Digital Recording of the Condition of *América Tropical*, a Mural by David Alfaro Siqueiros

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Abstract

The Getty Conservation Institute, in collaboration with El Pueblo Historic Park in Los Angeles, is carrying out the conservation of David Alfaro Siqueiros' mural, América Tropical, in downtown Los Angeles. The mural, painted in 1932, is located on an exterior second story wall of the Italian Hall on Olvera Street, El Pueblo Historic Park, in downtown Los Angeles and measures 5.4 meters high by 24 meters wide. It depicts a crucified Indian figure on a double cross, surmounted by the American eagle, with guerrero figures pointing guns at the eagle, in a tropical landscape with pre-Columbian ruins. At the time the content was considered politically controversial and the mural was whitewashed and left exposed to the elements for several decades. Since the 1970's, there has been an interest in the mural's preservation, and it is now protected by a temporary shelter. However, due to long neglect, overpainting, and the damages of time, today the mural is a faded image of the past and presents an appearance similar to that of a wall painting in an archaeological context.

The project consists of the documentation and treatment of the mural, the construction of a protective shelter and an exhibit devoted to the artist's life and work. Since the GCI's involvement, preliminary scientific study of the mural was carried out in 1988, and in 1990 a first phase of conservation treatment took place. In 1993, a digital image capture was done by Eric Lange, then a Fellow in the GCI's Documentation Program. His work consisted of a precise digital image capture system which could then be manipulated for a number of computerized documentation purposes.

In Spring of 1997, GCI conservators conducted a condition survey of the mural in preparation for the construction of the shelter, viewing platform and prior to the final conservation. A customized AutoCAD menu was developed, which allowed the conservators to examine the mural and enter data directly into laptop computers on site using a mosaiced digital image of the mural as a base for graphic documentation. The menu customization was based on previous work done at the Istituto Centrale per il Restauro in Rome. This system facilitated data entry and enabled conservators unfamiliar with the use of AutoCAD to enter condition data. Direct "in situ" data entry ensured control of the process by the conservators and eliminated the long, expensive and error prone process of copying manually produced, condition information into digital form by staff not working on site.

The condition survey provided a baseline record of the condition of the mural and recorded previous conservation treatments. This paper will present the use of the customized AutoCAD program for condition recording and the potential for this type of system in archaeological applications.

Introduction

In the early nineteen thirties the Mexican muralist David Alfaro Siqueiros was living in Los Angeles and teaching at Chouinard, a Los Angeles art school. While teaching in Los Angeles he was commissioned to paint a mural, depicting tropical America, on the second story wall of the Italian Hall, a building at the corner of what was then Macy and Main Streets, in the heart of downtown Los Angeles.

The mural he painted depicts the ruins of a Precolumbian temple, with a central figure of a crucified Indian figure on a double cross. In the upper East corner, two guerrero figures are shown, aiming rifles at the American Eagle, which sits above the central figure.

When the mural was completed, the content was found to be controversial and even threatening to Depression era Los Angeles and the mural was painted over. First, the East and West sections of the mural, which were visible from Olvera Street and Main Street respectively, were whitewashed, and finally, the central section was covered as well.

The mural was then largely forgotten for many years until the 1970's, with the rise of the Chicano movement. A new awareness of the mural and concern for its preservation led to the erection of a temporary protective shelter and the initiation of several conservation efforts.

Since 1988, the Getty Conservation Institute has been involved in the project for the conservation of the mural. The project consists of scientific study, documentation, treatment to the mural, the construction of a protective shelter, and an exhibit of Siqueiros's life and work. Preliminary scientific study of the mural was carried out in 1988, focusing on a materials analysis of the paint and plaster. In 1990, a first phase of conservation treatment, led by Agustín Espinosa, a GCI consultant and wall paintings conservator from Mexico, took place. This treatment included the stabilization of the mural, reattachment of loose plaster, cleaning, and surface consolidation.

At that time, Nancy Kaye, GCI consultant, conducted photodocumentation, which consisted of recording the mural section by section, as well as recording the conservation activities. A complete set of 35mm slides is stored in the GCI Visual Resources Management archives.

When it was determined that a permanent shelter and viewing platform should be erected to protect and display the mural, completion of the conservation was postponed until the shelter was constructed. Over the past six years, plans for the protective shelter have been drawn up and revised, and the buildings in El Pueblo Historic Park have been retrofitted for seismic stabilization. Some damage to the mural occurred, due to the earthquake of January 1994, and other damage resulted from construction work on the building. Presently, plans for a revised protective shelter have been finalized and approved.

In 1994, Eric Lange, a Research Fellow in the Documentation Program at the GCI, used the mural as a test case for a research project, involving the uses of in situ digital documentation. A scaffolding and rail system was developed, and the mural was photographed using a Hasselblad 6cmx6cm camera with a Leaf System™ digital back. The mural was imaged in one meter sections, at very high resolution, and each section was mosaiced together to form a color image of the entire mural. The composite color image is approximately 150 Megabytes. The mosaiced digital image produced from this work was used as the photographic base for the 1997 condition survey.

After the digital imaging of the mural was completed, the condition reporting phase of the project began. A team of GCI conservators comprised of Leslie Rainer, Angelyn Bass and Irene Sen, made a plan for a thorough condition report on the mural, working closely with Gaetano Palumbo and Mitchell Hearns Bishop. Giancarlo Buzzanca of the Istituto Centrale per il Restauro in Rome joined the team and designed customized AutoCAD™ menus for condition reporting of the mural, work he had done extensively at the ICR. We used raster images as backgrounds for image annotation in AutoCAD with Hitachi V/Image Plus™ helper software. As a result, we produced a customized menu for the condition report that managed both AutoCAD and Hitachi V/Image Plus, in a manner that provided an easy to use interface. In planning the condition reporting and designing the system, the team was confronted with some basic issues which are discussed here.

Aims and Philosophy of Conservation Documentation

What are the aims of documentation? Ideally, documentation of baseline data ought to produce an accurate depiction of the work of art, artifact, archaeological site or building in its present condition. This is done to the highest accuracy possible, given financial constraints and time available. The intention is to leave a record of the condition before any intervention takes place. This leaves a record that can be compared to the future condition of the object. For better or for worse, conservation interventions usually alter the object which is conserved. Therefore, there is an ethical obligation to carry out documentation before intervention. This baseline documentation, however, can be used for a number of diagnostic purposes, as well as analysis and presentation. While conventional documentation can be used for diagnostic purposes and can reveal causal relationships of deterioration processes, the ability of digital systems is much greater, as will be explained later.

Why Digital?

A digital method was favored over traditional manual recording for a number of reasons: reports digitally generated can be viewed and printed at different scales, and the whole site can be displayed at once, versus manual reports, usually done in sections, thus providing a level of visual information less easily attained with the traditional condition reports. The capability of the software makes classification and quantification of the information possible, so that, for example, a precise calculation of the amount of paint loss or of the linear extent of cracks can be obtained. There are, however, time and money constraints to take into consideration when digital condition reports are produced. These constraints mostly derive from the steep, learning curve needed to master programs such as AutoCAD. The problems were overcome by designing a customized

program, which the conservators could use with little training.

While digital recording is becoming increasingly popular for conservation documentation, there are some serious limitations in most uses of digital condition reporting.

- The condition survey is still carried out manually, and only at a later phase, often when the conservation intervention has already started, is it finally made available in digital form. This "translation" is often made with the help of a computer technician, who has never seen the site.

- If the conservator has to "translate" his/her own manual notes into an electronic format, preference is given to programs, which are very easy to use. In most cases, if the use of digital photographs is required, the software chosen is Adobe Photoshop, which allows quick raster annotations, and an adequate presentation of the site conditions. The problem with the use of this system is that the file size can become huge, since each new "layer" added to the base photograph is another raster image. Another problem is that most raster software cannot quantify the areas or linear extents of signs traced over a raster image, when this can be easily done when vectors are used, such as in the case of Computer Aided Design (CAD) or Geographical Information System (GIS) programs.

Designing the System

A model system

The ideal system, then, should allow the conservator to enter condition information directly into the computer, on site, preferably without the help of a software expert. On top of this, the software should record information in vector format, in order to minimize file size and allow various calculations to be performed; but at the same time, it should be able to display raster files (such as digital photographs) to be used as a base for the condition surveys. AutoCAD has the advantage of being software, that is used all over the world. While it is not cheap, educationally discounted versions are quite reasonable. GIS software might be preferable, given its ability to associate databases to graphical information, but it is not as widely used, and it is more expensive.

The system used

The system used in the condition recording of the Siqueiros mural consisted of two laptop computers (Dell laptops with Pentium 133 processors and 32 MB RAM) for directly inputting the information on site. The data was then transferred to a more powerful computer at the GCI for storage, back-up, and printing. The information obtained is presently stored both in an Intergraph TD-40 computer, with a Windows NT operating system, and on disks, so that data can be accessed and processed as needed.

The computers were equipped with a customized AutoCAD 13 system, with Hitachi V/Image helper software to enable raster / vector visualization, with push button menus defining layers and symbols for the recording. The mosaiced digital image of the mural, produced by E. Lange in 1994, was used as the photographic base, over which the conditions were mapped.

Standards

A persistent problem in graphic documentation, produced manually or digitally, has been the absence of widely accepted standards. In this project, the NorMaL 1/88[1] conservation standards were adapted for use.

Consideration was also given to a consistent way to name separate layers in the CAD drawings. Standard naming for CAD layers is well defined in the areas of architecture and construction and in a number of related fields. These standards define a convention for naming the layers of data in AutoCAD files. An example would be one name for a layer, showing biological damage, and another for cracks. We identified discrete areas of reporting, for each layer, and devised standard names. Similar conventions are observed in GIS applications, but little has been done to codify these standards in the world of conservation. As digital documentation becomes increasingly used in the conservation world, the need for standards in this area becomes critical.

Graphic legend

A graphic legend for the condition survey, one of the primary components of the menu customization, was developed by the team. It was based on different colored and patterned symbols, using the NorMaL protocols and other examples of condition reporting legends, for documenting wall paintings on other GCI projects. Symbols from these different systems were combined to express the specific conditions of the Siqueiros mural, found on the plaster and paint layers to describe techniques of execution, previous interventions, and state of conservation.

The menus

Once these parameters were established, a test system was designed. A series of menus, in AutoCAD release 13, was customized to allow conservators unfamiliar with CAD to carry out the condition survey with minimal training. This was accomplished through the use of "push-buttons", with combination of symbols and text, which guide the operator through various points of condition reporting, while all complex sequences of commands are performed by macros, hidden in the menus. This was done by creating a series of Auto LISP routines, that were associated with icons and menus. This is commonly done in specialized manufacturing and other areas that use AutoCAD heavily. The customization created an environment, where a relatively complex sequence of commands could then be performed, at the touch of a button.

Grid system

To document the mural systematically, a grid system was used. The grid was digitally laid over the computer and then

[1] The NorMaL (Normative Manifatti Lapidei) standard, produced by the ICR were intended for use with stone material

physically laid over the mural. It was laid out in thirty-three sections: eleven across the length and three high. The bottom and middle rows were made up of 2m x 2m sections, while the uppermost row measured 1.45 meters high. The grid enabled the team to reference sections on site with the computer image. These were referenced as rows A, B, and C (top to bottom) and columns 1-11, west to east, across the mural.

Using the System

The software and essential files were loaded on two laptops, which were operated on site by the conservators. The computer and documentation experts worked on site with the conservators, until they were comfortable with the system.

The only operations, which were needed back at the GCI, were the merging of the two files and the daily back-up. In spite of the fact that conservators were using trackballs, rather than a mouse or a digitizing tablet, members of the team were satisfied with the system, and completed the condition reporting in less time than they had planned.

Results of the System

The system allowed the team to produce conventional graphic documentation, in the form of a photographic base and mylar overlays, mapping the conditions recorded. Conditions recorded in the condition survey included: *techniques of execution, previous interventions,* and *state of conservation. Techniques of execution* documented physical evidence remaining of the techniques and materials used by Siqueiros in the creation of the mural. *Previous interventions* documented earlier conservation work, and the seismic retrofitting of the Italian Hall, as it related to the mural. *State of conservation* documented cracks, voids behind the surface, the condition of the remaining paint, and other surface damage. This will serve as a baseline description of the mural's condition for future monitoring.

In addition, the digital record of the mural produced can be added to in the future, when final conservation treatment and long-term monitoring has been carried out. Construction work of a permanent shelter poses a potential threat to the mural and this information can be used to monitor any damage caused during this period, as well as being useful for long-term monitoring.

Evaluation of the System

Problems were encountered during the experiment, but they can all be solved.

The first problem was the difficulty of using trackballs to draw: following the condition survey, a pen computer was found with sufficient Hard disk and RAM capacity to be able to run the program and handle the files, making the recording process closer to manual drawing.

Other problems were encountered in the slow performance of the machines used. In this case too, faster processors and more RAM could result in improved performance.

The screen resolution, 640x480 pixels, was also poor for the needs of the work, but, as before, this is a problem that can be solved by using more powerful machines.

The same can be said for the use of an add-on software, such as V/Image. While the behavior of the software was satisfactory, there were circumstances in which the computer "froze", without apparent reason. After completing the condition survey, a new release of V/Image was published, with different commands. However, the new release of AutoCAD, release 14, now has enhanced raster display capabilities. Buzzanca has updated the system to run on this release without helper software, for treatment documentation, which is the next phase of the project.

Conclusions

The use of laptop computers on site with the AutoCAD system, using a digitally produced photographic background facilitated recording for the conservators. By directly entering the information into the computer, eliminating the step of translating hand prepared graphics to digital files, a greater degree of accuracy and efficiency was achieved. This reduced the possibility of error in recording.

The digital image, produced by E. Lange, allowed the conservators to more accurately record conditions, than over a line drawing, which, because of the mural's deteriorated condition would have been an approximation, at best. Furthermore, the high quality of the digital image made it possible to zoom into details where necessary, and visualize the whole mural, for general conditions. The end presentation of the graphic documentation is of high quality, and is becoming the standard in producing condition reports.

The minor difficulties, encountered in adapting the software, were outweighed by the advantages in using it. Problems with printing and adaptation of vector/raster information have already been solved with updated computer programs. The one problem with the hardware was that of a track ball, which affected the quality of the drawing. This may be eliminated by using pen computers. Future work by the documentation team will include the testing of pen-based computers and new software versions, as they are made available.

The results of the condition survey provide useful information on *América Tropical,* which can be used as the base for treatment planning and long-term monitoring of the mural. As a test of using computers for direct digital recording on site, condition survey proved to be successful, and provides conservators with another tool to use in the field.

The combined use of raster display and vector drawing is an effective method for the recording of condition surveys, especially if this is performed with the use of customized menus, which can simplify the work of the conservator and minimize the chances of error. Vector drawings have small file size, can be printed at precise scales, and can be used as a diagnostic tool, more efficiently than simple raster annotations. Vector drawings can also be exported into a GIS program. GIS has more powerful capabilities than CAD. While CAD programs are excellent for measuring and calculating linear features and areas, they have a limited

capability in linking attributes to these features. GIS software, not only is able to assign attributes and link databases to graphic features, but it is also able to find and calculate relationships between features, that are not immediately apparent. While, for example, a query such as, "find the percentage of areas with moisture, where there is also biological growth", is very difficult to answer using CAD, in a GIS environment, this is routine, to the point that more sophisticated queries can be introduced, in which time is a component, and even the prediction of phenomena, which *may* happen on the basis of observed trends (such as in a query like "show me the evolution of biological growth in areas with moisture, and those areas, were this phenomenon is likely to occur within a year"). In this case, however, the data entered has to be as precise as possible, and it should derive from regular monitoring activities at the site, to increase the effectiveness of such predictive modeling.

In further experimental work, it will be useful to test such models in the implementation of a fully integrated electronic documentation system, where all of the information concerning the site is stored. By taking full advantage of the capabilities of GIS, the condition survey can be taken a step further, to identify statistically significant relationships between recorded conditions. At that point, the use of computers, for recording the conditions of cultural property, will accomplish the objective of providing precision and rapidity of use, together with diagnostic applications.

List of Figures in CD-ROM.

Figure 1. Black and white image of the mural.
Figure 2. Graphic legend.
Figure 3. Screen shot of condition reporting menus.
Figure 4. Angelyn Bass and Irene Sen entering data into a laptop computer on site.