

# DIGITAL PHOTOGRAMMETRY IN INDIA - A NEW WAVE

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## ABSTRACT

India is a typical example amongst developing countries struggling to catch up with efficient systems of management related to planning and development. Amongst various factors which influence this effort are 200 years of British rule in India (till 1947), high illiteracy, religious and traditional diversities, political happenings and lastly global commercial pressures.

It was in the mid 1960's that Analogue Photogrammetric instruments were introduced mainly in Survey of India, the national Surveying & Mapping Organisation of India established by the British more than 235 years back. As per the policy coming down from British times, Aerial photographs of all scales even now are classified Secret/Restricted in India. However, Survey of India could effectively use Photogrammetry for mapping on 1:50,000 scale and on 1:25,000 scale. In some projects large scale mapping was also done. Department of Space and a very few other Government organizations made attempts to develop Photogrammetry. Some academic institutions also introduced Photogrammetry in some courses.

Some limited attempts were made by Government organisations to adopt Analytical Photogrammetry without much success mainly due to heavy capital costs, maintenance costs and high skills. In late 1990's, digital Photogrammetry drew attention of several organizations, as the technology became desktop, cost affordable and learning easy. Government organizations found ways to deal with restrictions and embarked upon use of digital Photogrammetry.

## DIGITAL PHOTOGRAMMETRY IN INDIA

For the first time in India, a Hyderabad based private Company got a project from Oman in Photogrammetry in the early 1990's. The client arranged for the Analytical instruments and the project was implemented. As Soft copy Photogrammetry became operational, more private companies entered the field but most of the jobs were out-sourced from other countries. This has led to growing market for the Photogrammetry SW and building skilled manpower.

A parallel development took place in the government sector. Government organizations could carry out Photogrammetric processing for government projects after obtaining necessary clearances. Private companies could set up Photogrammetric SW/HW and carry out work with their work force within the government organizations. This created new opportunities in the private sector as well as employment opportunities. Training organisations came up both in the private and government sectors to meet the training needs.

## OPERATIONALISATION OF PHOTOGRAMMETRY

The authors of this paper were instrumental in organizing training programmes and promoting digital Photogrammetry in different organisations. Professional Bodies included Photogrammetry in their conferences and workshops many promotional programmes were undertaken by government, private and academic organizations. At many centers in India, digital Photogrammetry is operational with good resources in terms of skilled manpower and SW/HW.

The authors of this paper have been associated with several Photogrammetric projects using PHOTOMOD digital Photogrammetry Software developed by RACURS Russia. A brief list of some projects is given here to give an idea of the trend in the country in private sector.

## PROJECT NO 1:

CITY BASE MAP of one of the Indian Cities.

Scale of Aerial Photography: 1: 10000 (B/W).

No. of models: 55 models covering an area of 8000 hectares.

Scale of final output was 1: 2500.

The accuracy achieved for Aerial Triangulation and block adjustment was  $\pm 20$  cm for plane height

## PROJECT NO.2 & 3:

These two projects are of other Indian cities with identical specification of Project No.1 except a change in Area and the total no. of models. This consists of an area of 10,000 hectares and 70 models.

The accuracy achieved for Aerial Triangulation and block adjustment was  $\pm 20$  cm for plane height

## PROJECT NO.4

This project was also of one of the Indian cities with identical specifications of project No. 1,2 & 3 except that this includes creation of Contours of 1-meter intervals using DTM module of PHOTOMOD Software.

## PROJECT NO.5

This project was also of one of the Indian cities with identical specifications of project No. 4. This consists of an area of 6,000 hectares covering in 45 models.

## PROJECT NO.6

IKONOS STEREO IMAGERY – 1Metre resolution

CITY BASE MAP of one of the Indian Cities with an area of 40,000 hectares.

### Tasks:

1. Absolute Orientation
2. Data compilation
3. DTM/DEM with contour interval 5 meters
4. Final output scale 1:10000
5. Accuracy Achieved - Plan  $\pm 1.2$  meters ; Height  $\pm 1.5$  meters

## INTERNATIONAL PROJECTS

### PROJECT NO.8

No. of models: 102 models covering an area of 53200 hectares.

Input: Oriented models

Terrain: Undulating and hilly with about 60% dense models

Scale of Aerial Photography: 1:25,000 (color)

Final out put Scale : 1:5,000

### PROJECT NO.9

City base map on 1:10,000 scale

No. of models: 235 models covering an area of 7,300 hectares.

Input: Oriented models

Scale of Aerial Photography: 1:10,000 (color)

Final out put Scale : 1:2,000

### PROJECT NO.10

City base map

No. of models: 116 models covering an area of 7,300 hectares.

Scale of Aerial Photography: 1:14,000 (colour)/ 1:5,000

Tasks: AT, Block adjustment and data compilation

### PROJECT NO.11

City base map on scale 1:1000

No. of models: 45 models covering an area of 1,800 hectares.

Inputs: Oriented models

Task: Data compilation

Scale of Photography 1:5000 (color)

## PROJECT NO.12

City base map

No. of models: 240

Area covered : 125000 Hectares

Scale of Photography 1:25000 (color)

Terrain: Undulating and Hilly

### Tasks:

1. Aerial Triangulation / Block adjustment
2. Data Compilation
3. DTM / DEM with 5 meter contour interval.

## PROJECT NO.13

City base map

No. of models: 39

Area covered: 19,700 Hectares

Scale of Photography 1:25000

### Tasks:

1. Aerial Triangulation / Block adjustment
2. Data Compilation
3. DTM / DEM with 5 meter contour interval.

## SCOPE IN NEXT TEN YEARS

It would be appropriate to make some observations on high-resolution satellite imagery of one and sub-metre resolution. This imagery is considered useful for updating the existing maps. In India most of the country including cities and towns do not have large-scale maps. Original surveys on scale 1:1000 demand an accuracy of 20 cm in position and height. In view of this digital Photogrammetry is the only solution.

A modest estimate is made on the basis of large-scale requirements for towns, Cadastral surveys, Irrigation projects and precision agriculture.

Field of application	Estimated amount
Cadastral surveys	3.5 Billion USD
City/Town surveys, Precision Agriculture, Irrigation, Mining, Highways, Railways & Forestry and outsourcing from other countries	1.12 Billion USD

## CONCLUSIONS

Several new factors are influencing the rapid adoption of digital Photogrammetry in India. Emergence of desk top systems, Low cost of SW, increasing demand for large scale maps, out-sourcing from other countries are some of the major factors. Huge domestic requirement of large-scale mapping is fuelling the growth of digital Photogrammetry in India.