Created:August 3, 1993
Modified:June 24, 1994

Gemini Controls Group Report

Visual Scientific Development and Control Environments

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Choosing visual programming and control environments.

1.0 Disclaimer

This report may compare products from different vendors and may contain a specific decision to purchase that may be based on this comparison. The evaluation contained in this report is related only to the specific needs and requirements of Gemini, and should not be construed to apply to the needs and requirements related to any other application.

The contents of this report should in no way be viewed either as an endorsement by Gemini for a particular vendor's product or as Gemini's opinion that other vendor's products are unsuitable for any application.

Gemini makes this report available in the spirit of keeping its user community informed of the background behind its decisions. It urges this community to make decisions based on its own requirements.

2.0 Purpose

The Gemini 8-m telescopes have a hierarchical control system. At the heart of this hierarchy is the Observatory Control System (OCS). The OCS provides the connectivity between the various subsystems that control the functionality of the telescope system and the telescope users. As such, it serves several purposes:

1. **User interaction**

- to provide observers access to the features of the telescope in a manner suitable for developing and running science programs,
- to provide operators access to the telescope control subsystems, and
- to provide maintenance access to the telescope

2. **Telescope control**

- to provide the mechanisms for connecting and distributing tasks within the control system
- to provide an environment for sequencing through control operations in as automatic manner as is feasible

Closely tied with all of these purposes is the need to provide appropriate user interfaces for each operation.

The Gemini telescopes are to use a visual environment that provides a simple to learn visual programming language for development, testing, and operation within the OCS. Furthermore, to reduce both development and lifecycle costs, the Gemini Project intends to use as much commercial software as is reasonable.

3.0 AVS and Khoros

There are any number of visual data analysis systems available, from a wide variety of sources. Most of these provide little more (and often less) capability than can be found in existing astronomical data analysis tools. In any event, the need for the OCS is considerably more extensive than data analysis alone. There must be support for high-level process control, visual programming, distributed and remote processing, and support tools for development within that environment.

Given these constraints, there are two major commercial systems: AVS and Khoros. Both are widely used, reasonably priced, commercially supported, and available on a wide variety of platforms. Other systems were missing one or more of the above traits.

Both AVS and Khoros were evaluated. As part of this, Internet news and mail were used to query existing users of both systems.

4.0 And the winner is...

After examining both products, the Gemini Project is proposing to use the Khoros system for use in the OCS. Some of the principal reasons for this selection are:

- *Functionality*: AVS can be characterized as a visual programming system with a 3D emphasis. Khoros is a more general software development environment with an information processing emphasis. Khoros includes a GUI builder (different concept than the front-panel idea of AVS), code generators, source configuration management, etc. as part of an integrated environment.

- *Support*: The support for Khoros is quite good with strong free help available via Internet supplementing commercial support.
- *Process control*: Khoros (version 2.0, specifically) provides better support for high-level process control.
- *Flexibility*: There are several aspects of this. First, because it is a more general system, Khoros addresses a wider problem domain than AVS. Second, because the source code to Khoros is freely available, it is possible to adapt Khoros to custom requirements, if necessary. Third, the design of Khoros as a complete software development system (with source configuration management, etc) is useful when developing new applications and modules under Khoros.
- *Licensing*: The licensing structure for Khoros was judged more convenient and affordable than for AVS. In particular, the requirements for distributed processing capability add to the cost of AVS without affecting the cost of Khoros.

The following table summarizes the comparisons:

TABLE 1. Comparison of AVS and Khoros

	System	1	2	3	4	5
Functionality	*AVS*		o			
	Khoros				o	
Support	*AVS*			o		
	Khoros					o
Process Control	*AVS*	o				
	Khoros		o			
Flexibility	*AVS*		o			
	Khoros				o	
Licensing	*AVS*				o	
	Khoros					o

It should be pointed out that this evaluation is based on the need for a complete development and operational environment, not just on the visualization requirements found in a typical observatory environment.

5.0 Conclusion

AVS has strong points, with better 3D support and a more sophisticated visual programming language being two of them. Nevertheless, it is felt that Khoros provides more of the general features needed within the OCS.

AVS is not a competitor with Khoros for the Gemini Requirements. Although AVS is a valid alternative to PV-Wave, the Gemini Project has already selected PV-Wave for those applications.