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MAPS TODAY

Monthly Publication January 2019

6-3-1117, 602, Maruthi Sadan Apartments, Begumpet, Hyderabad-500 016, Telangana, INDIA
Tel: +91-40-66667776 Tel. & Fax: +91-40-66667333 E-mail: mapstodaygis@gmail.com

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MAPS TODAY

Monthly Publication

Subscription Rates

Period	Actual Price	Special Price
1 Year	Rs. 1200/-	Rs. 1100/-
2 Years	Rs. 2200/-	Rs. 2000/-
3 Years	Rs. 3000/-	Rs. 2700/-
5 Years	Rs. 4700/-	Rs. 4200/-

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Editorial

In the last over six decades, mapping technologies have undergone changes. But Photogrammetry remained as the most efficient system of mapping. Mohan's musings ending with slogan " Long Live photogrammetry" is apt as it covers briefly its evolution while fundamentals remained same. We are covering one of the good Photogrammetry soft ware in the market- PHOTOMOD, which can process imagery from platforms like Drone, Air, Space and terrestrial.

Article about introduction of GIS at the Department of Geography,Universityof Peradeniya, Sri Lanka by P. Wickramagamage is a proof of rapidly spreading feature of GIS.

The article describing selection of city for new HQ for Amazon using Maptitude mapping software shows the growing influence of mapping tools. Another article on using GIS tools is also interesting. Readers can visit the blog for more examples.

A book review on GIS research agenda is analytical and informative. Many in India with interest in research will find it useful. .

GeoMap Society (GEMS) continues with its programmes. Reports included in this issue.

As in the past GEMS will be organizing "National Survey Day" on 10 April 2019. Survey Quiz has been planned for civil engineering students. Those interested to be associated with this may email to <geomapsociety@gmail.com>

GIS Mission - 2019

You can/should be part of this

GS Kumar, Editor, MAPS TODAY**,** Former Director, Survey of India

Prof BL Deekshatulu,former Director, NRSC and Padmasri Awardee has enrolled as 3-year subscriber to MAPS TODAY. He extended his support to GIS India right from beginning in 1992. Prof IV Muralikrishna also confirmed 3 years subscription. This is a clear way of being part and supporter of GIS mission. Several professionals have been supporting GIS and RS consistently.

In this issue (January 2019) we have included some articles dealing with challenges in adoption of GIS. Srilanka's example is interesting. Dr V Raghava Swamy is instrumental in getting this article. This is another way of being part of GIS mission.

The cost of comprehensive GIS is about Rs 40,000 per sq km. i.e less than Rs 200 per acre whereas cost of land per acre is in lakhs of rupees. With free GIS software (Open source) and free satellite imagery, the cost of developing GIS data bases is negligible. It is clear that technology and cost are not the issues.

Private companies and individual professionals in India have the expertise in developing GIS data bases.

The issue is mainly related to political will.

In any area-related project, use of GIS results in savings and improves efficiency. That is the reason, cabs and home deliveries are using GIS technology. This is one example.

You can also send ideas to improve governance by use of GIS. You can adopt a school or college and periodically explain how GIS is improving our society. There are many ways.

First step is to demonstrate the intention by enrolling subscriptions. Send examples of GIS applications. Send information about the benefits derived from the use of GIS

New Year Good wishes. .

Declaration:

Printed and published by Maj Dr G. Shiv Kiran on behalf of GeoMap Society

Printed and published at 6-3-1117, 602, Maruthi Sadan Apartments, Begumpet, Hyderabad-500 016, Telangana, INDIA

---- *Editor* ***G.S. Kumar***

Review

Geographic Information Science: The Grand Challenges

MICHAEL F. GOODCHILD

http://www.geog.ucsb.edu/~good/papers/438.pdf

Many chapters in this book have touched on aspects of the research agenda – the research questions that arise in the mind of a user of GIS; the research problems that need to be solved to enable the next generation of GIS technology; in essence the science behind the systems.

Over the past twelve years there have been various broader efforts to define a more-or-less-complete agenda for GI Science, and many of them have been framed in terms of challenges to the research community. More broadly still, many fields of science have attempted to provide long-term motivation – and not incidentally to open sources of funding – by identifying grand challenges, themes that are capable of directing research to a common, distant, but imaginable end.

President John F. Kennedy's famous challenge of 1960 – to "put a man on the Moon by the end of this decade" – resulted in an unprecedented peacetime integration of science, engineering, political support and of course, a successful ending. In a somewhat similar vein biologists have been calling for the completion of "the web of life",

The third major section examines broader themes within science, and the degree to which they might translate into research challenges for GI Science and institutional challenges for the GI Science community. The final major section discusses the concept of Digital Earth as a grand challenge for GI Science.

1. The Research Agendas of GI Science

1.1 The late 1980s

It seems appropriate to begin this review in the late 1980s, because several events at that time helped to dramatically alter the landscape of the mapping sciences. In the UK, the Department of the Environment's Committee of Enquiry into the Handling of Geographic Information (the Chorley Committee; Department of the Environment 1987) saw three specific stimuli: the rapidly falling costs of hardware, which had reduced the cost of entry into GIS and related activities from $500,000 at the beginning of the decade to $10,000 at the end; the advent of COTS (commercial, off-the-shelf) software to perform the basic operations of GIS; and rapid growth in the availability of spatially referenced digital data.

In the U.S., the National Science Foundation announced a competition for a National Center for Geographic Information and Analysis (NCGIA), to advance the theory and methods of GIS, to promote the use of GIS across the sciences, and to increase the nation's supply of experts in GIS.

Rhind (1988) presented a research agenda for GIS, identifying problems in what he termed the handling of geographic data: the volumes of data involved, the numerous types of queries that might be addressed, the prevalence of uncertainty in geographic data; the need for integration of data among organizations; and the lack of awareness of such issues as Geographic Information Science: The Grand Challenges scale. He recognized that the solution of the more generic of these issues would come with time from mainstream information technology; but that issues that were more specific to the geographic case would have to be solved by an active research community focused on GIS. He saw a substantial role for knowledge-based or expert systems in the automated extraction of features from images, the integration of disparate data sets, the development of intelligent search procedures, the automation of cartographic generalization, the development of machine-based tutors, and the elicitation of knowledge from data. He also recognized the importance of research into better methods of visualization for geospatial data, the role of organizations, the legal issues of liability and intellectual property, and the costs and benefits of GIS.

The NCGIA research agenda (National Center for Geographic Information and Analysis 1989) has much in common with Rhind's, but already shows signs of a search for the more fundamental issues of GI Science, in contrast to the practical issues of GIS.

Five major research areas are identified:

- Spatial analysis and spatial statistics, the techniques used to model uncertainty in geospatial data, to mine data for patterns and anomalies, and to test theories by comparison with reality.
- Spatial relationships and database structures, addressing the representation of real geographic phenomena in digital form, and the interface between digital structures and human reasoning.
- Artificial intelligence and expert systems, reflecting Rhind's concern for the role of advanced machine intelligence in GIS operations.

- Visualization, and the need to advance traditional cartography to reflect the vastly greater potential of digital systems for display of geographic data.
- Social, economic and institutional issues, the host of social issues surrounding GIS. The NCGIA went on to propose 12 specific research initiatives within this general framework:
- Accuracy of spatial databases, focusing on error models for geographic data with strong links to the discipline of statistics.
- Languages of spatial relations, including principles of spatial cognition and linguistics.
- Multiple representations, the need to integrate representations of the Earth's surface at different scales and levels of generalization.
- Use and value of geographic information in decision making.
- Architecture of very large GIS databases.
- Spatial decision support systems, the design of systems to support decisionmaking by groups of stakeholders.
- Visualization of the quality of geographic information, through methods that explicitly display information about the uncertainty associated with data.
- Expert systems for cartographic design, using intelligent systems to augment the skill of cartographers.
- Institutions sharing geographic information, including research on the impediments to sharing between agencies. 5 Geographic Information Science: The Grand Challenges
- Temporal relations in GIS, the extension of GIS data models to include time.
- Space-time statistical models in GIS, the extension of spatial analysis to include time.
- Remote sensing and GIS, researching the issues involved in the integration of data acquired by remote sensing with data from other sources.

Eventually, NCGIA sponsored a total of 21 research initiatives between 1988 and 1996; reports, papers, and other products are available at http://www.ncgia.org.

1.2 The 1990s

Very substantial progress was made on most of these topics in the years following their publication. In addition, four factors contributed to the evolution of these research agendas in the 1990s: (1) the continued arrival of new technologies, including most notably the WWW, the Global Positioning System, object-orientation, and mobile computing; (2) the broadening of the research community, to include active participation by new disciplines, notably cognitive science, computer science, and statistics; (3) the trend away from technical issues of systems to fundamental issues of science; and (4) the recognition that certain topics were in effect dead ends. This last factor perhaps accounts for the virtual disappearance of expert systems, despite their prominence in Rhind's 1988 agenda. In 1996 the recently formed University Consortium for Geographic Information Science (http://www.ucgis.org) published the first edition of its research agenda (University Consortium for Geographic Information Science 1996), the result of a successful consensus building exercise amongst the thirty or so research institutions that were then members (the number has since risen to more than 60). The agenda had ten topics

- Spatial data acquisition and integration, including new sources of remote sensing, ground-based sensor networks, and fusion and conflation of data from different sources.
- Distributed computing, and the issues of integrating data and software over large heterogeneous networks.
- Extensions to geographic representations, addressing particularly the third spatial dimension and time.
- Cognition of geographic information, including studies of the processes by which people learn and reason with geographic data, and interact with GIS.
- Interoperability of geographic information, including research to overcome the difficulties of different formats and lack of shared understanding of meaning.
- Scale, and the complex issues surrounding representations at different levels of detail.
- Spatial analysis in a GIS environment, advancing the analytic capabilities of GIS
- The future of the spatial information infrastructure and the institutional arrangements that provide the context for GIS.
- Uncertainty in geographic data and GIS-based analysis, including the modeling and visualization of data quality
- GIS and society, the study of the impacts of GIS on society, and the societal context in which the technology is used.

UCGIS later added four emerging themes to the list:

- Geospatial data mining and knowledge discovery, the development of methods for extracting patterns and knowledge from very large data sources
- Ontological foundations of geographic information science, addressing the fundamental components on which our knowledge of the Earth's surface is based.
- Geographic visualization.
- Remotely acquired data and information in GI Science.

The UCGIS completely revised this list in 2002, replacing it with lists of long-term research challenges and short-term research priorities. The theme of visualization has been taken up and developed by the International Cartographic Association's (ICA's) Commission on Visualization and Virtual Environments. The four-part research agenda (MacEachren and Kraak 2001) includes:

- Cognitive and usability issues in geovisualization
- Representation and its relationship with cartographic visualization.
- The integration of geographic visualization with knowledge discovery in databases and geocomputation.
- User interface issues for spatial information

visualization.

In this strikingly simple model, GI Science was anchored by three concepts – the individual, the computer, and society – represented by a triangle, with GI Science at the core

More generally, the list of commissions of the ICA reflects the broad interests of the association, including many research topics. The International Society for Photogrammetry and Remote Sensing also provides a useful insight into contemporary research needs, with particular emphasis on imaging systems. Its seven permanent commissions address:

- Sensors, platforms, and imagery.
- Systems for data processing, analysis, and representation.
- Theory and algorithms.
- Spatial information systems and digital mapping
- Close-range vision techniques.
- Education and communications.
- Resource and environmental monitoring.

In 1998, NSF sponsored a workshop under its Digital Government Initiative to explore ways of improving geographic information services (National Computational Science Alliance 1999). The workshop made ten recommendations, all aimed at advancing GIScience research

- Advance research efforts directed toward the study of optimizing geographic query mechanisms and incorporating geometry and spatial relational operations.
- Develop improved mechanisms for storing and representing time-varying geospatial data.
- Support research on integrating spatial data fusion from multiple agencies, distributed data, and multiple collection devices.
- Support research on multiple representations/interfaces focused on task-specific (procedural) workflow classes.
- Support research in developing algorithms for knowledge discovery applied to very large, frequently updated spatial datasets such as those derived from space-borne Earth-monitoring sensors.
- Support research in the theory and methods of representing data with varying degrees of exactness and reliability.
- Support research in the context of decision-making to improve the representation of diverse data and the dynamics of geographic phenomena
- Extend the promise of cognitive research to make geographic information technologies more accessible to inexperienced and disadvantaged users and also examine how government information policies affect access to and use of geospatial data for a broad spectrum of public and private sector stakeholders
- Support research to examine commerce's issues in geospatial information such as preserving privacy despite geographic locators and breaking potential bottlenecks in distributing geographic information services due to GIS's unique workflow processes.
- Develop a Geospatial Digital Government Prototyping Center to create a network for testing and developing processes consistent with US priorities for geographic information technologies and services in the government workplace.

More recently, the Center for Mapping of The Ohio State University organized a 2002 workshop on Geographic Information Science and Technology (GIS&T) in a Changing Society. The perspective of the workshop was notably toward societal issues, and it identified six research areas:

- Geospatial data availability: its sources and influences.
- GI S&T workforce studies.
- Conditions associated with the adoption of GI S&T-based approaches.

Spatial understandings, or the cognitive ability of people to work with spatial data.

- Cross and longitudinal studies of the use of GI S&T.
- Improved tools for the societal evaluation of GI S&T activities.

Finally, the National Research Council's Computer Science and Telecommunications Board reported in 2003 on a study of research needs at the intersection of GI Science and computer science (National Research Council 2003).

It identified two over-arching themes: the need for an integrative, multidisciplinary approach to research, and the need to address issues of policy. Within this context, it proposed eight research topics:

- Accessible location-sensing infrastructure, based on systems that know their location.
- Mobile environments, freeing users from the desktop
- Geospatial data models and algorithms.
- Geospatial ontologies.
- Geospatial data mining
- Geospatial interaction technologies.
- Geospatial for everyone, everywhere.
- Collaborative interactions with geoinformation.

2 Towards Synthesis

Although each of these studies and reports contains an extensive list of topics, several common themes are apparent, as well as several consistent trends through time. Mark (2003) has analyzed several of the lists, including the topics included in my 1992 paper in which I proposed the term geographic information science (Goodchild 1992).

A somewhat different approach to framing the research agenda was taken by NCGIA's Project Varenius, a research effort begun in 1996 to advance the fundamentals of geographic information science, with funding from the National Science Foundation (Goodchild et al. 1999, Mark et al. 1999, Egenhofer et al. 1999, Sheppard et al. 1999).

In this strikingly simple model, GI Science was anchored by three concepts – the individual, the computer, and society – represented by a triangle, with GI Science at the core.

Research about the individual would be dominated by cognitive science, and its concern for understanding of spatial concepts, learning and reasoning about geographic data, and interaction with the computer. Research about the computer would be dominated by issues of representation, the adaptation of new technologies, computation, and visualization. Finally, research about society would address issues of impacts and societal context. Many research issues would involve the interaction between the three corners of the triangle.

………the First Law of Geography: "all things are related, but nearby things are more related than distant things".

3 A Natural Science?

It will be clear from the previous section that the research agenda of GI Science is diverse, covering issues of technology, society, and human cognition. This section introduces a fourth, which has been largely neglected to date – the dependence of GI Science on an understanding of the nature of the Earth's surface. Many decisions are made in the design of a GIS, and more generally the design of any technology that must process geographic information. They include decisions about data models, data structures, indexing schemes, and algorithms – and about the set of analytic routines and processing functions. Many of these decisions are in turn dependent on expectations about the nature of geographic information. For example, a decision to represent rivers as polylines (sequences of points connected by straight segments) is a compromise, balancing the disadvantages of representing a smoothly bending river with a series of straight lines and sharp corners, against the advantages of using such a simple geometry (intersections between straight lines are much easier to compute than intersections between curves). Yet while there clearly are expectations about the nature of geographic information, very few attempts have been made to research the topic systematically, or to assemble what is known in coherent fashion. The best-known statement is probably Tobler's, generally known as the First Law of Geography: "all things are related, but nearby things are more related than distant things". This first appeared in a paper on urban growth in Detroit (Tobler 1970), and formed the subject of a recent forum in the Annals of the Association of American Geographers (see Sui 2004, Barnes 2004, Miller 2004, Phillips 2004, Smith 2004, Goodchild 2004, and Tobler 2004 for additional details). More formally it is a statement about the endemic presence of positive spatial autocorrelation in geographic information, and thus of the principle underlying the entire field of geostatistics. The consequences of Tobler's First Law (TFL) for GIS design are profound. If it were not true, and nearby things were as different as distant things, then all forms of spatial interpolation would be impossible, along with the derivative processes of contour mapping and resampling. All advanced GIS data structures would be impossible, since there would be no basis for assuming that terrain could be represented as a mesh of triangles, or that points with similar characteristics could be grouped into polygons. One can go further and argue that a geographic world without TFL would be impossible to learn about or describe, since every point would be independent of its most immediate surroundings. There are of course exceptions, and TFL is not a deterministic law. It is possible for example for spatial independence to exist over distances in excess of what geostatisticians would define as the phenomenon's range, and it is possible for negative spatial autocorrelation to exist at certain scales (at the scale of the cells in a checkerboard, for example).

.Many geographic phenomena reveal more detail as they are examined more closely

Anselin (1989) has argued that TFL, or the principle of positive spatial autocorrelation, is one of two endemic properties of geographic information. The other is spatial heterogeneity, or the tendency for properties to vary from one area to another over the Earth's surface. In the terms of spatial statistics, this is a first-order effect, or a property of places taken one at a time, while TFL describes a second-order effect, a property of places taken two at a time. For that reason it might be preferable if TFL were the Second Law, and spatial heterogeneity the basis of a First Law. The consequences of spatial heterogeneity are also profound. If the Earth's surface is heterogeneous, it follows that standards and design decisions adopted in one region, and designed for the conditions of that region, will be different from those adopted in other regions. Spatial heterogeneity thus explains the lack of interoperability between the various classification schemes used in geographic information, and the tension between local geodetic datums and global ones.

It dictates that the results of any analysis will depend explicitly on the bounds of the analysis, and will change when the bounds change. It also makes a compelling case for the new place-based or locally centered methods of spatial analysis, such as Geographically Weighted Regression (Fotheringham et al. 2002) and LISA (Anselin 1995). Additional generalizations can be made not so much about the nature of geographic information, as about the nature of its representation. Many geographic phenomena reveal more detail as they are examined more closely, and the rate at which additional detail is revealed is to some degree predictable. Mandelbrot (1982) termed such phenomena fractals, and showed that fractal properties were broadly characteristic of geographic information. They imply a degree of predictability in the effects of scale change, allowing better-informed design decisions to be made regarding hierarchical structures in GIS. I have argued that the endemic presence of uncertainty in GIS representations has profound impacts on GIS design, and leads to an entirely different approach to the representation of position (Goodchild 2002). These cases all point to the need for GI Science to address the nature of geographic information, and in effect to become in part a natural science, comparable to physics, chemistry or biology, with its own unique domain of study in the natural world. Of course this vision of the domain of GI Science must include phenomena that are of human origin, or are influenced by humans.

4 Broader Themes

Since its inception in the 1960s, GIS has become useful and almost indispensable in a vast range of human activities, from Earth science to human health, and from transportation to resource management. It is the enabling technology that has permitted utility companies to move to a higher level of efficiency in their management of distributed networks, and package delivery companies to save millions in delivery costs. Advances in GI Science are essential to the further development of GIS, and the key to the success of the technology's next generation.

Despite its importance, however, GIS remains a comparatively small application of information technology, and as such it must rely on the larger mainstream for many developments. The relational and object-oriented databases now widely used in GIS are mainstream products, that would probably not have been developed if GIS was their only market; and at the same time GIS has relatively little influence on such developments. In this context, one might argue that the future of GIS lies not in the specialized research agenda of GI Science, but in broader research agendas that will determine the future of information technology. Many of the research agenda topics identified above are indeed more general than GIS, and one can expect a broader set of minds to be interested in them. To what extent, for example, are issues of ontology and interoperability unique to GIS, and to what extent are they common to a much larger domain? Semantic interoperability is a problem common to all applications that rely on the meaning of terms, and one might therefore expect solutions to come from a number of disciplines, not only from GI Science. This argument has two important implications.

First, it suggests that GI Science must continue to look more broadly to developments that may have potential for GIS. A case in point is the Grid, a term that encompasses a range of technologies and research efforts aimed at integrating the distributed computing resources of widely dispersed communities into transparent wholes. The bandwidth of the Internet now makes it possible for the components of computing – the processor, data, and software – to be distributed virtually anywhere, and for a user at a desktop to access what amounts to a previously unimaginable resource. Services need no longer be provided at the desktop, but can be invoked from servers located anywhere on the network, and might include any of the functions currently performed locally by a GIS. Several GI services are already available (the Geography Network, http://www.geographynetwork.com, includes a directory), but much research remains to be done to explore GIS applications of the Grid.

Second, it suggests that it is in the strategic interest of the GI Science community to generalize its efforts wherever possible. One such generalization would be from geographic to spatial, to explore domains defined by spaces other than that of the Earth's surface.

The space of the human brain, for example, has similarities and also important differences, that can lead both to new applications for GIS, and also to the cross-fertilization of research. While there is only one Earth, each human brain is different, requiring brain researchers to develop techniques for defining a generic brain, and for mapping each individual brain to it. One can ask whether other spaces display the same properties as are observed for geographic space, such as TFL, and whether information system design considerations are therefore the same or different for these other spaces.

5 A Grand Challenge: Digital Earth

The previously cited NSF workshop (National Computational Science Alliance 1999) asked whether grand challenges existed for GIS, and in its report listed four research themes that it felt might merit this distinction:

- To find ways to express the infinite complexity of the geographical world in the binary alphabet and limited capacity of a digital computer (the representation challenge);
- To find ways of summarizing, modeling, and visualizing the differences between a digital representation and real phenomena (the uncertainty challenge); To achieve better transitions between cognitive and computational representations and manipulations of geographic information (the user interface challenge); and
- To create simulations of geographic phenomena in a digital computer that are indistinguishable from their real counterparts (the modeling challenge; in effect a Turing test of GIS-based modeling).

………the concept of Digital Earth (DE) perhaps has the ability to capture popular imagination

All of these have intellectual depth, but somehow lack the compelling appeal of a megaproject. But the concept of Digital Earth (DE) perhaps has the ability to capture popular imagination. The term was coined by Gore (1992) and elaborated in a much-quoted 1998 speech (http://digitalearth.gsfc.nasa.gov/VP19980131.html): "Imagine, for example, a young child going to a Digital Earth exhibit at a local museum. After donning a head-mounted display, she sees Earth as it appears from space. Using a data glove, she zooms in, using higher and higher levels of resolution, to see continents, then regions, countries, cities, and finally individual houses, trees, and other natural and man-made objects. Having found an area of the planet she is interested in exploring, she takes the equivalent of a 'magic carpet ride' through a 3-D visualization of the terrain. Of course, terrain is only one of the numerous kinds of data with which she can interact. Using the system's voice recognition capabilities, she is able to request information on land cover, distribution of plant and animal species, real-time weather, roads, political boundaries, and population. She can also visualize the environmental information that she and other students all over the world have collected as part of the GLOBE project. This information can be seamlessly fused with the digital map or terrain data. She can get more information on many of the objects she sees by using her data glove to click on a hyperlink. To prepare for her family's vacation to Yellowstone National Park, for example, she plans the perfect hike to the geysers, bison, and bighorn sheep that she has just read about. In fact, she can follow the trail visually from start to finish before she ever leaves the museum in her hometown. She is not limited to moving through space, but can also travel through time. After taking a virtual field-trip to Paris to visit the Louvre, she moves backward in time to learn about French history, perusing digitized maps overlaid on the surface of the Digital Earth, newsreel footage, oral history, newspapers and other primary sources. She sends some of this information to her personal e-mail address to study later. The timeline, which stretches off in the distance, can be set for days, years, centuries, or even geological epochs, for those occasions when she wants to learn more about dinosaurs." This vision of DE raises numerous problems (Goodchild 1999, 2000). First, it implies that data structures can be found that support a smooth zooming from resolutions as coarse as 10 km (whole-Earth view) to near 1 m (individual houses and trees).

Research on this topic has been under way for many years, and implementations are now widely available (in ESRI's ArcGlobe and Google Earth, for example). Second, it presents enormous problems of data volume, since there are 5 x 1014 m2 on the Earth's surface. It raises problems of visual rendering, since although some data (e.g. terrain elevation) are easily rendered in three dimensional views, others (e.g. average income) would have to be communicated symbolically. Perhaps more problematic are the institutional issues, since DE would require smooth interoperability between data sets, and collaboration by numerous data suppliers and custodians. But all of these are of course exactly what is required for a grand challenge – the collaboration of many disciplines, agencies, and communities in progress towards a commonly held vision.

DE is presented by Gore as an educational tool, a way for a younger generation to acquire knowledge of the planet, and particularly of its environmental problems and ways in which they might be solved.

Another major benefit of DE would lie in its ability to serve as an experimental environment, allowing planners to evaluate the consequences of management and development alternatives. One can imagine evaluating the consequences of a steady rise in atmospheric CO2 using DE, as an alternative to the infinitely costly and dangerous experiment that humanity is currently conducting on the real thing (for a Japanese effort along these lines see http://www.nec.com/global/features/index9.html). GIS is currently used for this purpose, of course, but only over much smaller domains. Again, these are the kinds of massive benefits one would expect from the solution of a grand challenge.

6 Conclusions

In the previous sections I have implied numerous criteria for grand challenges, some explicitly and some implicitly. In this final section I will review these, and examine the extent to which they are satisfied by the various proposals. First, a grand challenge should focus many apparently disparate forms of research on a common goal. DE clearly satisfies this test, since it involves researchable issues that are both technical and institutional, and touch on the disciplines of geography, computer science, cognitive science, and any of the many disciplines that study the processes responsible for the evolution of the Earth's surface. Second, there are expectations regarding the magnitude of a grand challenge, whether measured in numbers of investigators, levels of funding, or numbers of papers produced. DE has already spawned several conferences, and research on many of its sub-problems continues throughout the GI Science community, though often without explicit recognition of its relevance to DE. DE has many pseudonyms: Virtual Earth, Earth System, and Digital Globe all produce numerous WWW hits on DE-like projects. The Japanese Earth Simulator project alone represents an investment of several hundred million dollars. Third, a grand challenge should capture the popular imagination, and thus political support. The results to date on this test are much less clear for DE, and also for GIS and GI Science. While there is now very extensive name recognition of GIS, and its value is without question, its development clearly has not attracted the kind of widespread public attention accorded to the lunar landings, or even the mapping of the human genome. It is, quite simply, a very useful tool that we can no longer do without – and DE a very useful vision of where it might be headed in the years to come.

(Email for list of references)

PAST FORWARD

Maj Ramana

Maj Ramana, Retd Survey of India officer (amanaveeraganta@gmail.com) sent two items: one recalling memory of 40 years back. Another is of archival interest. Readers are welcome to share interesting memories of their professional career with Maps Today readers Editor

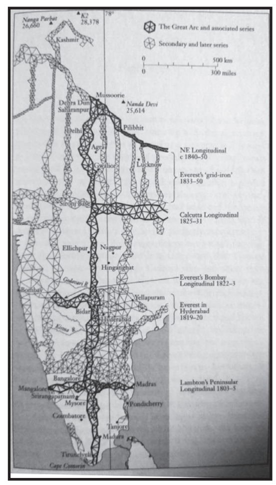
Memories recalled

My first posting in Survey of India along with KRMK Babaji Rao was in 1978 in 76 Photo Party at TankapaniRoad, Bhubaneshwar.
Major. J. R. Peter was our O. C. Party.
Col. P. Rough. was Director, South Eastern Circle
I visited. Bhubaneshwar in Nov 2018
The house where I lived is as it was.
Even 76 Photo party Building was found in tact, which was located in Shaheed Hager.

O. C. Party was Major. Sitaram Singh and Late. S. K. Choudary was posted in this party.
I am posting the photo of this building too, along with photo of 10 D. O.also located in Saheenager,maned by a class ll officer at T. P. Bandhoopadyay
1&3 rd photos , are where I was residing.
2 nd one is 10 D. O. Office.
SMS from Maj Ramana on 03/01/2019:
Any one in touch with Peter and Babaji Rao , T. P. Bandhoopadyay , can fwd them .
The other office photos can please be fwd to. S. G's office for their archives, if they have one.

G T S Tower

One of the greatest *MONUMENT TO ENGINEERING* Built in 1831 to carryout most prestigious and difficult engineering endeavor undertaken by team of engineers in modern times. This tower was used to carry out Great Trigonometrical survey of India during early 19th century. The survey covered the entire Indian Sub continent. It also included Great Himalayas and the height of the mount Everest was determined because of this survey. After this survey world came to know about Mt. Everest as the highest peak in the world.



The survey started from Madras and took about 50 years to complete.
It was longest measurement of the earth's surface ever to have been undertaken. This 1600 miles of inch perfect survey took more lives than a contemporary small war, involved equations more complex than pre computer age and it is hailed as one of the most stupendous work in the history of Engineering and science.
This tower is in Kolkata. There are such few towers existing in India which should be well preserved and maintained by Survey of India and local government.
Nishikant Choudhary
Valuable things we inherited from British Raj
Survey of India maps
Railways & Roads
Posts/ phones
Govt Hospitals
English education / Govt schools

Mohan's Musings

The USB of Photogrammetry

Jingle Bell, Jingle Bell – XYZ all the way!

Yes, that's right! It is always about positioning. Wherever you are, don't you like to know *where* you are? *Where*is unambiguously defined by XYZ (Example: Longitude-Latitude-Altitude). XYZs can be derived from a variety of techniques – photogrammetry being the most economical and elegant among them. Multiple sensors, manifold techniques, multifarious solutions have been in vogue in the realm of photogrammetric measurements. Let's take a quick look at the fascinating journey of photogrammetry –the time-tested technique of making dependable measurements founded on sound mathematical staple.

It all started with the novel idea of taking pictures from airborne pigeon with a pin-hole camera pinioned to its wings. The photographs, albeit with their edges occluded by falteringfeathers, didn't dampen the enthusiasm. The cameras bearing film rolls were flown from aircraft. Thus, interest areas are flown over with definite photo coverage – a huge improvement from relying on the impulsive pigeons.To exploit them, simple principles of trigonometry were effectively employed to deduce true distances from the photo prints.

The yearning to enhance the measurement precision resulted in the development of metric cameras– with core components such as calibrated lens assembly, vacuum-flattened focal plane, fiducial markers. They facilitated to accommodate the systematic distortions internal to the camera – known as Interior Orientation (IO) in the photogrammetric parlance. And this marked the definition of two popular condition equations – Collinear and Coplanar.

Collinearity condition connects the real world feature (ex: manhole), lens-centre, and the imaged location of manhole. Transformational matrices relate the two coordinate systems – one internal to camera and the other adopted for real world. A few important applications of this include determining the position and attitude of the camera (Space Resection or Exterior Orientation,EO), ortho-rectification.

Coplanarity condition relates the real world feature, two lens-centres of adjoining photographs, and the two image locations of the feature. Its applications include 3D coordinate computation, stereo-model formation.

The stereo pairs from manned space stations came in large format films. As the films were thin,a denser reseau of marks was imprinted in the body of the film which facilitated localized IO refinements. The condition equations found their way to 300 KM orbit!

The advent of imaging satellites – agile enough, like a painter's brush, to tilt its sensors across and along the orbit– provided stereo pairs. However, the geometry of line scanner is quite different and was quite new to the aerial mapping community. This stemmed in many stimulating discussions and apprehensions. Looking back at them, they all can be abridged *fear-of-unknown; fear-of-being-branded-obsolete*– that are not uncommon during transient times. The two condition equations continue to be applicable with a bit of reworking.

When GPS and Inertial Navigation System (INS) found their place onboard the flying platforms, the space resection is almost done. It only required honing them with the same mathematics. The equations are solved with a jump start – with GPS/INS inputs as superior initial guess.

Another fascinating application spawned by low-cost digital camera availability is in the realm of sub-millimeter industrial metrology. Cameras, being non-metric, required converging photography and redundant observations to carry out self-calibrating bundle adjustment. The format of core math is same!

The present pervasive technology is Remote Piloted Vehicles*aka* Drones.When a drone takes off, it reminds us of the same old pigeon in size –but *controlled to fly and land as desired*.The programmable low-weight and low-cost systems carry frame / video cameras in sync with onboard GPS. While the aerial flights of 1960s drifted due to lack of navigation instrumentation, drones drift away from the programmed paths due to wind. Some of the end effects are similar – inconsistent overlaps, intersecting flight-lines, sub-optimal Base-Height ratio. Thanks to advances in high performance correlators, 3D models of the terrain are generated in a jiffy. Let us not miss the fact that the Coplanarity condition is silently at work!

The multitudes of geometries evolved and experienced over a century have been ably defined by the Collinear and Coplanar equations – with appropriate adaptations. Technology keeps changing the gear; however the governing concepts at the core remain nearly static. Master them to master the photogrammetry. And they are not difficult.

Long live photogrammetry! Long live the two commandments!

GIS Tools: Using GIS to Solve Real Problems

January 23, 2017
By NCStateGIST
https://online.geospatial.ncsu.edu/2017/01/gis-tools-using-gis-solve-real-problems/

GIS professionals must use a number of software tools and technologies on a daily basis. Different applications require different sets of tools. In this month's blog, we discuss how these tools are used to help solve real-world problems.

What tools do GIS professionals need to do their jobs?

Geospatial technologies are rapidly changing; therefore, in order to be effective, GIS professionals must be adaptable to an ever-changing technological landscape and be prepared to engage in continuing education in order to stay up to date on the newest trends and techniques.

What are the types of GIS tools available?

GIS and geospatial science have become a technology-driven field ever since the advent of digitizing paper maps into computer systems for analysis. From data collection technologies to analysis software and visualization hardware, there is an ever-growing number of tools at the disposal of geospatial professionals.

In the area of data collection, traditional tools such as Total Stations now co-exist alongside GPS-enabled mobile devices, unmanned aerial systems (UAS) and micro-satellites. For analysis, any number of options exist, from proprietary software tools such as Esri ArcGIS and ArcGIS Online, to a growing number of free and open source solutions such as QGIS and GRASS GIS. Combining visualization and analysis, some of the newest tools available include Immersive Virtual Environments (IVE) and Tangible User Interfaces. In fact, NC State's Center for Geospatial Analytics has pioneered the development of Tangible Landscape using open source GIS, and NC State serves as the North American hub for GeoForAll as part of the Open Source Geospatial Foundation (OSGeo), with a focus on incorporating open source solutions into the educational experience.

How does GIS help solve real-world problems?

We talked last month about how GIS data mapping often uses software to create specialized maps showing a customized view of geographic information. GIS mapping tools have become imperative for many fields, such as urban planning and environmental assessment.

Other real-world examples of the use of GIS tools include understanding and mapping the spread of diseases. Epidemiologists often need to make predictions about the behavior of disease and use GIS technology to help visualize trends and inform decision makers about prevention strategies, as well as help first responders during an outbreak.

GIS tools are even used in architecture, where they can be utilized to identify line of sight during a building project, to make predictions about crowds and pedestrian traffic or to optimize space utilization when designing a project. By using GIS, architects can design buildings that are more efficient in structure and fit more effectively within existing landscapes.

These are just a few of the numerous examples where GIS and geospatial science can play a key role in helping scientists, decision-makers, and the public develop collaborative solutions to real-world problems, and NC State and the Center for Geospatial Analytics are at the forefront of GIS innovation and solution-driven research. Our educational programs have been designed to keep new and current professionals prepared for the demands of such a dynamic field.

Check back each month as we take a look at different aspects of Geographic Information Systems and geospatial science and how NC State's online programs can deliver the expertise you need to succeed. We will answer questions about the field of GIST and what it is like to learn at NC State.

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GIS at the Department of Geography, University of Peradeniya, Sri Lanka

P. Wickramagamage, PhD
Emeritus Professor in Geography
University of Peradeniya
Peradeniya, Sri Lanka

Prof P.Wickramagamage, *is an Emeritus Professor in Geography at the University of Peradeniya, Sri Lanka. He obtained his PhD from London. His research interests include GIS, Environmental Change, Geomorphology and Climate. Has published several papers. He is a Life member of Soil Science Society and Geological Society of Sri Lanka.*

In 1992 the Department of Geography celebrated its 50th anniversary with a National level conference organized to mark this occasion. Over a period of half a century, geographers had seen many land mark changes in their discipline in the world academia. These developments introduced profound changes to the way the planet earth was viewed/studied by geographers. Geography transformed itself from largely a descriptive to a more analytical and theoretical academic discipline. These changes in the western developed countries gradually filtered through to Geography at Peradeniya. However, the initial developments in GIS were largely unknown to us, even though analogue GIS had always been an integral part of the geography curriculum at Peradeniya. The effect of the developments in the field of computer technology was still elusive to geographers and others at the universities in Sri Lanka even in the late 1980s. We were able to make some progress by introducing programming as a small part of a paper in Geography in the1980s, despite these limitations.Thishad mixed success but at least it exposed geography students at the university to the world of computing at a time when computer facilities available at the university were at a very basic level.

The year 1992 was an important land mark for the Development of GIS at Peradeniya. By this time, the Department of Geography had entered into an agreement with University of Trondheim, Norway, to start a collaborative research programme, with funding from the Norwegian Agency for Development Corporation (NORAD). Under this project, we received a few personal computers and a small digitizer, with a broader plan to set up a GIS Laboratory to facilitate the research programme envisaged under this collaboration. We also received with that the first GIS software package, IDRISI, a DOS based raster GIS software package. This was followed by more computers, digitizers, printers and PC-ArcInfo, Mapinfo, and the allocation of a separate room to house this small GIS Laboratory. The newly established GIS laboratory played a pivotal role in the development of expertise of the Department in GIS. The academic staff of the Department were introduced to GIS by a colleague from the University of Trodheim, Prof. Axel Baudouin, who spent some time at Peradeniya training staff in GIS and doing research in the Mahaweli settlements of Sri Lanka. His contribution to the development of GIS at Peradeniya was substantial. However, teaching of GIS did not enter the undergraduate or postgraduate curricula in Geography or any other discipline at Peradeniya or in any other university in Sri Lanka until around 1993.

The GIS Laboratory of the Department of Geography, Peradeniya University

Development of the first syllabus in GIS was done with newly acquired knowledge of the subject by us. Mr. ASM Nawfhal and I had previous experience in computing and GIS and the knowledge we received from the Norwegian colleague helped update our knowledge and also enhanced our interest in the new technology. I learned Fortran during my postgraduate student days and Pascal and Turbo C, later. In addition, I learnt to work with an early version of IDRISI package, and also PC-ArcInfo and ERDAS (DOS versions) in the late 1980s, while I was at the East-West Center, in Honolulu Hawaii, USA. This familiarity immensely helped the development of the teaching programme and also the progress we made subsequently.

GIS at the Department of Geography of Peradeniya University

The initial steps to add GIS to the curriculum were taken after the setting up of the laboratory. The first syllabus was drafted and necessary approvals obtained around 1993. This was an introductory course in GIS and was offered in addition to the traditional cartography courses. This allowed students to practice GIS using PC ArcInfo software. We also embarked on an ambitious project to map the coastal zone of Sri Lanka with extensive fieldwork and air-photo analysis. This was the first time that we used GIS in a large-scale project and this work provided the necessary skills and knowledge. It also taught us the limitations in the DOS based PC ArcInfo. The outputs were of poor quality from a cartographic point of view and were difficult to produce. On the software side we also experimented with MapInfo and IDRISI and decided to settle for ESRI's ArcInfo and the subsequent versions of PC-ArcInfo, and ArcView. Finally, we settled for ArGIS as it is the main software platform, that Government institutions in Sri Lanka had adopted.

Some of the biggest problems we encountered in developing GIS at Peradeniya were the high cost of equipment and software, difficulty in diversifying software, limitations of space and number of seats in the GIS lab, and not being able to provide software to the students. Some of these problems were overcome by switching to the educational *'site licensing scheme'* provided to us by ESRI. The Site License allows us to provide software to students and staff free of charge. Under this scheme, the entire suite of ESRI software is provided. Currently, over 1000 licenses are given to students, staff and GIS labs of various faculties of the university.

The teaching of GIS to students taught us one important lesson. The neglect of mathematics by geographers, even after the quantitative revolution, meant that students were not prepared to handle quantitative concepts. This was at a time when the Social Sciences had gone quantitative in a significant way. Students entering the Faculty of Arts are generally poor in quantitative skills. Even the introductory mathematics courses the students had to take in their first year were not sufficient. However, despite the reservations of some staff, we were able to select students with better mathematical skills to specialize in Geography. Furthermore, an advanced course in mathematics was offered to all honours students as a non-credit compulsory course. This prepared them to learn quantitative GIS concepts better. Currently, all students selected for a special degree in Geography are required to follow additional mathematics courses.

Thus, the Department of Geography of the Peradeniya University has the distinction of being the pioneer institution in adopting GIS into their Undergraduate and Postgraduate curricula. Today at Peradeniya, two post-graduate institutes, the Postgraduate Institute of Agriculture (PGIA) and Postgraduate Institute of Science (PGISc), are offering GIS at Masters and PhD levels. Almost all other universities in the country also offer GIS in their Bachelors and Postgraduate programmes.

Speaking of what is to come in GIS education in Sri Lanka in the future, another first in GIS education in Sri Lanka, currently being implemented in universities is a fully fledged Bachelors' program in GIS. This was planned to improve job opportunities for our graduates. This new degree programme has close to 50% of coursework in traditional sub-disciplines of Geography, while the other half is devoted to GIS, Remote Sensing and other cognate disciplines. This is a four-year degree programme and has received overwhelming support from the UGC including funds for a new building. Those who complete all the requirements of the degree programme will be awarded a BSc in GIS. This is a break from the past where the Department only offered BA general and special degree programme since the creation of the Department of Geography in 1942. However, although all necessary approvals were received by 2014, the first batch of students are expected in 2020. A few members of the staff completed their postgraduate training in GIS and Remote Sensing and an expert in Remote Sensing and Surveying was recruited. Thus, the prospects for GIS education at Peradeniya remain strong and we remain hopeful of its flourishing in the future.

Mapping Apps for Amazon HQ 2

https://www10.giscafe.com/blogs/mappingapps/

Stewart Berry

Mapping is in my blood. I am a third generation professional "mapper" and I am extremely fortunate that from high school onward I have been able to specialize in geography, geospatial systems, and geo-data. https://www.linkedin.com/in/MappingSoftware.

Where will the new Amazon HQ be? Is your city on the shortlist?

October 3rd, 2017 by Stewart Berry

Using Site Mapping Tools to Explore the Amazon HQ2 Location Summary

Amazon is performing a competitive site selection process and is considering metro regions in North America for its second corporate headquarters.

· Amazon HQ2 will generate $5 billion in construction and create 50,000 jobs
· Amazon wants one competitive response per metropolitan statistical area (MSA)
· A similar layout to Amazon's Seattle campus is preferred

The Maptitude mapping software is an excellent tool for data analysis and visualization. We will use several different Maptitude tools to explore how they work together to provide tangible results. As an exercise we will:

· Explore the characteristics of a study area in the USA
· Work through a real-world set of requirements

Amazon HQ2 Building/Site Requirements

Core Preferences	*Quantity*	*Units*	*Description*
Site			
Population center	<=30	Miles	> 1,000,000 people
International airport	<=45	Minutes	
Major highways & arterial roads	<=2	Miles	Optimal access
Mass transit	0	Miles	Rail, subway/metro, bus routes
Greenfield/infill/existing site	4.4M / 100	Ft^2 / Acres	Pedestrian-friendly
Traffic congestion			At peak commuting hours
Crime			
Building Size			
Initial	>=500K / 11.5	Ft^2 / Acres	Phase I (2019)
Total	<=8M / 183.7	Ft^2 / Acres	Beyond 2027
Labor Force			
Universities & community colleges			List
Diverse population			
Highly educated labor pool			

Population Center

First, we will filter the metro areas that meet the population and educational requirements, by having at least:

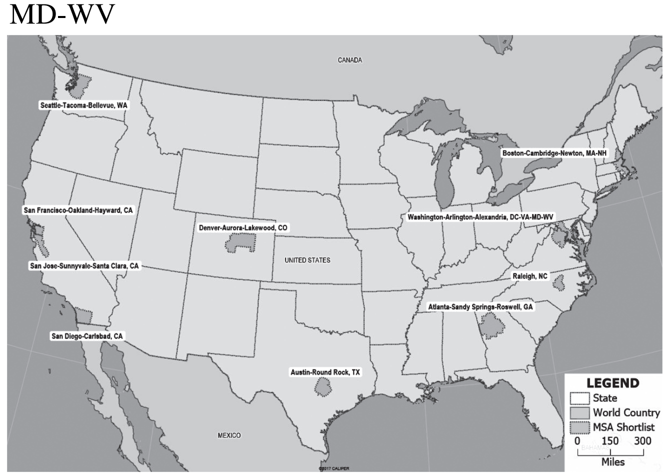
· a population of 1 million
· 32% of adults with at least a bachelors degree
· 3% of the workforce in the Information sector (NAICS 51)
· 14% of the workforce in the Professional, Scientific, Technical and Business Management sectors (NAICS 54-56)

The existing Seattle HQ MSA meets these criteria, so it seems that we are on the correct path!

City Shortlist

These cities meet the above criteria.

· Atlanta-Sandy Springs-Roswell, GA
· Austin-Round Rock, TX
· Boston-Cambridge-Newton, MA-NH
· Denver-Aurora-Lakewood, CO
· Raleigh, NC
· San Diego-Carlsbad, CA
· San Francisco-Oakland-Hayward, CA
· San Jose-Sunnyvale-Santa Clara, CA
· Seattle-Tacoma-Bellevue, WA
· Washington-Arlington-Alexandria, DC-VA-MD-WV



Each of the MSAs contains a major airport as required by the RFP.

MSA: Boston

We will now focus on the Boston MSA to see how it meets the Amazon criteria.

We created a 30-mile ring and a 45-minute drive-time ring that encompass:

- Extensive higher education
- Diverse population
- Major airport

We then extract the demographics for those rings to list the higher education institutions, explore the racial/ethnic/gender diversity of the region, and to list the airports in the region.

Building/Site

The above analysis is possible with Maptitude mapping software out-of-the-box.

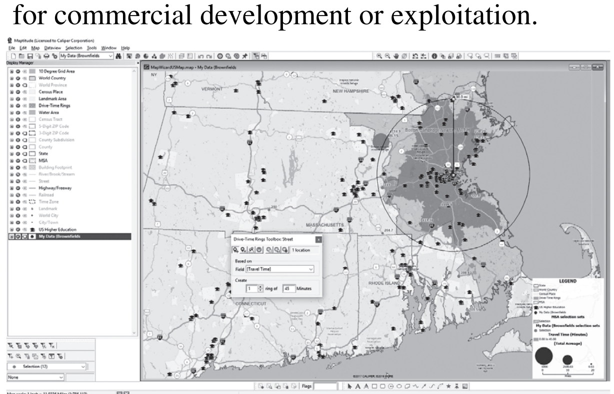
We are now going to geocode our address list of potential site locations and analyze their suitability:

- Geocode brownfields
- Filter by size and location
- Proximity to: Highways & mass transit

Brownfields

We obtained and geocoded in Maptitude a list of brownfield sites

- Source: Massachusetts Department of Environmental Protection
- These properties are typically abandoned or for sale or lease and have been used for commercial or industrial purposes and may be contaminated In this exercise, we will not be looking at greenfield sites
- Greenfield properties are previously undeveloped sites for commercial development or exploitation.



Proposed Site

The former Canton Airport site has the most commuter rail stations in the closest proximity. This site is also adjacent to a major interstate intersection and many amenities.

Conclusion

Mapping software has progressed to the point that wizard-driven tools, embedded data, and intuitive interfaces mean that even novice users can tackle and explore complex tasks. We call this "Mapping without Tears"™. We were able to quickly explore the criteria laid out by Amazon with the US$695 Maptitude software.

The former Canton airport site may have been converted into a park, but is listed as a brownfield site by the MA DEP. Maybe losing a park for an Amazon HQ would be an acceptable trade-off for residents!

UPDATE January 18th, 2018:

Building HQ2

When asked about next steps, an Amazon spokesperson said it looks forward to beginning hiring, and that it will use temporary spaces while it develops its campuses.

In Long Island City, Amazon plans to lease 1 million square feet of office space in the iconic Citi skyscraper at One Court Square for its new headquarters. Citi said it will move about 1,100 employees out of the space in the first half of 2019 to make room for Amazon. It's unclear if or when Amazon would put its own branding on the building, which has long carried Citi's logo.

xxxxxxxxxxxxxxxxxxxxxxxxxx

Amazon's permanent HQ2 site in Long Island City will be located along Anable Basin on the East River, overlooking Manhattan, according to city documents.

The new National Landing neighborhood in Arllington.

In Virginia's National Landing, the company plans to lease about 500,000 square feet of existing office space at 241 18th Street South, 1800 South Bell Street and 1770 Crystal Drive, according to JBG Smith, Amazon's exclusive developer in the area. The company will also purchase a site in Pentagon City called Pen Place, in addition to other land from JBG Smith.

In both Long Island City and Arlington, Amazon will eventually have 4 million square feet of office space with the possibility of expanding to 8 million square feet.

Housing

Long Island City is already experiencing a housing boom. Since 2006, over 18,400 residential units have been completed, according to the Long Island City Partnership, a local development group. By 2020, over 9,900 new rentals and condos are projected to open.

In contrast, National Landing has few residential options. But there's been recent housing growth in neighborhoods to the south and east, as well as in southwest Washington DC.

While home buyers will see an increase in prices right away in both markets, experts don't forecast an uptick in rent prices in the near term.

"For rentals, I don't see prices jumping for several years," said Eric Benaim, the CEO and founder of real estate firm Modern Spaces in Long Island City, "We're not feeling the impact of these employees yet."

Luxury apartment buildings have popped up in recent years on the Long Island City waterfront.

Overall, online rental marketplace Apartment List forecasts less than a 0.1% uptick in rent increases in New York City, and a 0.1% to 0.2% jump in the Washington DC metro area. While the impact is largely muted in these metro areas, rents in close commuting proximity to the new sites are expected to rise over time. But even a small rent increase can hurt families already struggling to pay rent. In New York City, 52% of renters can't afford their current rent. About 48% of renters experience the same challenge in the Washington DC metro area, according to Apartment List.

"These are two markets that are already some of the priciest in the country," said Igor Popov, chief economist at Apartment List. "The market rate housing already is out of reach of a lot of even middle class families in these metros."

Why Amazon's HQ2 might be better for New York than for Virginia

Local officials will also be tasked with making sure there's affordable housing in both locations, and that lower-income residents aren't priced out.

"We need to have more and more places for people to live without driving up the cost of all the existing housing," said Elizabeth Lusskin, president of the Long Island City Partnership. "We have been adding housing units in a tremendous rate in Long Island City, including affordable units ... but there's always going to be more to do."

Transportation and infrastructure

In National Landing, there are plans for a new entrance at the Crystal City metro stop and a new station in North Potomac Yard, according to city documents. The region's HQ2 bid also proposed the construction of a pedestrian bridge that would connect Crystal City and Ronald Reagan Washington National Airport. However, the project requires support from the National Park Service and the Metropolitan Washington Airports Authority.

Other infrastructure improvements that have been proposed include adding and upgrading streetlights, building a second elevator entrance at one of the metro stations and upgrading fiber-optic cables and traffic cameras.

An illustration of National Landing.

In addition, a Partnership Steering Committee — which includes Amazon employees, the Virginia Economic Development Partnership, county representatives, higher education officials and others — will meet regularly to make sure plans stay on track. It will also give recommendations on any changes needed to implement the plans.

"We're going to be busy right away," said Northern Virginia's Moret.

Meanwhile, Long Island City must address core infrastructure issues and sewage problems, as well as open more schools, according to Lusskin. New York City recently announced it would help by spending $180 million on infrastructure in the neighborhood.

A view of the waterfront of Long Island City.

An influx of new Amazon workers will also put more pressure on the beleaguered New York City subway system and add more congestion to the 7 train line.

"We are already in a situation where we're all concerned about capacity on the subways. There's a larger issue around the subways," said Lusskin.

However, some of the effects could be mitigated if a portion of Amazon workers live in the neighborhood and walk or bike to work rather than use public transportation.

"These issues about infrastructure, transit and schools — we are experiencing growth anyway, and we have to address these issues, but now we get to address them with some big friends," Lusskin said

GIS Tools: Using GIS to Solve Real Problems

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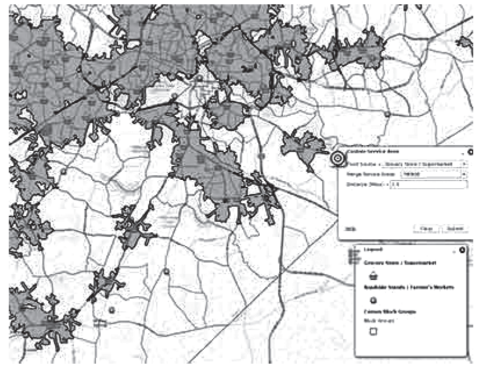

Student Project: Delineating Food Deserts in Raleigh

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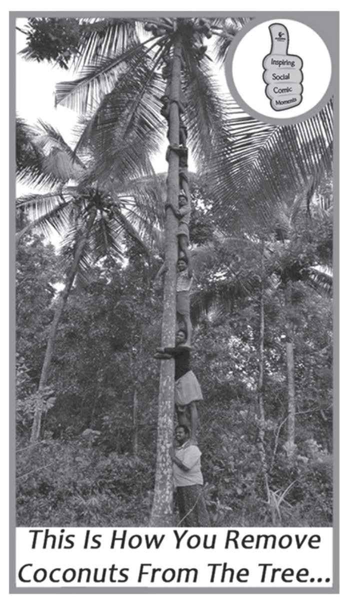

Beyond GIS

GS Oberoi Inspired Map Awareness Programmes (MAPs)

GS Kumar, GEMS, Hyderabad

Mr. GS Oberoi, Retd Director, Survey of India is a mapping professional committed to creating Map Awareness. He took up campaigns through articles / letters. He is convinced that maps form the basis for efficient planning and implementation in various sectors of development.

GeoMap Society(GEMS) a regd society of Hyderabad is organising Map related programmes including annual GeoMap Quiz for students since 1990. Mr. GS Oberoi gave a donation of Rs one lakh to GEMS group for Map Awareness Prorammes (MAPs) in December 2016

The first MAP was organised on 28 Jan 2017. Till January 2019 end, GEMS organized 17 programmes. Adopted three schools and regular programmes are being organized. Through such regular programmes, student participants are gaining understanding of important role of maps in today's society. Brig JS Ahuja retd Director SoI, has been a great support in organising these programmes.

GEMS has developed an appropriate topo map keeping in view security instructions. Soft copy of this map is available on request. This can be used for MAP.

Through this note we request volunteers to organize MAPS in schools/organizations We provide certificates ,prizes and other necessary support. In this issue we are giving two reports No. 16 & 17 on MAPS in Hyderabad

M A P No. 16 /International School dated 18 January 2019

Organised by GeoMap Society,Begumpet, Hyderabad 500016.

Conducted by : Brig JS Ahuja & Mr**.** GS Kumar, Retd Dirs, Survey of India assisted by school staff

Venue & Date : International School in Secunderabad on 18 January 2019

Topics Covered: Scale; Symbols; Depiction of features; Discussion on neighbourhood maps prepared by them

Prizes Six students were given prizes and ertificates

Comments/Observations:

Participants appreciated the skills of mapping and importance of Spatial relationships. Learnt value of scale and features of map. Staff too expressed appreciations of the programme

Brig JS Ahuja interacting with students on maps with LCD display on wall

Staff member addressing students

Brig JS Ahuja giving certificate to one of the prize winners

M A P No. 17 / Walamtari dated 24January 2019

Lecture by Shri GS Kumar on

" Understanding and Interpreting Topographical maps"

Date/Time" 24 Jan 2019 from 2 to 5 p.m.

Participants: About 35 fresh civil engineer trainees at Water & Land Management Training and Research Institute (WALAMTARI), Hyderabad

Topics covered:

- SoI Topo maps, scales, content and accuracies
- Integration of topo maps with RS, GPS etc to create latest digital maps
- Delineating catchment areas with help of contours and drainage pattern
- Map projections
- Applications-Engineering and non-engineering
- National Map Policy

Comments:

During the session participants were constantly referring to maps on scales 1:25/50/250,000,.They gained knowledge of understanding topo maps

Content in the north and south margins of map was also discussed, particularly info about magnetic variation useful when integrating old maps with compass survey with present maps.

Interactive session with Participants proved that it is the first time that they were exposed to topomaps in such detail and so relevant for them.

It was not easy to resolve doubts about maps of dual series – old maps and same area map in Open Series, Map Number, Layout, Datum, Projection etc

TS mandals will soon be on country's digital map

ROHIT P.S.; The Hindu May 18, 2015

The Central government's project 'Special Information System Decentralized Planning' nears completion. The weathered maps were drawn on cloth.

Aided by the detailed Nizam-era village maps of the region, an ambitious project that hopes to put Telangana mandals on the country's digital map has neared completion.

As part of the Central government's project 'Special Information System Decentralized Planning' (SISDP), the Telangana State Remote Sensing Applications Centre (TRAC) is digitizing the survey maps of the State dating from 1934.

Humor

Source: Internet

Humor

"Somebody must be watching us."

Source: Internet

EVENTS

Alaska Surveying and Mapping Conference (ASMC).	February 13 – 15, 2019	Anchorage, AK, USA	http://aksmc.org/
GIS/CAMA 2019	February 25 – 28, 2019	Portland, OR, USA	https://www.urisa.org/gis-cama-technologies-conference/
International QGIS USer Conference.	March 4 – 6, 2019	A Coruña, Spain	http://2019.qgis.es/
3rd International Conference on Data Engineering and Communication Technology (ICDECT-2019)	15-16th March, 2019	Hyderabad, Telangana, India	Web: http://icdect2019.com/
5th International Conference on Water, Energy, Food and Agricultural Technology.	March 20 – 23, 2019	Istanbul, Turkey	http://www.unioneag.org/5th-international-conference-on-water/?lang=en
Future of Mining Australia 2019	25-26 March 2019	Sydney, Australia	https://australia.future-of-mining.com/
Commercial UAV Expo Europe	8-10 April 2019	Amsterdam, The Netherlands	https://www.expouav.com
GIS In Action	April 22 -23, 2019	Portland, Oregon	http://www.gisinaction.org/
19th International Multidisciplinary Scientific GeoConference SGEM 2019	28 June - 7 July 2019	Bulgaria	http://www.sgem.org
GI_Forum 2019	2-5 July 2019	Salzburg, Austria	www.gi-forum.org
GeoInformation for Disaster Management (Gi4DM)	3-6 September 2019	Prague, Czech Republic	www.gi4dm2019.org
GIS-Pro 2019	28 September- 02 October 2019	New Orleans, LA, U.S.A.	https://www.urisa.org/education-events/gis-pro-annual-conference/

Information about events has been compiled from different sources. Readers are advised to check correctness from the organisers