Large volume production of DTM at Kampsax India using PhotoMod - Issues and next steps

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Synopsis

Kampsax India (P) Limited with its head office at Gurgaon close to Indira Gandhi International Airport of New Delhi has been set up in order to provide clients with in-depth expertise in mapping & GIS capabilities. The company is promoted by KX A/S, one of the leading international mapping & GIS company founded in 1917 (now part of COWI group) and IL&FS Infrastructure Development Corporation Ltd, and Industrial Fund For Developing Countries, Denmark. An ISO 9001 company, Kampsax India (P) Limited is a Government of India approved Export Oriented Unit since 1994. Company has established India's biggest digital photogrammetric mapping and GIS production facility at Gurgaon catering to international clients across the globe. The Company has produced digital map & GIS for Denmark, Sweden, Ireland, Elsalvedor, Great Britain etc and established a brand image for quality and accuracy in the international market for digital mapping, photogrammetry, remote sensing & GIS. The Company has been selected for the biggest digital mapping contract relating to Ordnance Survey – Great Britain as an associate of KX A/S A/S, Denmark. The entire production is planned at Kampsax India. The work relates to mapping of UK.

In recent years, many technological advances have been made in the field of Photogrammetry, the process of making maps using photographs. Perhaps the most significant achievement has been the refinement of methods to produce digital orthophotographs. Digital Orthophotos are scaled aerial photographs, which can be used as a base map in a GIS or as a tool to revise digital line graphs and topographic maps. The procedure used to create digital Orthophoto, called ortho-rectification, requires aerial photographs and a **digital terrain model (DTM)** as inputs.

Traditionally, Kampsax India has been using Leica software for large scale production of DTM for their clients abroad. Recently, use of PHOTOMOD has been made on selective basis for Large Scale DTM production. The production process used has two major components i.e. BLOCK and VECTOR MAPPING & UPDATE each comprising a large number of subprocesses.
The BLOCK process includes

- Aerial photography
- Provision of ground control points
- Scanning of aerial photography
- Aero-triangulation
- Production of DTM
- Production of orthophotos

The VECTOR MAPPING & UPDATE process includes

- Positional accuracy improvement of the 1:2500/1:1250 digital mapping units (DMU or 1 km²)
- Update of old data based on aerial photography and field revision

Project Requirements:
DTM blocks of 5*5 km with overlap of 30%.

Accuracy Requirement:
Not more than 1 metre i.e. "the maximum departure between the plane defined by three neighbouring points in the TIN and the terrain surface as defined in the stereomodel must not exceed 1 meter."

As the turn around time for the project is very less the production capacity had to be increased within short time. Photomod had advantages over other DPW's

Advantages of PhotoMod Software

- Low cost
- Simple and minimum accessories required
- Facility to generate highly accurate DTM automatically for a single model
- Tools for DTM editing like, filtering bad points
- More flexible options for each region, while generating automatic terrain model
- The interface to convert the orientation parameter of Socet Set (sup file) to photomod epipolar images for DTM and Stereodraw have already been developed.

We receive the support files (.SUP) from our aero triangulation and directly used these orientation parameter files for 3-D visualization and automatic DTM generation, it was unwise to reorient the model in PhotoMod which required at least 30-45 minutes for orientation of every single model. All the orientation parameters on Socet Set platform were available and the only thing required was to convert the parameters in such a way that, it can be used in PhotoMod for Epi-polar image creation for 3-D visualization, feature extraction DTM editing.

The interface has worked mainly on the input parameters from support files and the images along with specified formats, which is supported by the PhotoMod system. This interface processes the images with the help of the algorithm developed by Kampsax/Racurs in such a way that it creates output Epi-polar images, which is supported by the PhotoMod.

The procedure followed in Kampsax India through PhotoMod software ver 3.11:

- Automatic DTM generated for single model using DTM module of PhotoMod ver 3.11
- Editing of mass points wherever required using PhotoMod editing tools
- Breaklines were captured using PhotoMod StereoDraw module

Breaklines *define and control surface behaviour in terms of smoothness and continuity. As their name implies, breaklines are linear features. They have a significant effect in terms of describing surface behaviour when incorporated in a*

surface model such as a triangulated irregular network (TIN). Breaklines can describe and enforce a change in the behaviour of the surface.

- Both of the points and the breaklines are exported to ASCII and then merged. All the models containing the 5*5 KM block (Approx 45 models) are merged into a single file.
- The ASCII file is then imported to LH Socet Set for final Quality Checks and delivery in the clients required format.

ISSUES (PhotoMod ver 3.11)

- We were not able to generate data for blocks of 5x5 Km covering about 45 models
- Breaklines were not been able to be inserted in DTM
- Editing was not possible in contours
- Software crash due to illegal memory error (System interrupts are to be properly handled)

CONCLUSION

An attempt has been made to integrate production of DTM on PhotoMod compatible with the production carried on Leica Helava systems. The production on Photomod which is based on single models had to be put in one single block and Breaklines which are captured in StereoDraw module required modifications. This caused difficulties in the absence of no tool available for inserting and editing the Breaklines as the changes to contours or TIN model was not able to be visualised. In case such a facility is made available whereby the DTM of full block can be generated and corrected. This can be a major breakthrough in achieving low cost high volume DTM production.