INSTALLING A COPY OF THE
ARPA/DMA IMAGE UNDERSTANDING TESTBED AT THE
U. S. ARMY ENGINEER TOPOGRAPHIC LABORATORIES

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Covering the Period 30 July 1982 to 30 June 1985

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By: Andrew J. Hanson, Senior Computer Scientist
        Project Leader
        (415) 859-4395

        Artificial Intelligence Center
        Computer Science and Technology Division

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Director
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1400 Wilson Boulevard
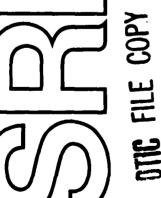Arlington, Virginia 22209

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ACKNOWLEDGMENTS

SUMMARY

The principal objective of this effort was to establish a functional copy of the SRI Image Understanding (IU) Testbed system of hardware and software at the U. S. Army Engineer Topographic Laboratories (ETL) Research Institute at Fort Belvoir, Virginia. Representative tasks included advising on the preparation of the ETL site for the Testbed system installation, purchasing the required hardware for installation at ETL, and arranging for availability of Testbed software systems. Other major tasks included supplementary hardware acquisition, installing Testbed software systems, and developing support software to enhance the overall capabilities of the system. We also assisted in establishing the ETL site as a node on the DDN ARPANET/MILNET network. Final tasks included installation of Lisp Machine software and associated consultation, as well as other general assistance and troubleshooting. The main beneficial results of this effort were the establishment at ETL of a state-of-the-art research facility and the transfer to ETL of a large body of research technology carried out by SRI, as well as by other contributors to the DARPA Image Understanding research program. This project has provided essential elements of the foundation required to support the mission of the newly formed ETL Center for Artificial Intelligence. *Additional keywords:*

Image processing; Technology transfer.

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I   OVERVIEW

A.   Background

For many years, DARPA has been a primary sponsor of basic research
in computer vision, including a broad program in Image Understanding
(IU), the goal of which was to explore fundamental computer vision
techniques applicable to image-interpretation tasks.   To provide a
framework for evaluating and demonstrating some of these capabilities,
DARPA and DMA jointly supported the establishment at SRI of the Image
Understanding Testbed facility.   The Testbed has served as a major
vehicle for demonstrating, testing, and evaluating the applicability of
IU research results to automated cartography.   Many software packages
were contributed to the Testbed by participants in the DARPA IU research
program; these systems were adapted to the SRI environment and numerous
additional utilities were generated at SRI specifically for the Testbed.
These efforts have resulted in an environment that allows the transfer
of research technology to other sites for evaluation.

The principal objective of the effort reported here was to
establish a functional copy of the SRI Image Understanding Testbed
system of hardware and software at the U. S. Army Engineer Topographic
Laboratories (ETL) Research Institute at Fort Belvoir, Virginia, and
thus carry out such a transfer of technology. The acquisition of a
Testbed copy significantly improves the capabilities of ETL for
evaluating and adapting Testbed software and Testbed environment
features to specific problem areas.   ETL personnel are now able to work
directly with contributed IU research software and to study the
implications of employing such techniques for cartographic tasks.   In
addition, the close association of ETL with the cartographic-production
branches of DMA enables them to cooperate closely in analyzing the
application and user interface requirements that are representative of
DMA's needs.

In October of 1983, a little more than a year after this project
was initiated, the ETL Center for Artificial Intelligence (CAI) was
created. Projects currently in progress at the ETL CAI that are based
on the IU Testbed environment include the following:

* Analysis of change detection in aerial photography

* Estimation of three-dimensional motion parameters

* Battlefield planning

* Terrain simulation.

The IU Testbed system established by this contract forms the essential core computational facility supporting the current work of the ETL Center for Artificial Intelligence.

B. Task Summary

The basic tasks of this project included advising on the preparation of the ETL site for the Testbed system installation, purchasing the required hardware and arranging for its installation at ETL, and arranging for availability of Testbed software systems. Subsequent major tasks included additional hardware acquisition, installation and testing, installing Testbed software systems, and developing support software to expand the overall capabilities of the system. We also assisted in establishing the ETL system as a node on the DDN ARPANET/MILNET network, as well as providing consultation, staff training, and other general assistance and troubleshooting. The final portion of this work concentrated heavily on issues involved in establishing the Lisp Machine environment at ETL as a natural extension of the Image Understanding Testbed.

As a result of this effort, a large body of research technology carried out by SRI and numerous other contributors to the DARPA Image Understanding research program has been transferred to ETL. The IU Testbed environment provides the the necessary advanced hardware and software facilities enabling the ETL Center for Artificial Intelligence to proceed with its own independent research and evaluation programs.

II   PROGRESS

A.   Project Accomplishments

The principal objective of this contract was to help establish a copy of the DARPA/DMA Image Understanding Testbed system at the U.S. Army Engineer Topographic Laboratories (ETL) in Fort Belvoir, Virginia. Among the tasks carried out to accomplish this goal were the following:

* Advise ETL personnel on the prerequisites for installation of a Testbed system.

* Select, purchase, and verify delivery of appropriate Testbed system hardware.

* Arrange for availability of software to be obtained from outside sources.

* Install and furnish advice on maintenance of software components constituting the Image Understanding Testbed system itself.

* Develop additional support software consistent with extension of the capabilities of the ETL Testbed.

* Assist ETL personnel by providing advice and consultation concerning the Lisp Machine systems installed at ETL.

* Assist in the development and acquisition of software exploiting features of the Lisp Machine environment.

A particular goal of the final phase of the project was to help ETL evolve towards using the Lisp Machine environment as a logical extension of the original VAX-based Testbed system that was in place at SRI at the beginning of the project; a large portion of the SRI vision research work has now shifted to the Lisp Machine environment.

We have continued our efforts throughout this project to enhance the capabilities of the ETL Testbed system and to advise the ETL staff on a variety of issues. Many site visits have been carried out to achieve the project goals. Typical tasks on these site visits included the following:

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* Checking out site preparation and hardware installation.

* Installing and updating the IU Testbed software libraries.

* Assisting in converting VAX Testbed software when changes were madein the operating system

* Conducting training sessions for the ETL staff.

* Advising ETL administrators on management issues.

* Assisting with issues concerning utilization of Lisp Machines in the ETL Testbed environment.

* Demonstrating new software systems.

B. Equipment Obtained

The following items of equipment were purchased and installed in the course of the project:

* VAX 11/780 computer system

* Grinnell GMR-275 image processing system

* 19" color monitor, 15" monochrome monitor, three 12" monochrome monitors

* Versatec V-80 printer/plotter and stand

* Six Datamedia computer terminals

* Optronics C-4100 color film scanner

* Large-capacity disk drive system

* Digitizing tablet with SRI mouse-function PROM

* Optical mouse pointing device

* Four modems

* Ten text terminals

* Teletype multiplexing system to support the additional terminals and modems

* Supplementary disk storage capacity for image data bases.

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In addition, several Symbolics Lisp Machines and color graphics systems were obtained by ETL (using internal ETL resources) during the course of this project. The resulting total system has therefore become nearly identical to the extended IU Testbed system, including Lisp Machines, used for IU research at SRI.

The following one-year service contracts, acquired at the beginning of the project, were subseequently turned over directly to ETL for continuation:

* VAX 11/780 system hardware maintenance

* VAX 11/780 system software maintenance

* Versatec V-80 hardware maintanence.

III   CONCLUSION

In the course of this project, SRI has undertaken and completed a significant technology transfer task. We have established at ETL a state-of-the-art network of computer systems equivalent in capabilities to the systems used for current Artificial Intelligence and Image Understanding research at SRI. We have also obtained, improved, revised, written, and provided consultation concerning a vast library of software methods and techniques connected with the DARPA/DMA Image Understanding Research Program, and have installed these systems at ETL. As a result of this effort, the members of the ETL Center for Artificial Intelligence possess all the technology necessary for them to evaluate and experiment with current IU research concepts, as well as to engage in their own related research projects.