

VOLUME 4 ISSUE 4

LIDAR

MAY/JUNE 2014

news

SERPENT MOUNDS



ALL-IN-ONE MOBILE

Video logging, asset inventory
& survey-grade map generation

HELI-SURVEYING

Specially designed belly-pod
houses a range of sensors

PHOTOGRAMMETRY

Computing power and UAS aid
photogrammetric renaissance



Imaging Technology Comes to Emerging Economy

Mexican university's surveying department develops national education standards, gains acceptance of scanning

The state of Nuevo León in northeastern Mexico is where technological progress and the preservation of historic architecture meet, if we are to judge by the recent imaging of a historic museum building with a high-speed laser scanner.

Starting in January 2013, the Civil Engineering Institute's Department of

Surveying at the University of Nuevo León scanned the exterior of the Regional Museum of the Bishopric—previously a palace for the bishop of the state of Nuevo León. Originally built by order of the Franciscan Bishop Fray Rafael Jose Verger in 1787, it was converted into a history museum in 1956. By the end of the year, the department

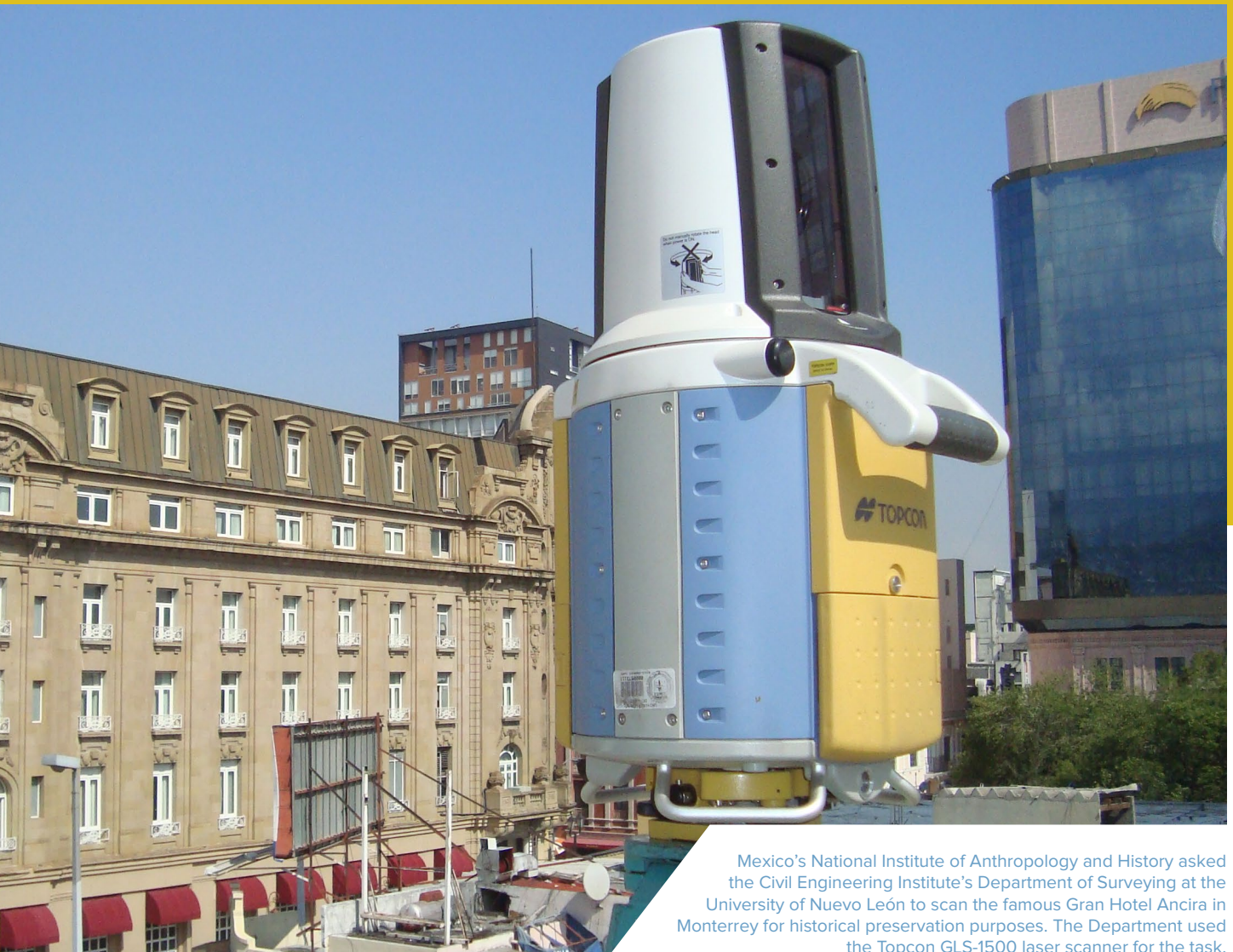
was expected to scan the interior of the building, according to Angel Ervey Martínez, the department chair.

In addition to its educational mission, the department provides land and construction surveying services to governments and the private sector. In this case, the department is scanning every minute design detail of the building for the Nuevo

University of Nuevo León Civil Engineering Institute Department of Surveying



BY DON TALEND



Mexico's National Institute of Anthropology and History asked the Civil Engineering Institute's Department of Surveying at the University of Nuevo León to scan the famous Gran Hotel Ancira in Monterrey for historical preservation purposes. The Department used the Topcon GLS-1500 laser scanner for the task.

León coordination center for Mexico's National Institute of Anthropology and History (INAH). Among other programs, INAH oversees the implementation and monitoring of a Disaster Prevention Program in the Field of Cultural Heritage. Preserving records of structures such as the museum for future reproduction in the event of a disaster that causes damage or a collapse is a critical task.

Currently, the INAH has an "encyclopedia" of historic structures in Mexico containing photographs and blueprints, but not a digital GIS database incorporating structural and cosmetic changes over the years that can be updated easily. "We're telling them

that they could collect and generate this pre-model information to make a database of all of the historical buildings to preserve their information," Martínez said. "If it is needed, you have the data and, for reconstruction, you can access the data if needed."

Demo for laser scanning

This kind of project was a perfect fit for [Topcon's GLS-1500](#) laser scanner, which the Surveying Department has owned since 2010. The scanner collects 30,000 points per second at a range of 150 meters.

Martínez and a multidisciplinary team of engineers and technicians from the department gave the museum director a

presentation on how the scanner works. "We scanned this museum to show them how the technology works and give them a demonstration of what they can do with the technology," Martínez said.

Over five days, the team scanned all four sides of the building, shooting nearly 14 million points. Using a [Sokkia GRX1 GNSS](#) receiver, the team set 15 control points and linked them to the vertical datum established by the state so that all of the data will tie into the same elevation for historical purposes. The points also were linked into a four-sided polygon before the instrument was tied to a backsight point, the control points were entered, and the scanning process began.



University initiatives to impact Mexico's economic development

The Civil Engineering Institute's Department of Surveying at the University of Nuevo León in Monterrey, Mexico is undertaking two convergent initiatives that will make a critical impact on the country's economic development in the years to come.

Students pursuing a master's degree in science or a master's degree in engineering have always had surveying courses available as electives. But by fall 2013, Angel Ervey Martínez, who chairs the Department of Surveying, expected to finalize a national surveying certification curriculum after two years of development work. Once the certification curriculum is in place, the department will use it as a basis for its own graduate-level geomatics degree curriculum.

Martínez said that he expects the national certification program to be overseen by Conocer (The Know, National Council for Standardization and Certification of Labor Skills), which promotes the development of a competency-based management model in order to increase economic competitiveness and high productivity throughout the country. Conocer is a joint division of the Secretariat of Labor and Social Welfare, and Secretariat of Public Education.

By fall 2013, Martínez expected to hear about the status of three standards—total station operation, data transfer from a total station to a computer using data modeling software, and mechanical leveling—from Conocer. By then, 15 students were expected to have completed total station operation studies.

"The idea is that there are many people who are doing surveying and they can come to the university and get a certificate in working surveying skills," Martínez said. "The idea is to tell them that they can sustain the skills they know and confirm them."

One of several historic structures that the University of Nuevo León's Civil Engineering Institute's Department of Surveying scanned with the Topcon GLS-1500 laser scanner for historic preservation is the interior and exterior of the Regional Museum of the Bishopric.

University of Nuevo León Civil Engineering Institute Department of Surveying

The team was able to scan at a distance of 450 meters. The GLS-1500 is engineered with a robust cylindrical design that helps stabilize the instrument in harsh conditions and aids registration. But the museum's high elevation overlooking Monterrey—and accompanying high winds—challenged the scanning team. The wind and the mere fact that the scanner had to be moved from time to time led to a fair amount of

leveling and recalibrating throughout the process, Martínez recalled.

Still, Martínez said that attempting to survey the museum with a total station was not an option. "I would never try to imagine that," he said, adding that the team probably could have finished the task in three days, rather than the five it took, but for the wind.

Every day, the team went back to the office and downloaded the data from the



Using a Sokkia GRX1 GNSS receiver, the scanning team set 15 control points on and around the museum and linked them to the vertical datum established by the state of Nuevo León.

University of Nuevo León Civil Engineering Institute Department of Surveying

scanner to a Topcon ScanMaster software file. The data exchange used an SD card that was pulled out of the scanner and inserted into a computer. Any points that were not needed for the point cloud were manually deleted. The points from a given day's work were overlaid onto the previous day's scan and if they did not align, the area was rescanned.

The point clouds were exported from ScanMaster files and saved to MicroSurvey CAD files, where they are stored. Ultimately, Martínez said, the

The University of Nuevo León Civil Engineering Institute Department of Surveying scanned another major structure in Monterrey using the Topcon GLS-1500 laser scanner: University Stadium. The team also used Sokkia GRX1 GNSS receivers to set control points.

University of Nuevo León Civil Engineering Institute Department of Surveying



Scanning projects display technological potential

In addition to providing a recordkeeping service for Mexico's National Institute of Anthropology and History (INAH) and the university, the Civil Engineering Institute's Department of Surveying at the University of Nuevo León is trying to demonstrate the robust surveying potential of high-speed laser scanning to owners of historic structures. The Regional Museum of the Bishopric in Monterrey is just one of several structures that the department has scanned with a Topcon GLS-1500 high-speed laser scanner for these purposes.

Three other structures recently have been scanned so that their architectural records can be preserved amid any future alterations.

- In October 2012, the INAH had the department scan the Gran Hotel Ancira in Monterrey, aka the "Million Dollar Hotel," which was built in 1912. The founder of the building, Don Fernando Ancira, commissioned its construction to a Parisian architect, who designed the interior and exterior with neo-classical detail. Such detail necessitated historic preservation of some kind and comparing the benefits of a 3D point cloud to a hard copy record is like comparing the benefits of a typewriter to those of a word processor.
- Built in 1967, University Stadium in Monterrey is the venue for the University of Nuevo León soccer teams' matches and for concerts and major sporting events such as the 1986 FIFA World Cup soccer tournament. Plans are to expand the stadium and the department scanned the interior and exterior in September 2012. Plans are for the department to also scan the tunnels, according to Angel Ervey Martínez, department chair.
- The façade of the School of Civil Engineering at the university is adorned with a "Homage to Nezahualcōyotl" mural designed by Mexican artist Federico Cantú in 1962. The mural shows some wear and some pieces have been lost, so the department scanned it to provide for repairs, its first use of the GLS-1500. Nezahualcōyotl (1402-1472) is a revered wise man and architect who designed important public works such as palaces, gardens and aqueducts in Mexico and Ciudad Nezahualcōyotl near Mexico City is named after him.

department will develop a virtual 3D model with the exact dimensions of the building and architectural detailing of both its interior and exterior. The interior of the museum, which features a dome, promised to pose a major scanning challenge, Martínez noted.

Preserving maintenance archives

Martínez pointed out that archiving 3D models of historic structures in Mexico will allow the owners to preserve the integrity of the structures, even when

maintenance is needed. Even before any work is done on a structure, “You can do a lot of work in your database, with the model,” he said. “The main idea we’re trying to let them know about is that a technology exists that can be used to preserve the building and make some rehabilitations. You can do a lot of things with the point cloud.”

In late February 2013 the Mexican *Milenio* newspaper published an article about the museum scanning project. The department also presented a paper titled “LIDAR Land Surveying Projects” at the International Civil Engineering Congress in Monterrey in November 2012 and has also developed a video showing

the scanner in action to pique viewers’ interest: <http://tinyurl.com/m99oxn9>.

These publicity vehicles have given Martínez and his team credibility and with it the confidence that the scanning technology they use will be accepted by those who were previously unfamiliar with it, according to Martínez. “Right now, our presentations are very simple; they explain how the technology works,” he said. “The more people accept it, the more work we can get with this kind of technology.” ■

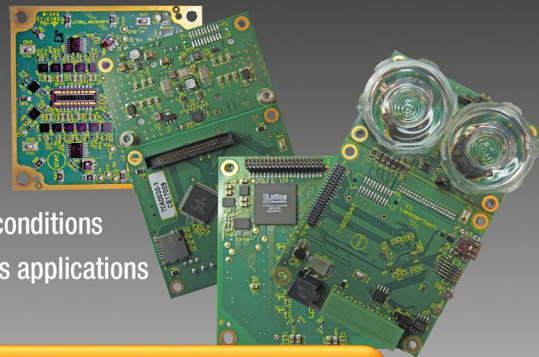
Don Talend, Write Results Inc., West Dundee, Illinois, USA, is a content producer specializing in covering civil engineering, construction and geospatial topics.

The power to create. Your way.

Leddar™

A UNIQUE LED-BASED DETECTION AND RANGING TECHNOLOGY

- Long detection range
- Best cost/performance ratio
- Rapid, accurate measurements
- Lateral discrimination abilities
- Robustness of detection under harshest environmental conditions
- Modules available for fast and easy integration in various applications



TRY IT NOW!
Get Your Evaluation Kit Online for Only \$299!

Go ahead. Test the power of Leddar™ and start innovating.

www.leddartech.com

Patented Technology