

UTILITIES

Preserving the beauty of historical monuments: Getac K120 rugged tablet used for 3D scanning and modeling of Lugang Mazu Temple, preserving its valuable cultural assets

Taiwan's Lugang Mazu Temple has over 400 years of history. The temple was first recognized as a level three monument in 1985 by Taiwan's Ministry of the Interior. Its status was upgraded again in 2019 when the Ministry of Culture designated it as a national monument and began digitally preserving the temple's cultural assets.

The Bureau of Cultural Heritage, Ministry of Culture, contracted LeaderTek to conduct the complete 3D scanning and modeling of Lugang Mazu Temple per the pilot project on the systematic digital preservation of cultural heritage. LeaderTek chose to use the Getac K120 rugged tablet for its field data computation needs. The tablet allowed the team to faithfully capture the temple, preserving time-honored craftsmanship and artistic values.

/ Challenges /

When using a 3D laser scanner to scan and model historical monuments, the scanner must be paired with a mobile computer running 3D point cloud processing software to receive, store, and compute the scanned data in real-time. However, three major drawbacks of consumer-grade laptops heavily impacted field productivity. First, commercial laptops tend to overheat after approximately two hours of use and then need to be shut down to cool off before they can function again.

Second, the low brightness of regular laptop screens makes it impossible to examine the scanning results in the field due to the overpowering brightness of the sun. This means the review process must occur separately, resulting in more hours needed to finish the project. Third, the short battery life of commercial laptops hinders overall productivity when scanning outdoors, as there aren't always charging places available.

/ Solutions /

LeaderTek used the Getac K120 rugged tablet with its 3D laser scanner and 3D point cloud processing software to create an excellent 3D scanning and modeling platform for the digital preservation of cultural heritage. The Getac K120 comes with the latest generation of Intel Core series processors and Wi-Fi technology, capable of receiving the large amount of data generated by the 3D laser scanner in real-time while running 3D point cloud software to compute the scanned data without slowing down or overheating.

The integrated Intel® Iris® Xe graphics card can also perfectly render every detail of the digital model while maintaining low levels of power draw. Getac's patented LumiBond® 2.0 full high definition (FHD) screen makes it easy to see the scanned images even while outdoors under direct sunlight. Meanwhile, the rich assortment of hardware and software security options means none of the 3D model data of these invaluable national monuments falls into the wrong hands.

The Getac K120 is certified to meet military-grade standards and has a wide selection of accessories to enhance mobility and convenience, delivering excellent usability in every scanning environment.

/ Advantages /

The Bureau of Cultural Heritage, Ministry of Culture of Taiwan successfully finished the digital preservation project of Lugang Mazu Temple through using this 3D scanning and modeling platform. The generated 3D models of the monuments and artifacts will contribute to future restoration and maintenance efforts. This data can also be used in remote learning, virtual exhibitions, and other value-added activities.

The exceptional communication capabilities, patented screen design, and high-performing yet long-lasting computation power of the Getac K120 allowed LeaderTek to smoothly conduct scanning and modeling operations even under the bright outdoor sun without having to move indoors to view the scanned data.

Yao Liang-Chu, manager, LeaderTek, said, "With the help of 3D laser scanners and the Getac K120, we were able to efficiently and steadily complete the digital archiving of cultural artifacts so that the beauty of Taiwan's historical monuments could be passed on to future generations."

/ Testimony /

"The Getac K120 is the perfect outdoors computing platform that can dramatically improve the efficiency of on-site 3D modeling with its long battery life and high-performance computing capabilities. We can now view the scanning results in the field while working for long periods. In the past, we could only scan 20 locations a day with commercial laptops. But, with the Getac K120, the number of locations we can scan per day has increased to 70, which is a 250% increase in efficiency."

LeaderTek manager Yao Liang-Chu



Getac K120
Fully Rugged Tablet

/ Challenges /

Initially constructed in 1591 during the late Ming Dynasty, Lugang Mazu Temple is the only temple in Taiwan to enshrine the Mazu goddess from the founding Mazu Temple in Meizhou. The wood and stone carvings and paintings are all done by famous artists, making it one of the most representative Mazu temples in Taiwan.

Faithful believers constantly visit the temple. Yet, despite the temple's status as a national monument, various buildings and artifacts of the temple are still frequently used. The stone and wood carvings and paintings within the temple have been gradually damaged by frequent use, old age, and the recent dramatic climate change. For example, the Phoenix Palanquin, which was used to transport the goddess Mazu during her pilgrimages, has suffered significant structural integrity damage after nearly a century of use. Situations like this make digital modeling critical to preserving the accurate appearance of historic buildings and artifacts.

Chen Chun-Yu, assistant researcher at the Institute of Cultural Heritage Preservation Research Center, Bureau of Cultural Heritage, Ministry of Culture of

Taiwan, said, "Taiwan's subtropical climate tends to make architectural, cultural assets and monuments more prone to damage due to natural disasters or artificial factors. Therefore, we seek to combine digital scanning and archiving with the existing national cultural assets database to establish a cultural asset technology protection platform to preserve valuable cultural assets."

The temple's architecture is exquisitely detailed both inside and out, so scanning and modeling with a high point cloud density 3D laser scanner was the most optimal choice. Such operations require a mobile computer paired with the scanner to receive, store, and compute the scanned data.

LeaderTek, the company in charge of the modeling task, pairs consumer-grade laptops with its 3D scanners. However, these laptops had to be shut down after two hours of operation to cool down, resulting in poor work efficiency. In addition, the consumer-grade laptop screen was not bright enough, making it impossible to view the screen clearly when outdoors. This meant the team had to revise the scanned images of the day separately after fieldwork was completed, resulting in longer work hours.

At the same time, the laptops needed to be recharged regularly to maintain the ample battery capacity required to provide high-speed computation. However, the scanning process, which involved constant movement within the temple, often made it difficult to recharge, affecting overall work efficiency.

Yao Liang-Chu, manager, LeaderTek, said, "Besides computing and storage, the ability to view images outdoors is important for digital modeling work. The limited performance of commercial laptops restricted our field productivity. Therefore, we had to find a device that was mobile, rugged, and capable of stable operation even while subjected to extended, high-intensity computation demands."

/ Solutions /

To improve the efficiency of its 3D modeling work on historical monuments, LeaderTek chose to pair its 3D laser scanner and 3D point cloud processing software with the Getac K120 rugged tablet.

The Getac K120 supports the latest Wi-Fi 6 technology for smooth connectivity to receive a



/ Testimony /

"Taiwan is constantly under the onslaught of natural disasters, making the digital preservation of monuments even more urgent. LeaderTek used the Getac rugged tablet in combination with 3D laser scanners to complete the digital modeling of Lugang Mazu Temple. The digital model can be used as a reference in future monument maintenance operations so that details can be accurately restored."

Assistant researcher, Institute of Cultural Heritage Preservation Research Center, Bureau of Cultural Heritage, Ministry of Culture of Taiwan Chen Chun-Yu



large amount of data from the 3D laser scanner on-site in real-time. The latest-generation Intel® Core™ series processor allows the 3D point cloud software to perform intensive data computation in the field while supporting many scans simultaneously without slowing down or overheating.

The Getac K120 is also equipped with an Intel® Iris® X® graphics card, which provides excellent graphics quality to perfectly render every detail of the digital models. Its ultra-low power consumption significantly reduces battery consumption for extended operation in outdoor environments where power is not easily accessible.

Lugang Mazu Temple is in the bright and sunny regions of southern Taiwan. The Getac K120 comes equipped with a 12.5-inch full high definition (FHD) display featuring 1,200 nits of brightness and LumiBond® 2.0 technology, allowing Getac's operators to see the screen and operate the device even when scanning outdoors under direct sunlight. In addition, the tablet supports both capacitive touch and stylus control, further enhancing outdoor usability.

The Getac K120 is also prepared to deal with the heightened IT security demands in response to emerging threats. Getac K120 users can choose from many hardware and software security options such as radio frequency identification (RFID) reader, smart card reader, fingerprint scanner, TPM 2.0, and Windows Hello facial recognition, etc., to effectively secure national monuments modeling data and avoid leaks. Furthermore, the Getac K120 is equipped with a self-disassembling solid state drive (SSD) and WPA3-Enterprise encryption, applying another layer of data security.

The Getac K120 is housed in a robust and fully rugged design that is IP66-certified and meets military-grade MIL-STD 810H standards. It can withstand dramatic ambient temperature changes and sustain drops of up to 1.8 meters in height while powered on. The waterproof, dustproof,

and corrosion-resistant features allow the Getac K120 to endure the challenges of harsh climates. Users can choose from various operating modes and accessories to enhance operational convenience according to their needs.

Yao Liang-Chu said, "The digital modeling process of Lugang Mazu Temple required not only long work hours and diverse field environments, but also had high real-time communication and computing demands. The Getac K120, with its high performance, low power consumption, and rugged design, has greatly enhanced our on-site work efficiency."

/ Benefits /

The artifacts and architecture of Lugang Mazu Temple have a long history. They are easily damaged by artificial or natural disasters due to Taiwan's subtropical climate. Archiving monuments and artifacts through digital modeling will help with future restoration and maintenance efforts and contribute to remote learning, virtual exhibitions, and other value-added activities.

Most of the scanning work of Lugang Mazu Temple was conducted outdoors. The Getac K120's excellent communication capabilities allowed it to maintain a high-bandwidth connection with LeaderTek's 3D laser scanners receive point cloud data continuously via Wi-Fi. The specially designed screen displayed the scanned images even under direct sunlight, letting the operator view and control the computer on-site via touch screen.

The Getac K120 has a long battery life and high-performance computing capabilities. It will not shut down due to the high heat caused by constant high-speed computing and can continuously operate for more than six hours so that work can continue even when access to power is limited. In addition, the military-grade ruggedness and IP66 waterproof/dustproof design

ensure efficient working conditions in open-air environments or dusty indoor spaces. Accessories such as shoulder straps, hand straps, and hand handles greatly enhanced mobility. This contributed to the successful completion of the scanning and the extensive documentation of the Lugang Mazu Temple, which is filled with historical and cultural significance and captured for generations to come.

/ About LeaderTek /

LeaderTek Co., Ltd. was founded in 2002. The company is the only professional vendor in Taiwan that has applied 3D laser technology to preserve the architecture of monuments digitally. Besides creating scanned floor plans and monitoring for deformations in historical monuments, the company also monitors tunnels, bridges, factories, and reservoirs. LeaderTek works with universities and colleges in Taiwan every year. The company has successfully transformed some of its R&D results into practical technologies used by governments and private enterprises and has won multiple accolades from Taiwanese institutions.

