

CENTRE FOR SPATIAL ANALYTICS AND ADVANCED GIS

“FUTURES” OF SPATIAL

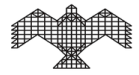
“Under the aegis of NIAS Council of Management (COM) and with support from Tata Trusts, Centre for Spatial Analytics and Advanced GIS (C-SAG) has been established. This Centre will work in the field of Spatial Analytics and advanced GIS to develop suites of Intellectual Property that will build deep and advanced capability in India”

Today, data and information play a significant role in bringing logical decision-making, intelligence and wisdom in society. In recent years, the “spatial character” of data and information is gaining prominence and greater significance.

Spatial data is generated in multitude of ways – through satellite measurements and imaging; through sensors on Unmanned Aerial Systems or aircrafts; embedded precise positioning using specialized hand-held devices; underground utilities data; indoor positions and mapping; mobile systems and Wi-Fi systems based on positions of transmitters; radio-frequency identification (RFID) using networks of fixed detectors/readers; laser

imaging matched to 3D geometry and many, many more methods.

World over, society is generating, referencing, archiving and using vast amount of spatial data sets - of citizens, vehicles and automobiles, land, agriculture and crops, soils, cities, water systems, infrastructure, aviation and advanced transportation systems, environment, disasters, weather and many others. Maps and images are used in day-to-day actions of searching points of interest, routing, districting, property assessment, taxation, deciding government spend and many other daily needs. Spatial datasets are also getting “time-stamped” - making them amenable to change detection and time-analysis.



SPATIAL ANALYTICS

Spatial Analytics (SA) is the logical processing of such spatial data and information entities using their topological, geometric, or geographic properties and is emerging at the forefront of advanced Geographical Information Systems (GIS) knowledge.

SA is also spurred by the increasing ability to capture and create geotagged data-rich environments. Combined with Internet-of-Things (IoT) and using Artificial Intelligence principles, SA is charting the future of geographical data processing in the Big-Data and Cloud environment.

Using advanced computational analysis, SA helps determine intrinsic geographic patterns – patterns of commonality, optimality, suitability, predictability etc and adopts advanced modeling and heuristics of self-learning principles for processing spatial datasets. SA helps definitions of “where”; metrics of distances/area/shape/proximity/nearness etc; relationships between data by similarity; siting and locating analysis; spatial econometrics; aviation analytics; Spatial Decision Support Systems (SDSS) and simulations using interpolation methods.

All of the characters of SA are oriented to “find patterns” and “newer meaning” and for predicting a FUTURE trend. SA can unravel hidden meanings.

KNOWLEDGE AREAS OF SPATIAL ANALYTICS

GOVERNANCE AND DEVELOPMENT

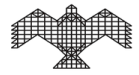
- Health GIS App - manage health activities
- City-GIS App to enable civic services management in cities
- Tank Monitoring GIS App that can provide status of water tanks in rural areas
- Public Fund Monitoring GIS App – map the distribution and usage of public funds
- Railway-GIS analytics to manage tracks, assets and develop GIS solutions.
- Development Indices at village, panchayat, taluk, district level based on multi-parameter analytics

CITIZENS AND SOCIETY

- Farmers-GIS – help farmers for cropping activities and provide farm advisories
- Social GIS App – maps patterns of social disparities and aspirations
- Behavioural GIS – analytics of human behaviour and practices
- GW Advisories – Based on usage of images and mapping

SPATIAL ANALYTICS

- **Botanical GIS for ecological studies of biological population dynamics**
- **Epidemiology analysis on disease mapping and health care**
- **Spatial Visualisation – converting statistics into spatial maps and visualisation**
- **Spatial econometrics – making measurements**
- **Image Analytics – detect changes in multi-date images**
- **Fractals/Scale invariance anal. for scientific modelling**
- **Spatial search Tools**
- **Business GIS Tools**
- **Crime Analysis in GIS**
- **Facility Siting tools**
- **Land Analytics for real estate**
- **Forecasting Landuse Change**
- **Demographic Projection Analysis**
- **Environmental overlay analysis**
- **Optimal routing tools**
- **Aviation Analytics**
- **Traffic Analytics tools**
- **Spatial Decision Support tools**



CENTRE FOR SPATIAL ANALYTICS AND ADVANCED GIS (C-SAG)

The main goal of Centre for Spatial Analytics and Advanced GIS (C-SAG) is to develop an Intellectual Property (IP)-based advanced SA and generate high-end capability in advanced GIS area. C-SAG would help India to develop and utilize the advanced capabilities of SA.

“Spatial Analytics is important for a variety of citizen, governance, commercial and research purposes – there is a need for greater understanding in the management and analytics of spatial data. Even as many GIS applications have been taken up, the Spatial Analytics is in nascent stage. In the vision of JRD, furthering advanced studies, is the goal of NIAS – that is what we propose to do through C-SAG and build knowledge capability”

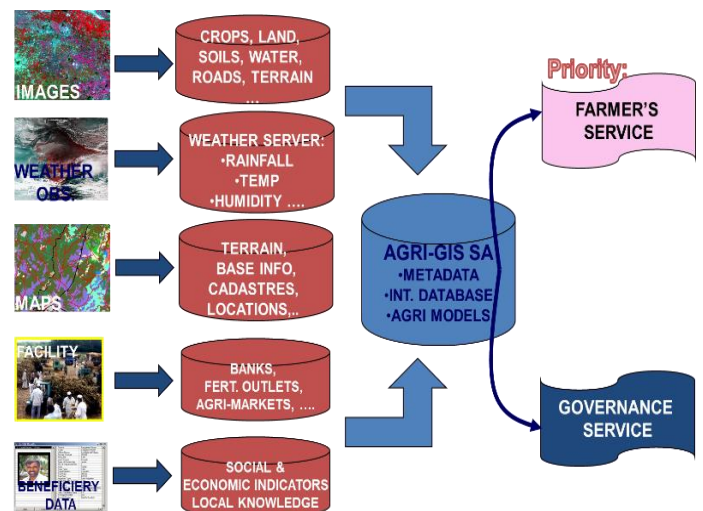
– S Ramadorai, Chairman, NIAS Council of Management

- ✓ High-end advanced knowledge development in geographical science – creating IP in SA and advanced GIS technology and application areas.
- ✓ Developing and maintaining a state-of-the-art GIS knowledge-base – data, information, apps, projects, facility, IP, models etc – building inherent capability within the country.
- ✓ Education Networking – create a common platform for universities/institutions for expanding and enhancing the research capabilities in SA.
- ✓ Specialised advanced training and orientation programmes in SA and advanced GIS – for government, private industry and for faculty training.
- ✓ Consulting to government, industries - creating assessments/evaluation and independent documents/reports related to SA and advanced GIS technology.
- ✓ Partnerships at international level with high-capability SA and GIS institutions; partnerships at national level with government/industries for specific SA and advanced GIS activities and research/skill development.

AGRI-GIS: THRUST AREA

C-SAG will focus to develop an Intellectual Property (IP) suite for Agri-GIS - an innovative tool-set of a GIS engine. The focus of the Agri-GIS engine would be mainly to address Smallholder Farmer Services – focusing mainly in 3 districts of S Orissa and addressing – Farm level aggregation and Disaggregation of crop and socio-economic parameters; assess lack of information of suitability of beneficiary land for various crops; assess Water Availability; help beneficiary on nutrition management; provide information on Production Technologies Available, Financing options, Insurance options, Access to inputs and Marketable Lots, etc. Local and regional policy integration into analysis is also to be undertaken.

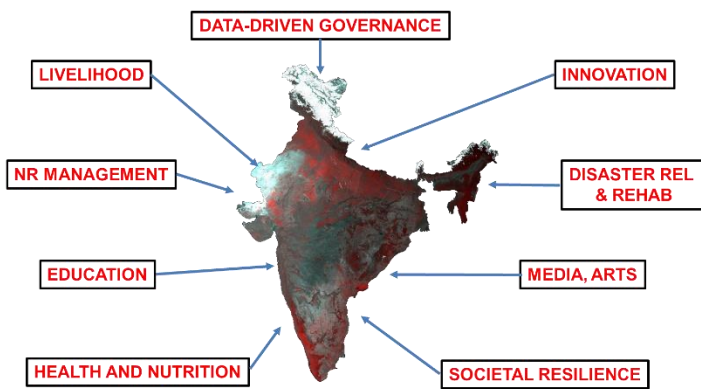
The benefit of the C-SAG Agri-GIS model stems on a “single, common, standardized, robust and reliable”



multi-layered (about 104 parameters) geo-spatial and geotagged database” - serving farmer beneficiary DECISIONS – addressing his individual social, economic and resources queries; administrators DECISIONS – addressing best local-level policy and government interventions.

SA - KNOWLEDGE AREAS

In coming months, the IP-driven approach of C-SAG would be taken up - Image Analytics, Fractals and scale invariance analysis, Spatial search tools, Spatial Decision Support tools, Real-time GIS, IoT – Spatial “things”, 3-dimensional GIS, Sensor Networks and Citizen as Sensor etc to bring a strong and sustained knowledge base in the country. These SA and GIS IPs will be relevant for society and grass-root governance – say, in Digital India, Smart-City, Crop Insurance, Health, NR Management, Disaster Management, National GIS, Karnataka GIS, UAS Applications etc.



C-SAG is committed to advanced knowledge in SA and address intersections between SA and GIS with social issues, natural resources domain and decision-making process. C-SAG will integrate the power of GIS, Data Science and Data Analytics and Decision Theory to key problems of society.

“Knowledge is business of NIAS – thus the Centre is advancing the main vision of NIAS in a new and emerging area of SA and advanced GIS”.

Dr Baldev Raj, Director of NIAS

Tata Trusts Supports C-SAG

Agricultural development and sustainable livelihoods for communities has been a key focus areas of Tata Trusts. In conjunction with Bill and Melinda Gates Foundation, the Trusts is supporting Centre for Spatial Analytics and Advanced GIS (C-SAG), established under NIAS, for “empowering” farmers with timely advisories from real-time satellite images, GIS processing, beneficiary-level data analytics using advanced Spatial Analytics and Artificial Intelligence capabilities. Tata Trusts envisions that C-SAG will help Indian farmers and enable them to better plan and manage their on-farm and off-farm activities, thereby improving their agricultural income and their overall quality of life.

C-SAG: THE ORGANISATION

C-SAG comes under the NIAS Society and is established under the aegis of **NIAS Council of Management** – Chaired by Mr S Ramadorai.

To guide, mentor and provide the overall framework for C-SAG development, an **International Advisory Board (IAB)** has been established - under the Chairmanship of Dr K Kasturirangan, Former Chairman, ISRO and Emeritus Professor of NIAS AND having several eminent international and national experts as Members.

“The Centre is a first of its kind – dealing with knowledge of SA and GIS and focusing on crafting Intellectual Property (IP) – which will be very relevant for society and grass-root governance.

-Dr Mukund Rao, Chief Executive, C-SAG

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