day and another 20 or so on day two and three. We turned away a little over a hundred the week prior to the conference. The only notice that was sent included my personal email file, some advance registration forms to the vendors which went out late, and word of mouth. We were quite stunned as well as pleased at the response in such a short time period.

The idea of having a 50/50 (Intro/Adv) set of lectures, tutorials, etc was off base. While everyone seemed to enjoy themselves and come away with lots of new friends and ideas, almost everyone wanted more advanced and more technical goodies the next time. We are already working on plans for next year and we will have many different discipline specific tracks and more depth. Everyone wanted more hands-on tutorials and workshops next year. We are also working on that idea. The next issue of AVS Network News will explain some of our plans for next years conference. We would appreciate your opinions. At first we were a little surprised that we only had 10% from acedemia. We think the reason that we only had about 10% from academia was due to our mailing list. Our contacts are mostly from companies and laboratories, etc. We will make sure to get it out to the university community more thoroughly next time.

We set up about 16 ad hoc user groups around the world. This is being coordinated currently by Stephen Franklin. We want to have many Special Interest Groups and there were many volunteers to help. We were both pleased and impressed by the way the attendees volunteered to help not only with user groups, but with next year's conference, special interest groups, advice and consultation and so forth. We really felt that it was a “users” conference and we tried very hard to keep it that way. The artile titled “AVS User Groups” will explain how to join, how to set up your own, how to coordinate these groups with the international user group, how to get on special interest group mailing list, how to volunteer to help and so forth. There were about 15 people from Europe and Japan. The countries represented were France, Germany, Austria, Switzerland, Finland, Denmark, UK, Spain, Taiwan and Japan.

All of us were very pleased and excited with the level of interaction between all of the attendees. There were no wall flowers, everywhere one looked there were groups meeting, talking, excited about finding new friends and collaborators. A major effort was made to keep the vendor focus out of the conference. They were there and willing to answer questions, show their products and advise, but had nothing to do with organizing any portion of the conference. There were only a couple of times things slipped by us, but you can’t win them all. We are currently putting together a packet to send to the attendees. It will include an updated attendee list, user group information, order forms for videos of the lecture series, several questionaires on what users would like to see the center provide or provide better, areas of interest, projects users would be interested in collaborating on with other users, and many many more topics. If you would like to be added to this list, send your address to me via email at avs@ncsc.org or to the International AVS Center, 3021 Cornwallis Road, RTP, NC 27709.

Numerous people volunteered to donate modules to the center and we want to encourage others to do the same. We started a tape exchange program whereby if one does not have net access or for reasons of security or other difficulties we can rotate a tape of the ftp site every 4 to 6 weeks. We send the modules we have and the individuals on the other end send anything they are able to collect back (if any). If you need the same service send a note to the address listed above.

# WAIS and AVS

Steve Thorpe, International AVS Center

The International AVS Center now has over 250 modules available on our anonymous ftp site for you to make use of. These can be obtained via anonymous ftp to avs.ncsc.org. Please see the file AVS_README at that address for more information on the ftp site and the International AVS Center.

With so many modules available, it can be difficult to find the modules you need to solve your particular problem. To help you wade through our ftp site, there is a Wide Area Information Server running. WAIS allows you to ask an English language query of the server, and a ranked list of relevent documents is returned. You can then retrieve the documents that seem appropriate.

There are two WAIS indexes, or databases, that are available for your use. One is an index of all of the .txt files that go along with the modules at the ftp site, and other text files at the IAC. The second index has just been created - it is an archive of all of the postings to comp.graphics.avs starting with May 1992 postings.

To get started with WAIS, please read the ftp site's file WHAT_IS_WAIS, and check out the WAIS client module on the ftp site called awais. This is an AVS module that will allow you to peruse through a wide variety of WAIS sources on the Internet, including the International AVS Center's.

For example, I might be interested in JPEG files, so I might ask the server the question: "Can I read or write JPEG files using AVS?" A typical response from a WAIS client that you could type your question into, would be as shown below. I could then select any of these documents for viewing or downloading from within AVS.

| AWAIS | | | Search Results | Items: 8 |
|---|---|---|---|---|
| # | Score | Source | Title | Lines |
| 001: | [1000] | ( AVS_TXT_FILES | AVS_README | 589 |
| 002: | [ 844] | ( AVS_TXT_FILES) | AVS_CATALOG | 2008 |
| 003: | [ 603] | ( AVS_TXT_FILES) | write_jpeg | 459 |
| 004: | [ 592] | ( AVS_TXT_FILES) | read_jpeg | 456 |
| 005: | [ 413] | ( AVS_TXT_FILES) | WHAT_IS_AVS | 290 |
| 006: | [ 380] | ( AVS_TXT_FILES) | FAQ | 274 |
| 007: | [ 184] | ( AVS_TXT_FILES) | read_HDF_SDS | 198 |
| 008: | [ 184] | ( AVS_TXT_FILES) | read_abekas_ | 116 |

# AVS '92 - A Review

The first International AVS Users Group Conference was held February 11-13, 1992. The conference was hosted by the International AVS Center at the North Carolina Supercomputing Center in Research Triangle Park, North Carolina. In cooperation with Advanced Visual Systems Inc, CONVEX Computer Corporation, Digital Equipment Corporation, Hewlett-Packard Company, IBM, SUN Microsystems, and Wavetracer Incorporated. There is some comnfusion as to what the AVS Consortium means. The above companies represent the group of AVS Vendors that are funding the International AVS Center and promoting the development of scientific visualization using AVS. There are many additional platforms that AVS is ported to and information on those companies is available through Advanced Visual Systems Inc. Only Consortium members are represented in any International AVS Center activities since it is their money, equipment and moral support that directly sponsors this center for AVS users.

(128.109.178.23); (2) any electronic mail sent to avsemail@ncsc.org will receive a reply containing the form; (3) those who prefer using listserv can send a message with the message body "get user_grps AVS_USER_REG" (without the quotes) to listserv@avsusers.ncsc.org and receive the form by return electronic mail.

The information and preferences you provide on the form provide an easy way of adding yourself to electronic mailing lists based on your geographic area and your areas of special interest. These are standard listserv mailing lists to ensure individuals the widest range of access and control over the mail they receive. (Send a message with “help” as the message body to listserv@avsusers.ncsc.org for more information on listserv.)

There are two final items to cover in closing this article. The first is to thank David Bennett, Jeff Huskamp, Ray Idaszak, Terry Myerson, Todd Seemann, Steve Thorpe, and everyone else at NCSC for their enthusiastic, professional, and open support. The second item is to encourage you to write to me (either at my IAVSUG organizational address, iug_pres@avsusers.ncsc.org, or my personal one, franklin@uci.edu) with any ideas, comments, reactions, or suggestions you have about the IAVSUG. One of the great strengths of AVS is the common ground it provides for a broad, diverse range of both uses and users.

# SIGGRAPH ’92

A proposal has been submitted and accepted for an exhibit at SIGGRAPH '92. The proposal was sponsored by the DIGISTAR division of Evans and the International AVS Center in cooperation with Advanced Visual Systems Inc., CONVEX Computing Corporation, Digital Equipment Corporation, Hewlett-Packard Company, IBM, SUN Microsystems and Wavetracer Inc. In addition there are numerous groups around the world that are filling the role as affiliates and will participate in part of this collaboration. Affiliates include Xerox Corporation, Bussan Advanced Systems, North Carolina Supercomputing Center, SET Technology, Waterloo Maple Software,and others who are still being processed.

We have a 20 foot dome projecting visualizations from the DIGISTAR onto an overhead hemisphere. This is similar to what you may have seen in a planetarium, but instead of analog it is digital. This demonstrates the emerging large scale presentation technologies that will be essential in dealing with the large quantities of data that are currently being created. It will demonstrate high spatial fidelity and participatory involvment. We will have approximately ten AVS Consortium workstations around the perimeter demonstrating real world applications using these workstations with AVS and demonstrating how scientists are beginning to solve real world problems with visualization environments in a distributed, heterogeneous and collaborative method. We will be demonstrating the DTM protocol (developed at NCSA) as an AVS module for collaborative working among different scientists working on the same data set from remote sites and other interesting demonstrations which are currently being designed. Entire focus is on real science being done today.

We are bringing together about one and one half million dollars in equipment, space, connections and expertise to allow us to begin to show the world how scientists can begin to work together in truly collaborative way with todays technology. Stop by and say hello!

**VOLUNTEERS NEEDED!**

Many of you have volunteered to assist the IAC where needed once we were through the initial start up phase. We would like to solicit volunteers to help with next years AVS’93 Conference. In particular, we need individuals to chair several lecture tracks and coordinate speakers, etc. We need individuals to prepare and coordinate panel discussions. We also need people to work with the AVS Consortium to assist and advise them on several Workshop tracks. We would also like a volunteer from the west coast to work with us to begin preparations for AVS ’94 and a volunteer from Europe to work with us preparing for AVS ’95.

# User Group Update

Stephen Franklin
President International AVS User Group

For those of us fortunate enough attend it, AVS '92, the first annual International AVS User Group Conference, held February 11-13, 1992 at the International AVS Center (IAC) at the North Carolina Supercomputing Center (NCSC), offered both a valuable, memorable experience and a challenge. Much of the value was in the direct contact with other AVS users and in joining these other users in discussing shared concerns and interests with members of the AVS Consortium and with the staff of the IAC. The challenge is how to continue these contacts among AVS users and these joint discussions and how to broaden them to include AVS users other than just those who can attend the annual conferences.

The traditional (dare one say "logical") way of meeting this challenge (perhaps, better called an opportunity) is with an umbrella user group organization. Now, most AVS users are reasonably (or unreasonably) busy folks with about as much need for yet another organization to belong to as a mouse needs another button. And the AVS users at the conference were no exception. Even though the first User Group organizational meeting wasn't scheduled until Wednesday evening, an impromptu group that started with 10 and grew to almost 30 met Tuesday evening. We discussed how to foster local and special interest user group activities including broadened access to the types of activities, interaction, and resources the Conference provides for attendees and for which the IAC coordinates.

The enthusiasm and willingness (even eagerness) for local and year-round AVS user interaction was so apparent that by Wednesday evening's formal organizational meeting (attended by over half the users who attended the conference), we had volunteers to organize local user groups in Austria, France, Germany, the UK, and 10 areas in the US. The level of enthusiasm for "by-laws" and "articles" for a legal entity called the "International AVS User Group" was not nearly so high. In fact, truth be told, copies of drafts of these documents were available and (by overwhelming consensus) ignored in favor of the IAC's willingness to take care of administrative support for the user group for the coming year while a {*de facto*} board of directors (volunteers are still being sought!) investigates and then carries out the initial legal formalities. Meanwhile, the consensus (again, overwhelming) was to proceed with the activities that the international group of AVS users present at the Conference considered appropriate for an International AVS User Group (IAVSUG).

So what are the user group activities to be over the coming year? In addition to next year's International AVS User Group Conference (again, chiefly in the very capable hands of David Bennett and his IAC cohorts at NCSC), local AVS user meetings are probably the most visible and important. To help those who volunteered to organize such meetings, the IAC is making available for these meetings, video tapes from AVS '92 and full-size masters (which can be copied to produce overhead transparencies) for the AVS '92 presentations, workshops and tutorials. The IAC will also provide "tar" tapes of its AVS archives for local user groups. In fact, such tapes were distributed at the Conference to local user group organizers. To arrange vendor support for such local meetings, there is an e-mail mailing list addressing the principal AVS representatives of all vendors in the AVS Consortium. These representatives will put local user group organizers in touch with local vendor personnel who can help arrange local support for AVS user meetings.

Because AVS use is so broad and diverse, both in discipline/application area and background of its users, a real challenge for any user group is to facilitate contacts among those users sharing particular interests. Establishing special interest group contacts and geographic area contacts depends on AVS users identifying themselves and their interests to others. As a way of doing this for yourself, just obtain an AVS_USER_REG form from the IAC, fill it out, and return it via electronic mail according to the instructions it contains. The AVS_USER_REG registration form is available a number of ways: (1) anonymous ftp it from avs.ncsc.org

## Conclusion

An interactive design environment is realized in AVS. In this environment, we can determine the effect that modifications have on the flying form and the pressure distribution immediately on the console. AVS is flexible enough to analyze the calculated results from many points of view. Furthermore, we can easily understand the transient motions using the animation. In the case of transient analysis, the capacity of our Titan 750 system is not enough to operate interactively and we need the remote execution capabilities of the solving module.



***Figure 5***



***Figure 6***



***Figure 7***

## References


[1] J. A. White and A. Nigam. *A Factored Implicit Scheme for the Numerical Solution of the Reynolds Equation at Very Low Spacing*. Journal of Lubrication Technology, 102, 80, 1980.

[2] K. Ono. *Dynamic Characteristics of Air-Lubricated Slider Bearing for Non-contact Magnetic Recording*. Transactions of the ASME, 97-2, 250, 1975.

[3] A. Burgdorfer. *The Influence of the Molecular Mean Free Path on the Performance Hydrodynamic Gas Lubricated Bearings*. Transactions of the ASME, 91, 94, 1959.

[4] Stardent Computer Inc., *AVS 3 Reference Manual*, Vol 1, 2, 3.

network. These parameters are sent to lower modules as field data.

***Solving module***

This module calculates: the flying form in steady state, the pressure distribution on the lubricating surface, the frequency domains dynamic characteristics, and the transient response motion. When the calculations toggle, the module generates the calculation grid according to the dimension data sent from the upper module and starts a calculation. We use the Divergence-Formulation routine most frequently because the calculations load is rather light compared to other methods. We can obtain the transient response using an FDM routine ("the factored implicit scheme" by J. White et al. [1] ), but it is too time consuming to use interactively in our Titan 750 system. In certain cases, some modules need to be executed remotely on larger scale supercomputers.

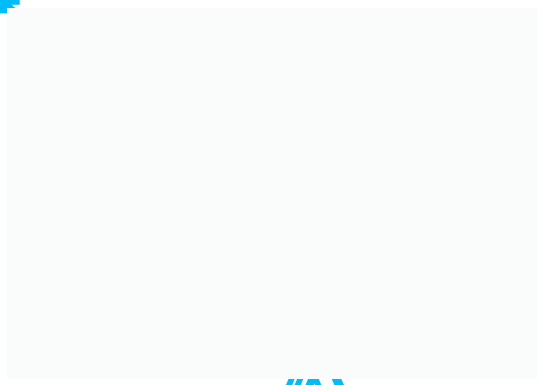

*Figure 3*



*Figure 4*

***Post-processing modules and results***

We visualize: the pressure distribution, the profile of the slider itself (according to dimension data), the stream lines of lubricating flow, and the transient animated methods. The pressure distributions can be presented as a 3D color contoured geometry (Figure 3) using the **fld to mesh** module and colored fringes (Figure 4) using a newly developed module. A slider profile module is also developed. It has the dimensions parameter as the "Required" input and the flying form data (height, pitch angle, roll angle) as the "Optional" input. This module generates 3D geometries according to these data and we can see them with the **Render Geometry** module. Another module was developed for the animated motions of the transient response. It is a coroutine module which reads the transient data file and sends it to lower modules step by step. The animated motion can be presented by connecting the output to the slider profile module. The stream lines can be generated with the **stream lines** module (Figure 5).

The graph viewer is useful to analyze the frequency domain dynamic characteristics (Figure 6). It is not preferable that the axis is always reset at every input. It is always required to correct the axis.

**Example Network**

An example network is shown in Figure 7. The dimensions are set in the **slider data** module and sent to the flying form calculating routine (the **slider form2** module). At each iteration step, the flying form data is sent to the **slider to geom** module, which shows the slider profile according to each data (this appears on the screen as an animation). After convergence, the steady state pressure distribution data is written to the designated file, and the dummy data is sent to the **pres field** module in order to trigger it. The triggered **pres field** module reads the file and sends it to modules which rewrite the pressure (fringed) distribution.

# An Interactive Design Tool for the Magnetic Head Bearing Slider

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In this paper, a network is introduced which realizes the interactive design environment of the magnetic head air bearing slider in hard disk drive systems. The network includes all the processes of numerical design: pre-processing, solving, and post processing. The pre-processing module generates dimensions of a design target which is determined by dials (or other operating apparati available in the AVS GUI) operated by the user. These dimensions are sent to the solving module, where calculations are expected by a calculation toggle on the module. After the calculation, results are automatically sent to the post processing modules in the steady state simulations. For transient simulations, results are output to files for later animation.

Using this network, we can see results immediately after model modifications, without any file translation or system changes. This environment makes such modification-after-modification operations quick and easy.

## Introduction

Recording density of a hard disk drive system largely depends upon flying height of the magnetic head air bearing slider. A decrease of flying height increases the density. However, it also increases the possibility of the head crashing against the recording disk. To maintain reliability, we need to analyze the flying characteristics of the head slider.

We can predict the characteristics numerically with the compressible viscous air flow equation. In our system, it cal be solved by three different methods: a finite element method (FEM), a finite difference method (FDM), and a Divergence-Formulation method. The divergence-Formulation method is a kind of control-volume method which constructs equations considering the continuity of flow in each small cell.

## Interactive Design AVS-Network

To realize an interactive environment on AVS, a network which possesses all of the processes needed in our numerical design is developed.

### *Pre-Processing module*

Typical dimensions of a head slider are shown in Figure 1. Ten parameters can be selected in this version. Each value is set with dials or other apparati available in the AVS GUI. Figure 2 show apparati used in the

*Figure 1*

*Figure 2*

## Contents

AVS Network News Update..... 2

An Interactive Design Tool for the
Magnetic Head Bearing Slider..... 3-5

User Group Update.....6-7

SIGGRAPH '92..... 7

WAIS and AVS.....8

AVS '92 - A Review.....8-9

Obtaining Modules..... 10

International AVS Center Module Highlights..... 11-13

What's New?.....13

Development of a VHF/UHF Broadcasting
Planning and Visualization System on the Basis
of AVS.....14-17

Animating Time Dependent 3D Data Using AVS..... 18-19

Module Submission Criteria.....19

The AVS to Video Connection..... 20

**AVS Network News**

The International AVS Center serves as a catylyst for expanding the AVS user base. It increases the productivity of users by fostering discipline-specific module development and new uses for AVS. Located at the North Carolina Supercomputing Center, the worldwide clearinghouse collects, ports, and distributes user-contributed, public domain modules and acts as liaison between users and vendors.

**AVS Network News** is the Center's quarterly magazine and newsletter serving users and vendors with updates on AVS programs and their use, user's articles, editorial viewpoints, and product information postings from vendors and independent software developers. For an annual subscription, send a $12 check or money order (plus $10 if out of USA), payable to the International AVS Center, to the address shown below.

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# AVS Network News Update

There are several changes being made to the AVS Network News. A newletter version with two colors and in standard newletter format will be distributed to AVS Users and the AVS Vendors for distribution in the field three times per year. A high end glossy will be distributed to the AVS Vendors only once a year in conjunction with the AVS Conference. The cost of distributing the high end glossy to 5 or 10 thousand individuals was prohibitive at this stage of development. As soon as the user base is sufficiently large and advertising is a viable option, we will resume our current method of sending out the high end glossy to everyone each quarter. Future contributers of articles will need to submit both color and black and white slides with their articles. This method will allow the AVS Vendors to purchase larger quantities and make the newsletter available to many more users each quarter as well as allowing us to provide this service to our AVS users.