

IEEE GRSS and IEEE India Council collaboration on ICHack'22

September 3- 4 2022

Title:

Geo-visualization to reveal urban changes using Google Earth Pro: HSR Layout, Bangalore, 2000–2020.

About Mapathon:

Mapathon is a coordinated map making competition for creating various maps wherein the public is invited to access a particular area of map to analyze its coverage. It is a collaborative event where participants come together to develop new methods/maps that improve the accuracy and usefulness of maps for a community. This event, organized jointly by IEEE India Council, IEEE GRSS Bangalore Section, and BMSCE IEEE invites all Indian undergraduate students to develop maps from openly available geospatial datasets using Free Open-Source Software (FOSS), for example Google Earth Pro, to foster large scale usage of maps in different thematic areas. Its user-friendly resource is often a useful intermediary for learners who are interested in learning more about Geoscience and Remote Sensing field. Google Earth Pro can also be leveraged to view its extremely high-resolution satellite imagery, upload or download geospatial data in its native interoperable file format (KML), and find locations (e.g., for simple geocoding). It has indigenous capacity to customize and employ mapping to resolve societal challenges and create new opportunities. The primary objective is to understand the potential of open-source mapping and maps for Indian regions and to build capacity for the same. The participants will collectively work in a crowd sourcing method for jointly producing different classification maps of India.

Abstract:

Urbanization in India began to accelerate after independence, due to the country's adoption of a mixed economy and the development of the private sector. Employment opportunities and infrastructure facilities are a few of the important reasons for urbanization. Due to these opportunities, there is increased migration from rural areas of the country. This uncontrolled migration leads to overcrowding and a lower standard of living by residing in congested houses with improper ventilation and sanitation. Overcrowded urban areas are highly vulnerable to risks posed by man-made and natural disasters. In addition, usage of public transport facilities has been reduced after the pandemic which is increasing the traffic congestion on the roads in major cities. The lack of proper urban planning is the main reason people are unable to fully utilize the advantages of urbanization. Managing numerous factors like transportation networks, infrastructure facilities, utility systems, etc. to develop an urban area is a challenging task. The advancement of geospatial technology has been an extremely helpful tool for urban planners in the past decade. Spatial analysis and modeling, visualization is some of the few

abilities of this technology for the urban planners and decision makers for creating land use maps, modeling road networks, site selection by creating maps overlay.

Problem Statement:

Geo-visualization of urban features of Bangalore city for the years 2000 and 2020 to reveal urban changes using Google Earth Pro. (Exact study area boundary and tasks shall be shared with students during the Mapathon.)

Goals:

1. Assess the number of buildings for the years 2000 and 2020 (Point feature).
2. Assess total length of paved-road transport network for the years 2000 and 2020 (Line feature).
3. Assess the spatial extent of waterbodies for the years 2000 and 2020 (Polygon feature).

Data source & Skills:

Download and install Google Earth Pro, Basic understanding of landscape, Simple digitization (Demo)

Study area: HSR Layout Bangalore, 30Km²

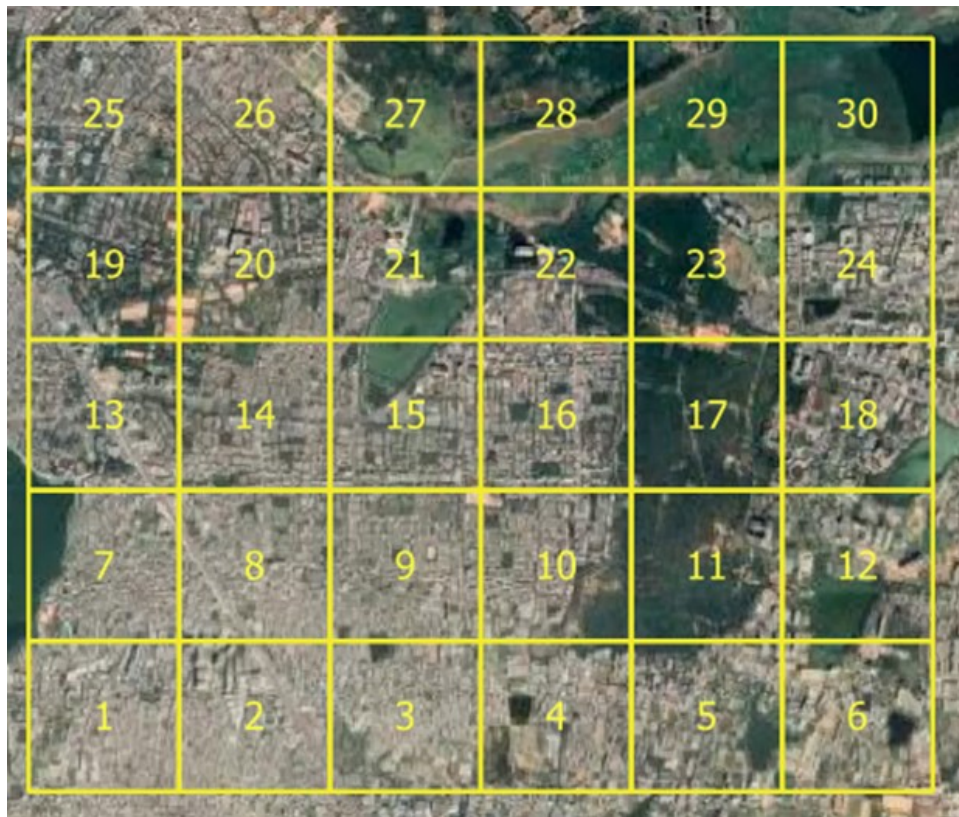


Figure 1. Location map of division of the study area into grids on Google Earth Pro for the year 2020 for the objectives 1 & 2



Figure 2. Location map of study area for objective 3 on Google Earth Pro for the year 2020.

Examples expected to be achieved because of the first and second objectives of this Mapathon?



Figure 3. Test data created for the GRID16 on Google Earth Pro for the year 2020.

Things to be submitted:

- Temporal maps of all three objectives in .kml format in all the respective years correctly named (Example: TeamNumber_buildings_2000, TeamNumber_roads_2000, TeamNumber_waterbody_2000).
- Multi-temporal thematic maps (6 Maps) in image format (Example .jpeg format)
- A document / presentation. It can contain the following details:

- o Statistical results of change detection of individual features (No. Buildings, Total length of the roads, Area statistics of waterbody) and interpret the result.
- o Potential application of these Maps and limitations.

Evaluation criterion for Mapathon:

Theme	Number of features marked correctly.	Statistics	Visual representation of a mapping	Map Interpretation	Potential application of the map
	20	20	20	20	20
Objective 1					
Objective 2					
Objective 3					

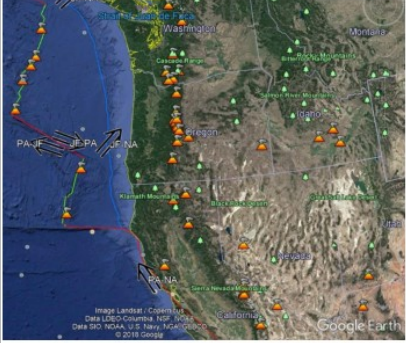

Annexure I

- **Geo visualization/geographic visualization/cartographic visualization** - a set of tools and techniques supporting the analysis of geospatial data using interactive visualization.
- **Geospatial Technology-** the range of modern tools contributing to the geographic mapping and analysis of the Earth and human societies.
- **GIS-** computer system for capturing, storing, checking, and displaying data related to positions on Earth’s surface.
- **GPS-**A system of satellites and receiving devices used to compute positions on the Earth.
- **Remote Sensing** - Acquiring information about an object without contacting it physically. Methods include aerial photography, radar, and satellite imaging.
- **Geospatial data-** Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth.
- **Grid** - Two sets of parallel lines intersecting at right angles in a plane coordinate system.
- **Grid cell** -A discretely uniform unit that represents a portion of the Earth, such as a square meter or square mile.
- **Layer** - A thematic set of spatial data described and stored in a digital database or map library.
- **Google earth** - It is a geospatial software application that displays a virtual globe, which offers the ability to analyze and capture geographical data.
- **Google Earth Pro** - It offers the most comprehensive set of publicly available geospatial data, including high-resolution imagery, 3D cityscapes, detailed road maps, panoramic imagery at street level, historical imagery.

Annexure II

They must submit a report of a maximum of 2-3 pages. Each page explains one feature which consists of two maps of 2 years and brief description about value or count of each feature, statistical analysis, and inference along with proper map legends, title, and scale.

Report format

Feature 1		<p>Map description and analysis (must include below points but not limited to)</p> <ul style="list-style-type: none"> • Values of features observed in year 2000 • Values of features observed in year 2020 • Statistical Analysis of the feature observed • Inference of the feature from the maps and its impact • Add legends to the maps (below the map)
2000	2020	
		
<p>PREPARE SIMILARLY FOR OTHER FEATURES RESPECTIVELY</p>		
<p>Team Logo</p>		<p>Team Name: RuDRA</p> <p>Topic: Transport Network Map</p> <p>Team member/lead:</p>
<p>College:</p>		<p>Email : www.data-lab.in</p>

Annexure III

Few frequently asked questions about Geospatial data visualization and its contribution to community development.

FAQ

Annexure IV

Criteria of evaluation. This explains the screening round that will happen on the second day of the event morning 8:00 am.

Criteria to enter the second day of event (from 8:30 am) - group which completes the max number of feature marking for all the features.

Productivity per person is evaluated for active participation by all team members.

Since it is a visualization event, the presentation of the final report is especially important.

The final winner will be decided based on mapping of maximum features and a well explained report.