

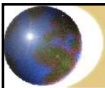
Intro to Spatial Science & Technology

Lec 1: General Introduction and Overview

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2nd Jan 2024

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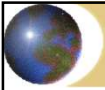


What is Location?

When do you talk/refer to it?

And Why?

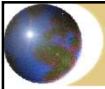
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Location or (Geo-) Spatial - Significance?

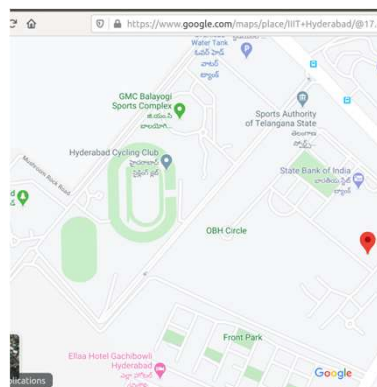
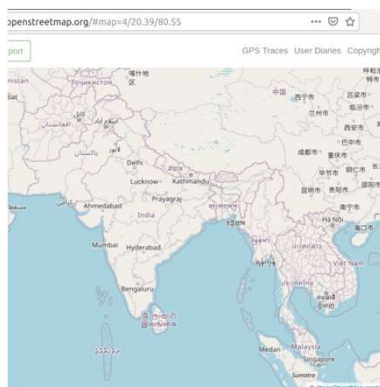
- World view – Maps, etc
- Navigation, Locational neighborhood, closeness etc
- Locating something
- Natural resources
- Governance / Management – disasters, prioritizing work, etc..
- Interactions between objects/bodies
 - Helps discover science

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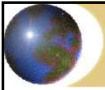


Examples of GeoSpatial Technologies

- Online Maps - Open Street Maps, Bing, Google Earth
- Devices like Car Navigation



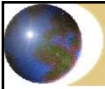
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What does location mean to you?

- Just a point in space?
- A clue for what is happening in its neighbourhood
- Help discover Larger spatial-temporal phenomena –
like Climatic, health/disease surveillance

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Geospatial Technologies

- How to handle Location – a constant or as a variable?
- Geospatial Information Systems
 - Simple Map Visualization to Web-based Map mashups
 - DB to Geo/Spatial DB; Spatial Data Mining
 - Analysis
 - Statistical to evolving field of Spatio-Statistical tools
 - BI to Geo-BI
 - Modelling and Simulation
 - Eg., Complex Climate-Social-Economic Integrated Modelling
- Remote Sensing - again, Volumes of Data to Information – a still struggling journey

– Challenges
due to
Emerging
Computing
Models; Data
collection
platforms;
New Tech

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Spatio-temporal Data

- Are all Spatio-temporal data big data?
 - Multi-dimensional
 - Large Volume
 - Unknown Parameters/Variables
 - Limited knowledge of underlying processes – Science

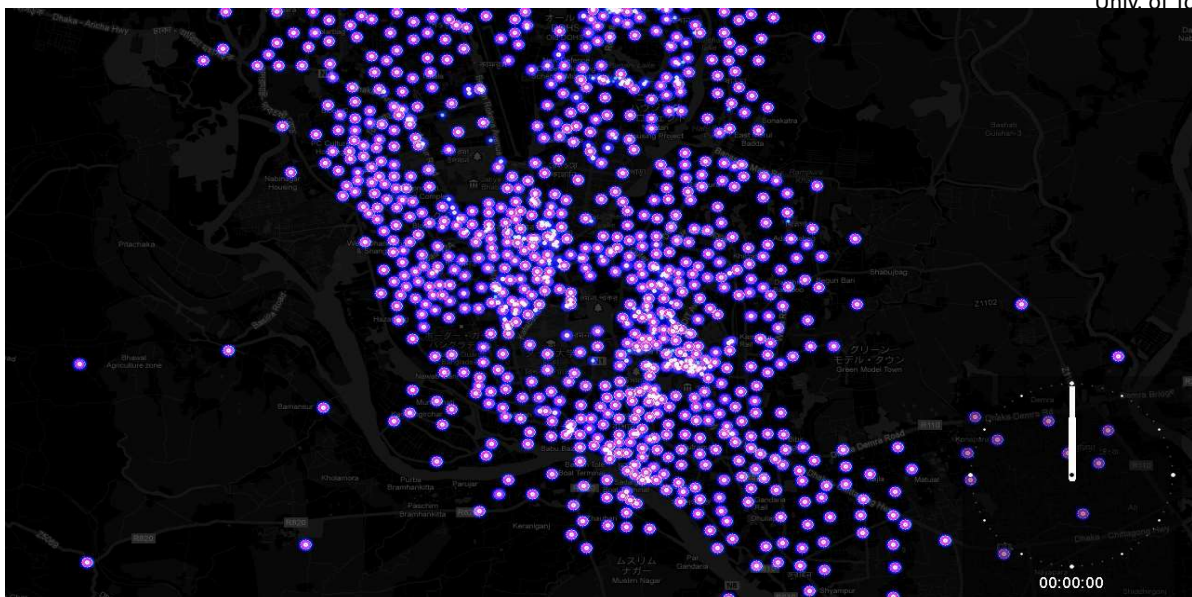
- Algorithms and Scale + Multi-disciplinarity
 - Land use and Agriculture
 - Cropping Systems
 - Meteorological phenomena
 - Climatic perturbations
 - Urbanization Patterns
 - Image Processing challenges –
 - as Spatial and Spectral resolutions improve



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IoT driven data visualization - Mobile locational data

- Mobile Data of Dhaka
 - Courtesy, Prof. Shibasaki,
Univ. of Tokyo



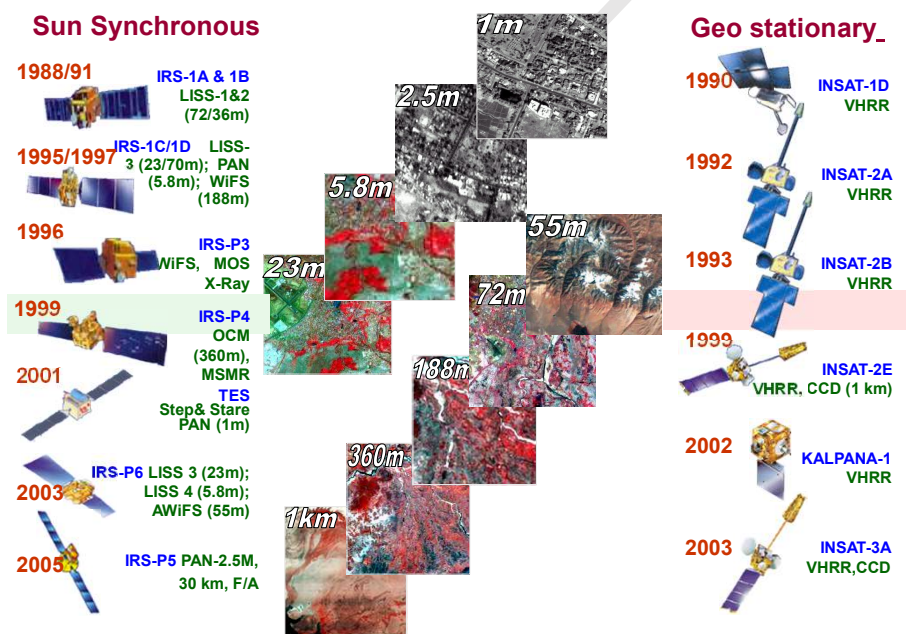
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Satellite Imagery

- Provides us with info of large regions in spectral regions not visible to human eye
- A range of applications – due to its advantages
 - Agriculture
 - Forestry
 - Urban
 - Oceanography
 - Etc
- But, till what level have these Applications dependent on RS?
 - Due to spatial resolution, spectral clarity, radiometric detail and temporal history

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India's Earth Observation Missions



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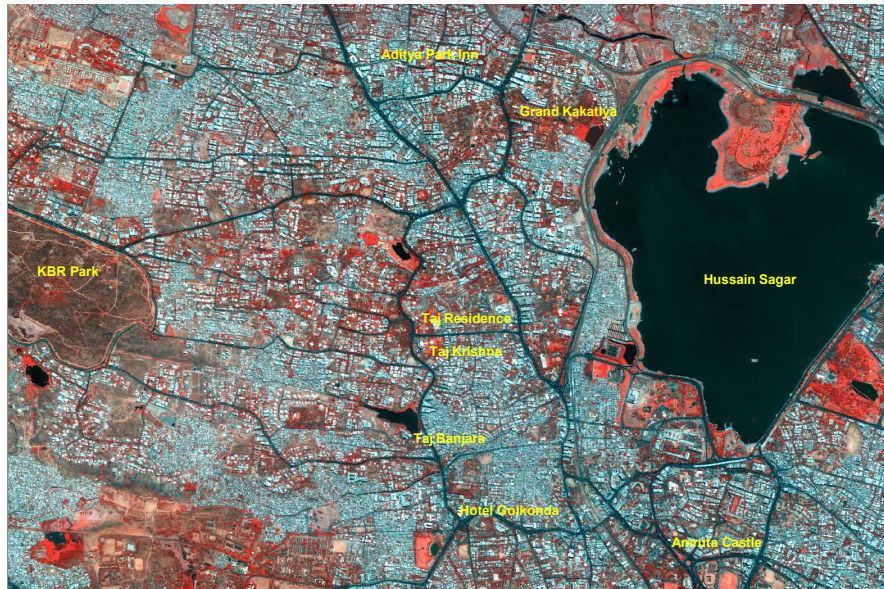
Parliament house, Rashtrapati Bhawan as seen from satellite.



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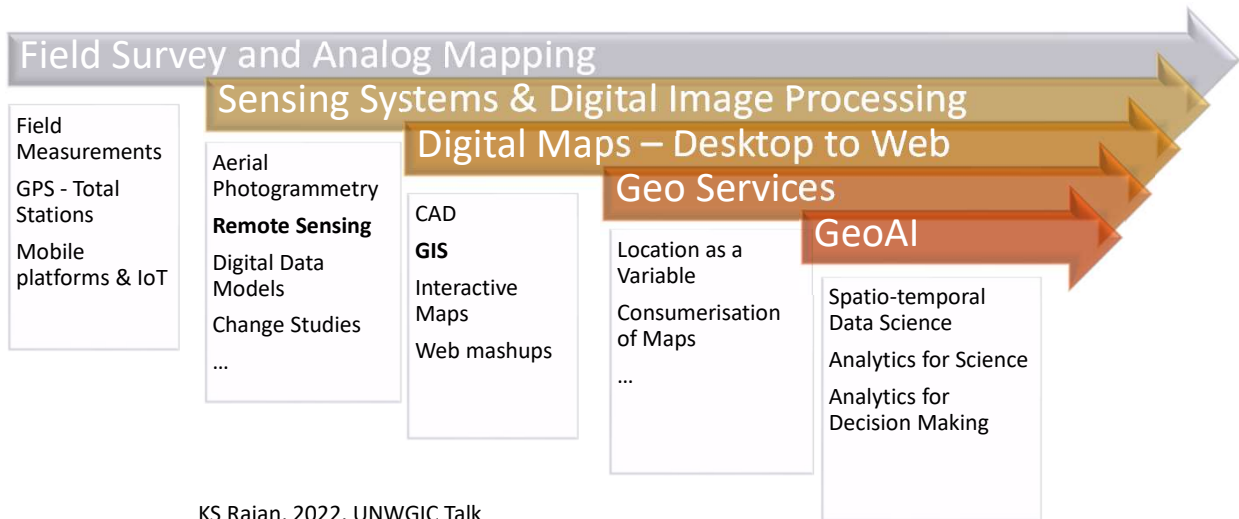
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Challenges that these pose

- How do we store and handle such volume of data
- Are current data models good enough – Preserving Spatio-temporal characteristics
- Are we interested in Trajectories or Snapshot views
- What kind of correlations with other events can be done
- Analysis
 - Point-flow analysis
 - Path based analysis
 - Aggregators for Behaviour and Pattern extraction
 - Identifying the Outliers

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Evolving world of Geospatial Technology



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Course Structure - ISSAT

- Unit-1: Characteristics of Satellite imagery
- Unit-2: Satellite data processing
- Unit-3: Case studies and challenges in satellite data processing
- Unit-4: Spatial data handling and Processing including Global Navigational Satellite Systems
- Unit-5: Spatial data analysis and its Challenges
- Unit-6: Geo-visualization and Web GIS

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ISSAT Course Grading Plan

Type of Evaluation	Weightage
Quiz (after RS content mostly)	20%
In class quizzes	10%
Final Exam (Mid Sem Dates)	40%
Course Project <ul style="list-style-type: none"> - RS data processing - Spatial Analysis - WebGIS - Interactive 	40%

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Expectations from Students

- Each student Project report
 - A topic to choose from those to be listed (some flexibility will be there)
 - Work on Satellite data handling, Image Processing and Spatial Object generation
 - Spatial data analysis
 - Analyse and Discuss on outcomes
 - Present an Online WebGIS demo

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