Intergraph Technology Enables KKC to Develop True Ortho Technique

THE CHALLENGE:

Kokusai Kogyo Co., Ltd. (KKC) applies surveying and mapping technologies to urban planning, social research, environmental monitoring, and more. As the owner and operator of numerous aerial mapping platforms, KKC maintains cutting-edge acquisition technology and serves as a reseller of satellite imagery in Japan. Government clients contract KKC to provide 3D datasets and orthoimagery of Japan's densely crowded cities.

Some roads in Japan are smaller than alleys in most other nations – less than four meters in width – and snake between the tall buildings in its most crowded urban centers. Such small thoroughfares pose obstacles to traffic flow and are dangerous to the population in the event of a major disaster, making downtown evacuation and rescue efforts difficult in streets that are already clogged with vehicles and people.

Prefecture governments would like these roads mapped and inventoried so they can be better managed, but in aerial photography, these small lanes are often obscured by tall buildings or the road surfaces are lost in the shadow of surrounding buildings. Remotely sensed imagery suffers from geometric errors that are associated with the sensor orientation, topographic relief displacement, and curvature of the earth. Digital orthorectification processes seek to remove these distortions, but one distortion, known as building lean, has been particularly difficult to correct – even with digital techniques.

Tall buildings and other vertical structures appear to lean away from the center of the scene. The leaning and displacement become more extreme in features farther from the center of the frame. The reason for this is that the imaging platform was located directly over the center of the scene during acquisition, which means that objects away from this focal point were actually imaged at a slight angle.

THE PROJECT OBJECTIVES:

- Create a practical method of creating true orthos for nearly the same cost as traditional orthoimages
- Remove distortion of building lean

PROFILE:

Name – Kokusai Kogyo Co. Ltd., Japan

Web site – www.kkc.co.jp/english/

Headquartered in Tokyo, Kokusai Kogyo Co. (KKC) is a major Japanese engineering consulting firm with 64 domestic offices and several overseas branches. KKC was founded in 1947 and has built a solid reputation as a multidisciplinary firm offering innovative solutions in a variety of industries, especially those requiring the use of surveying and geospatial information technologies.

Size – KKC has 64 domestic offices and several overseas branches

KEY BENEFITS:

- In the first six months of operation, KKC collected more than 12,000 images in 40 projects with the DMC
- The distortion of building lean was eliminated
- Operation of the DMC costs less than half that of film-based camera missions

PRODUCTS USED/SERVICES PROVIDED:

- Z/I Imaging® DMC® (Digital Mapping Camera)
- ImageStation® OrthoPro

THE SOLUTION:

In recent years, photogrammetrists have developed true orthorectification processes that rely on the acquisition or extraction of accurate elevation data sets for the urban terrain, meaning that precise X, Y, and Z coordinates for the bottoms and tops of buildings and other vertical structures are included. The result is an image in which the roof of every building is perfectly aligned with its foundation as if the imaging sensor were directly over every point in the scene when the image was captured.

For specific applications such as urban mapping, KKC previously created true orthos by applying advanced processing techniques to obtain the necessary high-quality building elevation model, and perform the pixel-by-pixel rectification. The process costs 10 to 20 times more than ordinary orthorectification. Due to this high cost, KKC often only applied true orthorectification techniques to those portions of an image where the tall buildings reside or where the client wants detailed road information.

KKC looked to Intergraph's technology and purchased the Z/I Imaging® DMC® (Digital Mapping Camera) to streamline its processes. The decision was not driven specifically by the need to generate true orthos, rather, KKC considered the DMC an ideal fit with its objective of staying at the forefront of mapping and survey technologies. The firm realized that a digital camera would reduce the turnaround time of mapping projects because of the elimination of film processing and scanning. Since the camera purchase, KKC has confirmed that operation of the DMC costs less than half that of film-based camera missions.

In the first six months of operation, KKC collected more than 12,000 images in 40 projects with the DMC. KKC realized immediately that the camera had the potential for revolutionizing the generation of inexpensive true orthos.

For standard operation, the recommended scene overlap during image acquisition is 60 percent front-to-back and 30 percent side-to-side. KKC experimented with increased overlaps in scenes, finally settling on 80 percent for both. KKC then uploaded the data directly into Z/I Imaging's ImageStation® OrthoPro software, a fully digital processing system. The increased overlap in scenes provided the orthorectification software with views of every feature point from multiple angles. This allowed the software to extract accurate digital elevation models for ground features as well as vertical structures, a key element in true ortho processing.

With those two highly accurate data sets available, the ImageStation OrthoPro software performed the pixel-by-pixel analysis and processing necessary for generation of true orthos. No special software was required, and the only added time consumed by the process is the extra flight time needed to collect the overlaps. The result was true orthos in which every building and elevated structure was located in its proper position and orientation. Building lean had been eliminated.

KKC and its customers are extremely pleased with the quality and cost effectiveness of the true orthos and all other images produced to date with the DMC. Extensive operational use of the true orthos has confirmed their usefulness in urban mapping applications. Specifically, those narrow roads can now be imaged and mapped from aircraft, regardless of the heights of buildings surrounding them.

For more information, visit www.intergraph.com.

ABOUT INTERGRAPH

Intergraph Corporation (NASDAQ: INGR) is the leading global provider of spatial information management (SIM) software. Security organizations, businesses and governments in more than 60 countries rely on the company's spatial technology and services to make better and faster operational decisions. Intergraph's customers organize vast amounts of complex data into understandable visual representations, creating intelligent maps, managing assets, building and operating better plants and ships, and protecting critical infrastructure and millions of people around the world.