High Resolution Imaging Applications in India

Presentation by Indian Delegation to 48th STSC-UNCOPUOS

February 17, 2011 - Vienna
• Current Constellation of High Resolution Imaging IRS Satellites
• Sample High Resolution Images
• A few Applications
  – CartoDEM
  – SIS-DP
  – Georeferencing of Cadastral Maps
  – NUIS
  – Energy
  – Infrastructure
  – Agriculture
  – Archaeology
Indian High Resolution Imaging Capability

- 22.10.2001
  TES
  Step& Stare PAN

- 17.10.2003
  RESOURCESAT-1
  LISS 3; LISS 4; AWiFS

- 05.05.2005
  CARTOSAT-1
  PAN, F/A

- 10.01.2007
  CARTOSAT-2
  PAN

  CARTOSAT-2A
  PAN

- 12.07.2010
  CARTOSAT-2B
  PAN

Aerial
Digital Camera
Laser Terrain Mapper
A few High Resolution Images
CartoDEM: National DEM from Cartosat - 1 Stereo data

- Surface model of elevation covering Indian mainland; referenced to the WGS84 ellipsoid datum
- Accuracies: 8 m Vertical & 15 m Horizontal at 90 – 95% C.I.
- > 80% of area covered

**CartoDEM applications:**
- Contour generation
- Drainage network analysis
- Quantitative analysis of run-off & soil erosion
- Volume-area calculations
- Design of hydraulic structures
- Design of new road, rail & pipeline alignments
- Watershed planning
- Urban utility planning
- Landslide zonation
- River configuration studies & flood proofing
- Fly through visualization
CartoDEM: Applications

Bangalore city, Karnataka

Mahanadi river basin

DEM

Simulated flooded area using CartoDEM

Ortho-image

actual flood inundated area in SAR data
CartoDEM and Orthoimage of a hilly terrain Rajasthan
Space based Information Support for Decentralized Planning

Use of High Resolution satellite data & ICT to support speedy and accurate planning at Panchayat level

SIS-DP Objectives
- Land & water resources information at Cadastral level
- Tools for user driven applications for speedy, accurate decision making;
- Dissemination & Capacity building

Orthorectified 1:10K co-registered image

Geo-rectified composite map with cadastral boundaries

Input spatial / attribute data from user department
- Ponds, Wells, Water harvesting
- Structure Health Centres, Educational Institutes,
- Watershed development
- Marketing yards, Power Grid, REC, Forest, Animal Husbandry, Cottage industries, Disaster Management, etc.

Overlay

Land use/Land cover Mapping – Level III
- Soil Mapping
- Land Degradation Mapping
- Groundwater Prospect Mapping
- Vegetation Cover Mapping
- Wetland Mapping
- Snow and Glaciers Mapping
- Watershed boundaries

1:10K Scale Based Rendering

Land cover / Roads / Settlement/ Slope

Cadastral Data

NR Census (available)
Towards administering Towns/Cities in a Scientific Manner

- Multi scale (10K, 2K, 1K) hierarchical Urban Geospatial database
- For supporting Urban Planning, Infrastructure development, e-governance.

NUIS: National Urban Information System

- Physiography
- Soil
- Geomorphology
- Lithology
- Urban Landuse

No. of Towns: 158
Area: 55,755 sq.km

- Metro - 13 towns
- Class I - 76 towns
- Class II - 15 towns
- Class III - 19 towns
- Class IV - 17 towns
- Class V - 6 towns
- Class VI - 12 towns
NUIS Applications

CARTOSAT-2 PAN + LISS-IV MX
HYDERABAD
Urban Morphological Mapping

1. To detect and delineate various typologies of urban structures using both normal and stereo data employing visual and digital analysis.

2. To prepare a detailed urban morphological map at large scale using orthoimage.

Building Height derived using Stereo

3-D Building model of a part of Ahmedabad City

Legend
- Red: High rise
- Green: Medium rise
- Yellow: Low rise
- Blue: 9m
- Open: Open / Vacant

Source: Carbonet-1 (1990)

HEIGHT (m)
- < 3: Low rise
- 3-9: Medium rise
- >9: High rise
Geo-Referencing of Land Records

For ‘Citizen-centric’ delivery of information & services; Information empowerment; e-governance, implementation & monitoring of developmental plans - at farm levels

- Cadastral level advisories
- Alternate Land use
- Crop insurance
- Modernization of Land Revenue Administration
Supporting NLRMP for Land Record Modernization

- Computerisation of land records
- Survey/resurvey using satellite data, aerial and ground survey
- Citizen centric services
Energy: Hydropower Site Selection

- Estimation of power potential
- Pilot study completed for Pinder Valley, Chamoli dist
- Resourcesat data for thematic mapping
- Catosat-1 stereo data for terrain analysis

Spatial Analysis

- DEM & Terrain Analysis
- Geomorphology
- Geology
- Land use/Land cover
- IRS P6 LISS IV FCC

Site Characteristics

\[ P = \nu \eta O H \]

\[ \eta \] is efficiency of the power generation system

Discharge Modeling

- Spatial Analysis
- Resourcesat data for thematic mapping
- Catosat-1 stereo data for terrain analysis
Infrastructure: Rail network realignment

For improved gradient for traversing across the terrain

- Cartosat Stereo imaging with DGPS survey could provide required solution in a cost effective and timely manner
- 3D perspectives as a tool for detailed analysis of terrain complexity

Contour from Stereo
Agriculture: Assessment of Irrigation Potential

Upper Wardha Project, Maharashtra State

Jalgaon Minor-2 of Jalgaon Distributary on Parsoda Branch Canal is incomplete

Cartosat-1 images showing the Incomplete canal and Pending canals with balance irrigation potential yet to be created
synoptic view and stereo capability helps in generating multi-tier database on resource inventory for condition assessment; conservation management planning and monitoring

Transport Network; Surface water bodies & canals; Hills & Rocky outcrops; and Agriculture

Archaeology: Management of Hampi World Heritage Site
Thank you for kind attention...