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Challenges

in surveying education and some technology-based solutions

Can Census GIS bell the Corona Cat?

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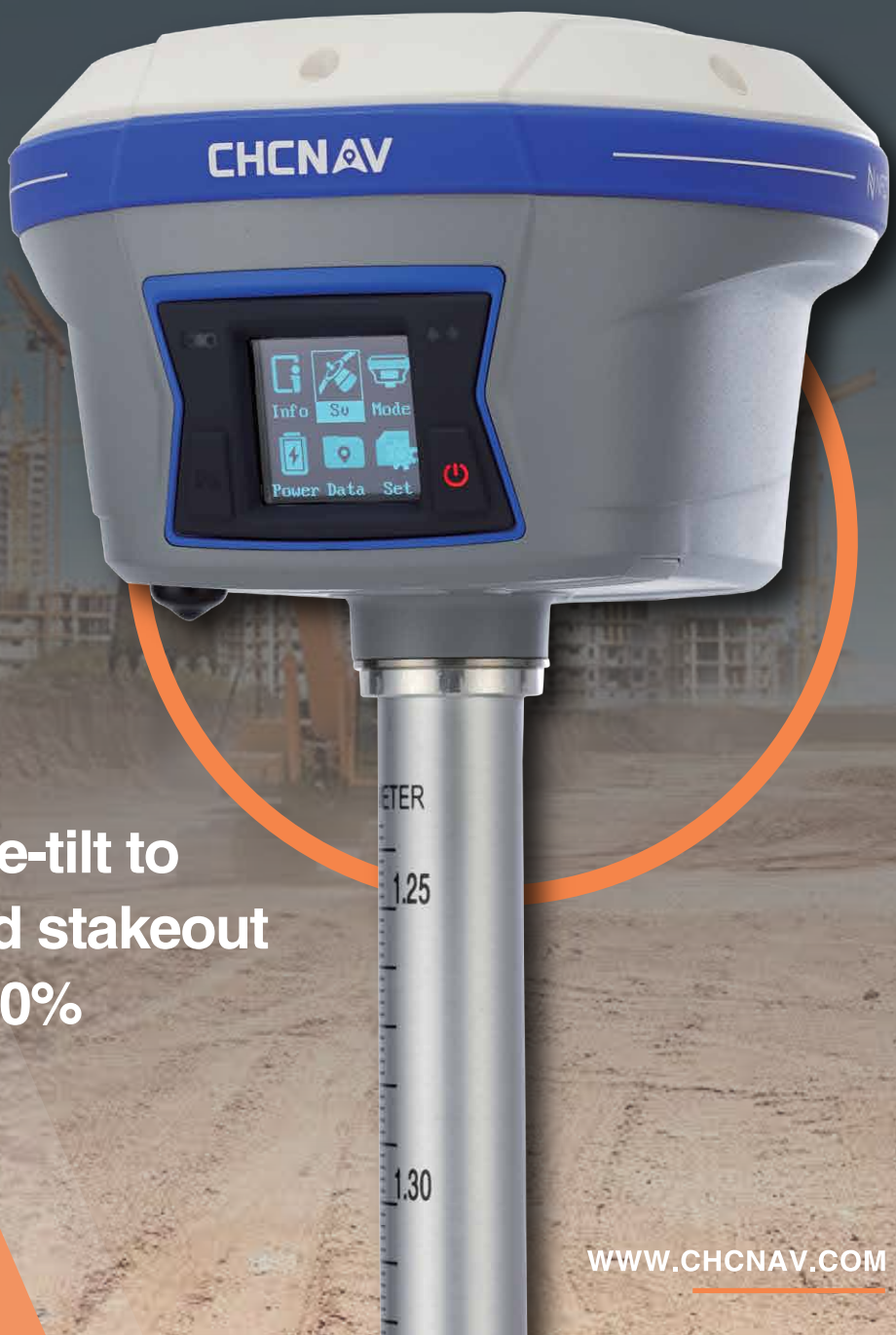

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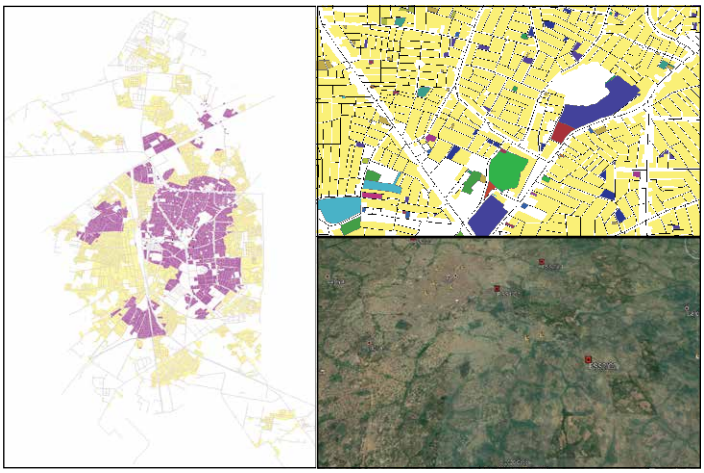

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Editor Bal Krishna
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Infodemic

In the times of pandemic,

The World Health Organization has warned against the infodemic.

Various information channels are flooded with mis-information

Ranging from alternative remedies to phishing attempts.

Surveillance apps under the guise of tracking the disease,

Information perpetuated by vested interests,

And worse, stigmatization of the infected

And criminalization of the vulnerable.

The damages of infodemic could be deep and lasting.

Though there have been heartening endeavors

To find the vaccines for the disease

There is not much hope

To get one to fight the infodemic.

Bal Krishna, Editor
bal@mycoordinates.org

Challenges in surveying education and some technology-based solutions

The surveying industry requires the academia to more focus on the development of students' practical skills parallel to learning theoretical principles

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Education in surveying covers a broad range of fundamental topics in mathematics, physics, engineering and law, combining theoretical concepts with practical experience [1]. With the rapid changes taking place in technology and industry, surveying educators are facing many challenges, for instance, the need to satisfy industry requirements and the profession, more engage students in their learning, and increase student satisfaction, which would lead to improving their retention.

The surveying industry requires the academia to more focus on the development of students' practical skills parallel to learning theoretical principles. In specific, to improve generic skills associated with problem-solving with the ability to solve complex problems, critical thinking (e.g. design practical operation so to ensure an optimal outcome), perception of professional worth, and the ability to rapidly integrate new technologies into current surveying practice. Communication skills are also necessary which are developed through the design of tasks that require teamwork as well as the analysis and presentation of results. In order for students to efficiently obtain these needed skills, the lecturers and tutors have to implement innovative teaching approaches. Key actions are updating course content, implementation of advanced pedagogy and use of cutting-edge technology. These address completeness and appropriateness of the content, updating course structure to follow changes in technology (e.g. integration of multi-sensors), assessment methods (e.g. classroom versus authentic learning), development of skills, and competitiveness with other courses and/or universities (e.g. unique elements). Blended learning methods that couple learning theoretical principles with developing technical skills can assist here. Blended learning includes flip teaching, collaborative learning, e-learning, and peer-assessment [2].

E-learning

E-learning can help in improving student engagement as learning is becoming ever more focussed around the use of computers and modern communication methods. For example, with COVID-19 restrictions, the importance of online e-learning increases, and became the main means for education during this period, which enables students to learn anywhere, anytime and with various devices [3]. Central to e-learning approaches are *learning management systems* (LMS), such as Blackboard and Edmodo, providing a virtual platform for students to access teaching resources (e.g. course notes, lecture recordings, e-assessments) and interact with peers and other students, web-based flexible learning environments, and media to encourage collaborative learning among students.

Simulation-based e-learning

Simulation-based e-learning (*SIMBEL*) [4] can also help students to prepare for specific work routines without the need for face-to-face instructions. It provides great potential to develop practical skills in a virtual environment. SIMBEL provides the opportunity for students to engage, experiment and reflect practise skills both before and after the field exercise, thus saving part of the high cost of actual training. As an example, an online interactive levelling virtual simulation tool was developed in Curtin University, Australia. The tool was designed to allow students to practice data entry, fieldwork calculations and checking. Furthermore, students use it to practice self-assessment. The feedback in SEMBEL is immediate as it is applied within each task itself. The response from students is that they found this virtual tool useful in developing their understanding and ability to carry out fieldwork.

Simulation-based e-learning (SIMBEL) provides the opportunity for students to engage, experiment and reflect practise skills both before and after the field exercise, thus saving part of the high cost of actual training

Video technology

Video technology can be used as an educational tool for the development and documentation of practical skills [5]. By providing authentic-like recordings for demonstration of typical practical procedures, instructors do not need to spend significant proportions of their time explaining routine procedures but can focus more on specific problems. Besides, students can follow the video instructions at their own time and pace. Video recording of students' practical performance can be a powerful tool by allowing self-analysis and reflective practice.

Peer-Assessment

One efficient way of improving students' experience, which is limited to conclusions derived from their own work, is by involving them in *peer assessment* of other group's work [6]. Peer-assessment is a useful tool for formative assessment. By placing themselves as assessors, students better address the learning objectives of the fieldwork in their work. At Curtin,

One challenge for lecturers and tutors is to show influential enthusiasm during the lecture and in their working with students. This enthusiasm is contagious and will help students to love their program and progress, leading to improving their retention

we tested peer-assessment for two units over two years [7]. To prepare students for the peer-assessment, tutors explained the purpose of peer assessment and its value. The validity of peer-assessment was measured by comparing students' marks with those given by tutors. Significant differences that were found in assessing any task indicated to the tutors that more explanation is needed in the relevant task either in its description or its assessment criteria. Peer assessment can also help students in improving their approaches to problem-solving by learning from mistakes and innovations of others, provision of constructive criticism to peers, follow key learning objectives and appreciate the importance of coming to the final correct solution.

Student-centred Learning

Methods such as *flip teaching* that replaces the traditional face-to-face classroom lectures have a proven benefit. It is a form of active and collaborative learning. Instead of traditional passive teaching in the classroom, teachers can focus more on specific questions, case studies and/or problems that promote or reinforce the targeted subjects' outcomes. However, flip teaching is a challenging approach as it requires students to read and prepare for the class beforehand and when the in-class attendance is not compulsory, there is a risk of lower turnover. *Collaborative learning practised in surveying education* is an important skill in the 21st century and directly addresses some of the above generic skills. Today this process is becoming more computer-assisted and with the use of social media, gaining from its popularity among students. These allow collaboration to take place without any face-to-face contact, fitting the more mobile nature of today's students.

Lecturers are consistently required to define challenging surveying exercises that help students to develop both their practical surveying skills and generic skills. They also need to provide professional guidance during exercises concerning the use of surveying instruments and surveying methods so as to successfully complete the exercise and present results in a professional format suitable for potential clients.

This can be further supported by simulating exercises that are designed to replicate a particular task. Most important, tutors need to provide constructive and timely feedback to students that address the strengths and weakness of their critical thinking and demonstrated skills. This would encourage students to address areas of weakness and allow them to take corrective action to improve future work.

Last but not least, one challenge for lecturers and tutors is to show influential enthusiasm during the lecture and in their working with students. This enthusiasm is contagious and will help students to love their program and progress, leading to improving their retention. This can also improve when lecturers and tutors know what students like. Students need encouragement and constructive feedback. They appear to appreciate authentic or work-integrated learning, where inclusion of well-designed demonstrations and practical work largely contributed to high student satisfaction.

References

1. Greenfeld, J. & Potts, L. (2008). Surveying body of knowledge – preparing professional surveyors for the 21st century. *Surveying and Land Information Science*, 68(3), 133-143.
2. El-Mowafy A., Kuhn M., and T. Snow (2013). Blended Learning in Higher Education, Facing Current and Future Challenges in Surveying Education. *Issues in Educational Research,* 23(2), 132-150.
3. Herrington, A., Schrape, J. & Singh, K. (2012). Engaging students with learning technologies, eScholar Program, Curtin University, Perth, Australia.
4. Kindley, R. (2002). The power of simulation-based e-learning (SIMBEL). *The eLearning Developers' Journal*, 12 September.
5. Frehner, E., Tulloch, A. & Glaister, K. (2012). "Mirror, mirror on the wall": The power of video feedback to enable students to prepare for clinical practice. In A. Herrington, J. Schrape & K. Singh (Eds.), *Engaging students with learning technologies*. Curtin University.
6. Falchikov, N. (2007). The place of peers in learning and assessment. In D. Boud & N. Falchikov (Eds.), *Rethinking assessment in higher education: Learning for the longer term* (pp. 128-143). London: Routledge.
7. El-Mowafy, A. (2014). Using Peer Assessment of Fieldwork to Enhance Students' Practical Training, *Assessment and Evaluation in Higher Education*. 39(2), 223-241.

Can Census GIS bell the Corona Cat?

(COVID-19) has uncertain ramifications in the Indian Context, owing to India's lack of data on people as well as health facilities

Riya Gupta
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With the world grappled in Corona virus (COVID-19) pandemic with over 5.5 million cases as of May 26, 2020, the affected numbers from India fail to find a proportion with its population density, hygienic/ living conditions, law enforcement, and healthcare program. It is said to do with the rate of testing, and it won't be surprising to find a substantial number of contaminated persons amongst the billion-plus population, had the rate been better than 2243 for every 1 million (ICMR, 2020). The underlying reason is always lack of data and essential resources, and there can be no better time to acknowledge and act upon the same.

While it is dismaying to see the Corona Circles on near-real time dashboards getting bigger (and sometimes smaller, to conform to the global unfoldings (Monmonier, 2014)), like a bystander, it is wise to acknowledge the inevitability of the damage it shall cause in the near future, and aim for preparedness at the earliest possibility. While everyone is tracking the disease (ACPN, 2020), Government of India's 'Aarogya Setu' App (Agarwal, 2020) might as well track the diseased (when everyone will have access to a smartphone) with its social mapping, but till then solutions need to be thought of in both the short and long run.

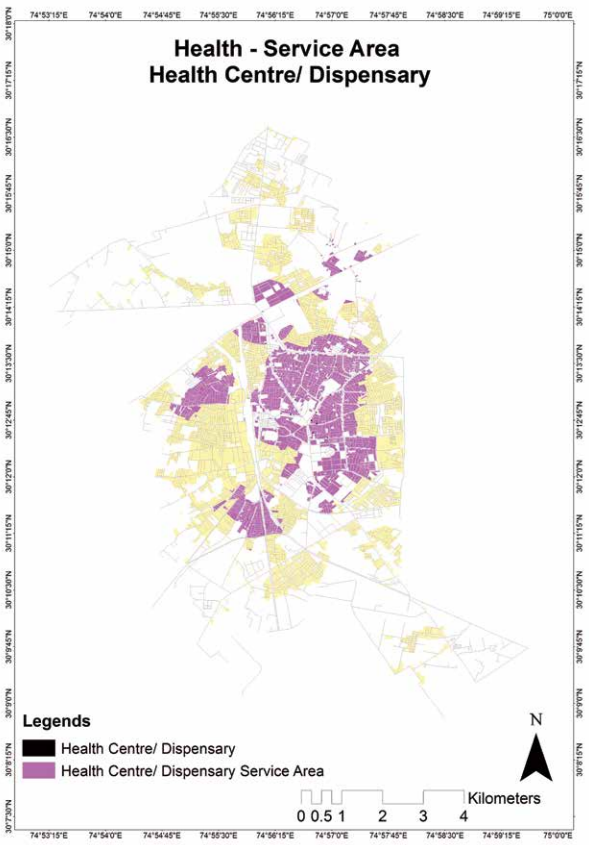
An opportunity of the decadal census is quite at the door, and a lot can be achieved if this grass-root level exercise may move beyond the idea of 'notional maps' (United Nations, 2009) in the Indian context. Even the latest Census of 2011 contains less of maps and graphical charts, and more of data worthy of scalograms and sociograms (Mahavir, 1996), leaving a lot to be desired in this era of cartographic coups.

The change, right from the process of data collection, is necessary, for the Census Town and Village Directories contain only the number of amenities, with no information on their spatial distribution, completely overlooking the consequential inconsistencies of the over- or inadequacy of amenities (Bennett & Geraghty, 2020).

These amenities may as well suffice the required number in proportion to the population they are meant for (DDA, 2014), but on ground, the reality is different (Gupta, 2019). **(Figure 1)**

Supposedly, if the census mechanisms start going beyond 'notional maps' and sombre tabulations **(Figure 2)**, and replace them with the ones in **Figure 3**, governance and decision-making might as well take a somersault.

It is best to map every house, with all its occupants' information and respective cadastral layers. It is quite analogus to extending the SVAMITVA Scheme (MoPR, 2020) to Urban Areas (perhaps as SUAMITUA) and adding a few more columns to its Property Data Attribute Table – for information that cannot be captured by drones. The settlements – be it cities or hamlets, need to be controlled – for their complexities to be constructive. Mere technological means might sound disagreeable (Sandercock, 1997), but in a country with dearth of plans, planners, and planning mechanisms, it is best to undertake the bird in hand; and with the ever-augmenting circles of



Dispensaries are meant to serve 10,000 persons.

Population of the city ~ 3 lakhs
Thus, required dispensaries = 30
Available dispensaries = 17

But, population served < 1,70,000 because of overlapping catchment areas.

Figure 1 – Distribution (in Purple) of Dispensaries (in Black) in Bathinda City

Settlement Infrastructure Data						
Name of Settlement	Population	Number of Educational Amenities	Number of Health Amenities	Nearest City for Amenities	Type of Amenities (Public/Private)	Level of Amenities
Settlement Household Data						
Name of Settlement	Population	Number of Households	No. of HH using a certain fuel	No. of HH having a certain floor material	No. of HH having a certain roof material	No. of HH possessing certain items

Figure 2 – A prototype of the tabular data in the Census

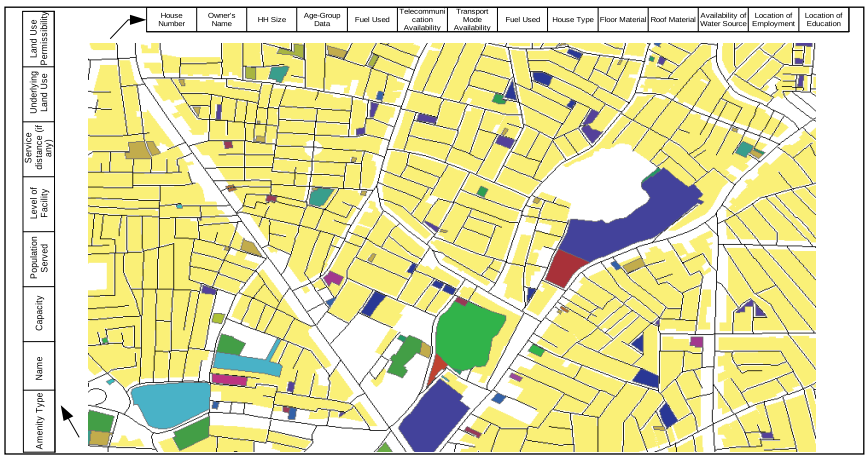


Figure 3 – A prototype of the data that ought to be a product of the nation-wide census

the coronavirus, planners cannot help wondering the better alternatives – of projecting migration with the help of cadastral data, and providing a better planned exodus; of deducing social vulnerability and most-at risk groups in catastrophic times; of helping out the common public with resources, goods and services; of facilitating employers and decision-makers with data on employees and citizens, respectively.

A Punjabi idiom loosely translated to 'More the jaggery, sweeter the pudding', fits in the scenario of data geo-visualization – always better with more and detailed shapefiles, as described below:

a. Mapping an amenity's catchment area as per the distance norms (walkable distance).

A walkable distance for a health centre/ dispensary is 800 m (Republic of Iraq, 2010), inducing the image of a dispensary with a circle/ buffer of radius 800 m around it in mind. In fact, Gupta (2019) poses a juxtaposition of another amenity, i.e. primary school – with a walkable distance of 800m (Perry, 1929). Taking into account abutting streets and their interconnected nexus, the distance around the amenity decreases considerably, thus serving lesser residential areas than anticipated. A geo-processing tool of GIS called Network Analysis is used for this purpose. **(Figure 4)**

Similarly, a dispensary with a walkability of 800 m has an influence area smaller than that. **(Figure 5)**

b. Redefining the catchment area obtained in (a) as per the amenity's capacity.

The capacity of a health centre/ dispensary is 10,000 persons (DDA, 2014; TCPO, 2014).**(Figure 6)**

It depends on the population density of the area, whichever polygon (the one related to maximum

distance, or the one related to maximum capacity) is smaller. Optimum planning might advocate going with the smaller

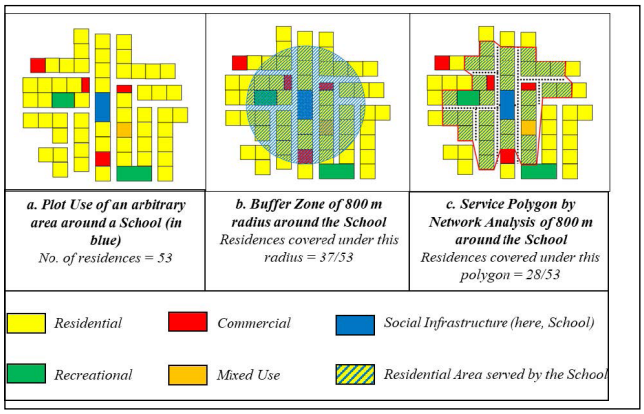


Figure 4 – Difference between Amenity's Catchment Areas using Buffer Zoning and Network Analysis

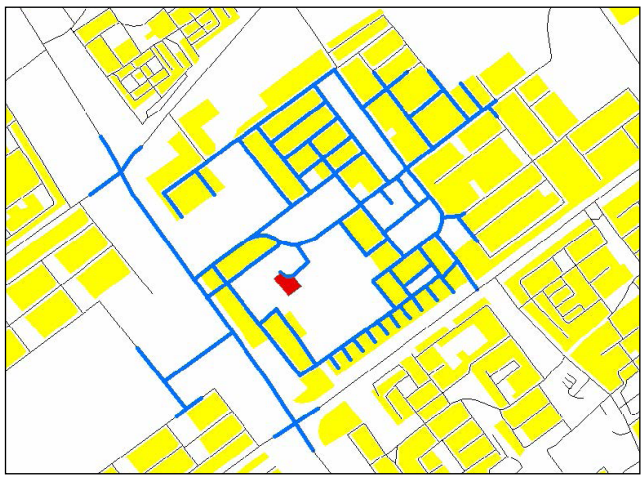


Figure 5 – Maximum 800 m walkability – Only the Residences (in Yellow) with Blue Road in front of them are in the catchment area of the Dispensary (in Red).

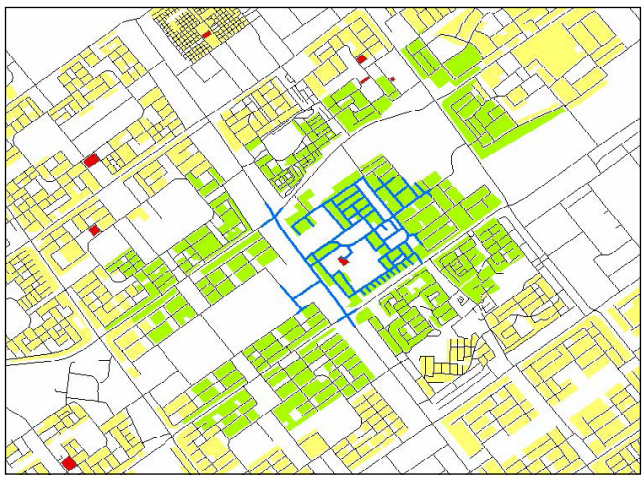


Figure 6 – Population of 10,000 around the Dispensary (in Red) covered by the Residences (in Green)

polygon – or whatever is feasible at settlement level. Either way, population density is a significant function – both to deduce the catchment area of an amenity, as well as to determine the extent and speed of spread of a contagious disease, as the one at hand.

With uncertain R_O and unprecedented super-spreader events (Ciarochi, 2020), parameters like heterogeneity of population and scarcity of medical facilities have been overlooked by even the most eminent of researches on SEIR (Susceptible – Exposed – Infected – Recovered) modelling of COVID- 19 (Hamzah et al., 2020; Lopez and Rodo, 2020), thus affecting the efficacy of such models as well as of their successors (Boseley, 2020).

c. Mapping the area of actual influence of an amenity.

For various kinds of amenities with a lot of choices – especially schools, and rarely health services – people do not necessarily follow the walkability's or amenity's capacity's catchment areas. They prefer being served at an amenity of their choice, no matter how far it be – a parameter called 'gravitational pull of an amenity' (Stulz, Pichler, Kawohl, & Hepp, 2018), that planners may/ may not imbibe in their plans of requirement projections (subject to data availability). If one is only interested in fulfilment of numbers, there is the question of distribution. When that too is taken care of, individual choices of the people come into play. A planner who knows his/ her settlement and its economic conditions knows where to draw the line. However, census must not hesitate from collection of this type of data, for it's never enough (Falkenberg & Styan, 2014).

d. Projecting further requirement of the same kind of amenity.

Maps of amenities and their catchment areas make it easier for gap areas to be identified – and the consequent future projections. (Gupta, 2019) **(Figure 7)**

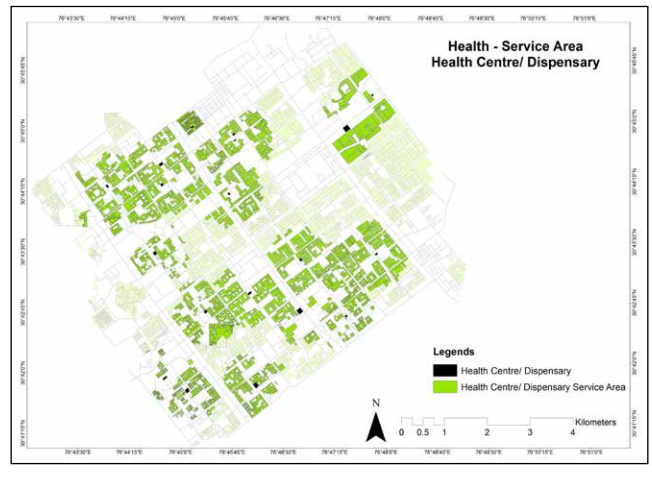


Figure 7 – Pale green unserved patches as opposed to the green residential patches served by the Dispensaries (in Black)

This can be applicable to all kinds of amenities, helping India usher on the path of better preparedness for any kind of eventuality. Hence, Census GIS might as well bell the Corona Cat, but only after laying an intricate trap.

Bibliography

ACPN, (Asian City Planners Network). (2020). 100 Delhi Containment Areas. Retrieved from https://goo.gl/maps/bR9aLmkSRGUHH5DM7

Agarwal, S. (2020, April 20). Aarogya Setu app primed to take lead in COVID-19 war. *The Economic Times*. Retrieved from https://economictimes.indiatimes.com/news/economy/policy/aarogya-setu- app-primed-to-take-lead-in-covid-19-war/articleshow/75238590.cms

Bennett, L., & Geraghty, E. (2020). Models and Maps explore COVID-19 Surges and Capacity to Help Officials Prepare. Retrieved April 25, 2020, from https://www.esri.com/about/newsroom/blog/models-maps-explore-covid-19-surges-capacity/

Boseley, S. (2020, April 7). How can coronavirus models get it so wrong? *The Guardian*. Retrieved from https://www.theguardian.com/world/2020/apr/07/how-can-coronavirus-models-get-it-so- wrong

Ciarochi, J. (2020). How COVID-19 and Other Infectious Diseases Spread: Mathematical Modeling.

Retrieved April 24, 2020, from https://triplebyte.com/blog/modeling-infectious-diseases

DDA, (Delhi Development Authority). (2014). *Master Plan for Delhi - 2021*. New Delhi. Retrieved from https://dda.org.in/ddanew/pdf/Planning/reprint mpd2021.pdf

Falkenberg, L. J., & Styan, C. A. (2014). Too much data is never enough: A review of the mismatch between scales of water quality data collection and reporting from recent marine dredging

programmes. *Ecological Indicators*, *45*, 529–537. https://doi.org/https://doi.org/10.1016/j.ecolind.2014.05.006

Gupta, R. (2019). *Resource Efficiency Analysis of Social Infrastructure*. Indian Institute of Remote Sensing, Dehradun.

Hamzah, F. A. B., Lau, C. H., Nazri, H., Ligot, D. V., Lee, G., Tan, C. L., … Salunga, R. E. (2020).

CoronaTracker: World-wide Covid-19 outbreak data analysis and prediction. *Bulletin of the World Health Organization*, (March), 32. https://doi.org/http://dx.doi.org/10.2471/BLT.20.255695

ICMR, (Indian Council of Medical Research). (2020). SARS-CoV-2 (COVID-19) Testing: Status Update 26 May 2020 9:00 AM IST. India. Retrieved from https://www.icmr.gov.in/pdf/covid/update/ICMR_testing_update_26May2020_9AM_IST.pdf

Lopez, L. R., & Rodo, X. (2020). A modified SEIR model to predict the COVID-19 outbreak in Spain: Simulating Control Scenarios and Multi-scale Epidemics. *MedRxiv*, 2020.03.27.20045005. https://doi.org/: https://doi.org/10.1101/2020.03.27.20045005.

Mahavir. (1996). *Modelling Settlement Patterns for Metropolitan Regions: Inputs from Remote Sensing*. International Institute for Geo-Information Science and Earth Observation. Retrieved from http://www.itc.nl/library/papers_1996/phd/mahavir.pdf

Monmonier, M. (2014). *How To Lie With Maps*. *University of Chicago Press*.

MoPR, (Ministry of Panchayati Raj). (2020). *Framework for Implementation of SVAMITVA Scheme - Survey of Villages and Mapping with Improvised Technologies in Village Areas*. *Panchayati Raj*. New Delhi. Retrieved from https://panchayat.gov.in/documents/20126/0/Svamitva+Guidelines.pdf/c561bb40-4de3-9e19- fae8-1f75502c8ec8?t=1587661167254

Perry, C. A. (1929). *The Neighborhood Unit, a Scheme of Arrangement for the Family-life Community*.

New York: Regional Survey of New York and Its Environs. Retrieved from https://books.google.co.in/books?id=JhptGwAACAAJ

Republic of Iraq. (2010). *Urban Housing Standards Manual*. Baghdad. Retrieved from http://investpromo.gov.iq/wp-content/uploads/2013/04/URBAN-HOUSING-STANDARDS.pdf

Sandercock, L. (1997). *Towards Cosmopolis: Planning for Multicultural Cities*. *Wiley*.

Stulz, N., Pichler, E.-M., Kawohl, W., & Hepp, U. (2018). The Gravitational Force of Mental Health Services: Distance Decay Effects in a Rural Swiss Service Area. *BMC Health Serv Res.*, *18*(1), 81. https://doi.org/10.1186/s12913-018-2888-1

TCPO, (Town and Country Planning Organisation). (2014). *Urban and Regional Development Plans Formulation and Implementation Guidelines*. New Delhi.

United Nations. (2009). *Handbook on Geospatial Infrastructure in Support of Census Activities*. New York. Retrieved from https://unstats.un.org/unsd/publication/seriesf/Seriesf_103e.pdf

Comparative analysis of online GNSS processing websites on selected geodetic control stations in Oyo town, Nigeria

The results obtained from differential GNSS observation and online processing websites were compared and analysed to determine their accuracy levels with applications areas

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Availability of Ground Control Points for surveying and engineering projects is a major challenge in developing countries including Nigeria. Reliable control stations are either several kilometres from project sites or not available in some cases. Surveying and mapping projects are carried out with GNSS receivers in differential mode with at least two receivers and the data processed with proprietary software from GNSS equipment manufacturers which make project cost too expensive for clients. Continuously Operating Reference Stations (CORS) in developing countries is an alternative to passive ground control stations but CORS users face some challenges such as data not available when needed, difficulty in accessing the data, lack of understanding in processing field observations with CORS data together. This study was undertaken to assess the accuracy levels of some selected free Online GNSS Processing Websites for the establishment of ground control stations. Methodology included establishment of second order control stations using GNSS receivers and uploading the field data to selected Online processing websites. The results obtained from differential GNSS observation and online processing websites were compared and analysed to determine their accuracy levels with applications areas. Recommendations included creating awareness among surveyors and other professionals on the functionality, reliability and dependability of online GNSS processing websites so that users can fully explore the potential of the online facilities in mapping and possibly cadastral applications in Nigeria and other parts of the world.

Introduction

Many applications in physical planning and scientific studies require geospatial data from field measurements. The field survey measurements will only become useful when processed with reliable Ground Control Points (GCPs). Global Navigation Satellite System (GNSS) is the modern method for establishment of ground control points and for easy navigation and positioning. Components of GNSS include the US Global Positioning System, Russian GLONASS, European Union Galileo and Chinese Beidou. Control surveys establish precise horizontal and vertical positions of reference monuments, there are two general types of control surveys namely horizontal and vertical controls (Ghilani & Wolf, 2012). Horizontal control surveys generally establish geodetic latitudes and longitudes of stations over large areas. From these values, plane rectangular coordinates, usually in a state plane or Universal Transverse

Mercator (UTM) coordinate system can be computed. Vertical control surveys establish elevations for a network of reference monuments called benchmarks. Depending on accuracy requirements, they have traditionally been run by either differential levelling or trigonometric levelling. GNSS survey can also establish vertical control but are limited by the need for a precise geoid model. Network of ground control points serve as the basis for originating or checking subordinate surveys such as topographic and hydrographic mapping; property boundary delineation; and route and construction planning, design, and layout. They are also essential as a reference framework for giving locations of data entered into Land Information System (LIS) and Geographic Information System (GIS).

GNSS has been used extensively by surveyors primarily for geodetic control networks and for photo control. The system has become more compact, more technologically advanced, easier to use and with a full complement of satellites enabling 24-hour usage, the diversity of surveying applications has increased significantly. GNSS systems are now available for many surveying and mapping tasks, including establishing control, setting out, real-time deformation monitoring, on-board camera positioning for aerial photography and the list is continually growing. GNSS is a tool for fixing positions, navigation and timing. GNSS receivers range from low-cost systems with a positional accuracy of tens of meters, to high-cost geodetic survey systems able to determine positions to the centimetre and millimetre level. For survey accuracies, it is essential that hardware and software specifically designed for survey applications are used and these should always be utilized in the manner for which they were designed.

Positioning modes in GNSS can be absolute positioning or relative positioning. Absolute positioning involves Precise Point Positioning (PPP) which is a positioning technique that removes or models GNSS system errors to provide a high level of position accuracy from a single receiver without any base station. Relative positioning is called differential positioning which employs two or more GNSS receivers simultaneously tracking the same satellite to determine their relative coordinates. The requirement for relative positioning is that at least one station should be selected as base station.

International GNSS Service (IGS) maintains open access and free high-quality GNSS data and products for scientific, educational and commercial applications (www.igs.org/about). The products are contributed from more than 100 countries and by over 200 self-funding agencies, universities and research institutions. The IGS operates a global network of GNSS ground stations, data centres and data analysis centres to provide data and other derived data products for earth science research, positioning, navigation and timing applications. GNSS data Analysis centres attempt to estimate inter-system calibration biases, compare equipment performance and further develop processing software capable of handling multiple GNSS observation data. The IGS Real-Time Service (RTS) is a GNSS orbit and clock correction service that enables Precise Point Positioning (PPP) at worldwide scales. The RTS products enable applications such as scientific testing, geophysical monitoring, hazard detection and warning, weather forecasting, time synchronization, GNSS constellation monitoring, imagery control and many other public-benefit applications (Agrotis et al., 2012). Surveyors, GIS analysts, engineers, scientists, and the public at large that collect GNSS data and use CORS data to improve the precision of their positions.

Regarding the improvements in GNSS data processing methodology, many new opportunities have been offered to the users. Several software packages to process precise GPS/GNSS data for research applications have been developed by different international research groups. The availability of executable code, documentation, and user support varies with the individual development group. Recently, web based GNSS positioning services have begun to be developed as an additional option to classical evaluation methods. Such services produce solutions automatically by using some of the GNSSS observations loaded via the web interface over the Internet. GNSS observations collected in the field are recorded in standard data formats such as Receiver INdependent EXchange (RINEX) and then uploaded to web-based positioning services, allowing location coordinates of observation points to be obtained in short time and free of charge (Ulukavak,2018). Many organizations have developed online GNSS processing services. These services provide GNSS processing results to the user free of charge and with unlimited access. The user sends a Receiver Independent Exchange Format (RINEX) file to the service and within a short period of time, the estimated position of the receiver used to collect the RINEX data is sent back to the user.

The only requirement for using these services is a computer having an internet connection and web browser. These services are designed to be as simple as possible for the user and with minimal input. Some of these services process not only the GPS but also the data of other systems, particularly those of GLONASS, and provide resilience and a higher accurate positioning service in certain cases to their users (Isioye et. al., 2019). Web-based positioning services have been considered as an alternative to scientific or commercial software for years. These services provide many advantages to users by reducing the cost of software, hardware, tools, personnel and transportation services.

The results of GNSS observations uploaded to these services provide many advantages such as the possibility of downloading results from the web interface or sending the results to the users via e-mail. Many of these services are free and some of them require free membership for accessing with a username and password while using (Ulukavak, 2018). In general, these services use the data and products of the high accurate and precise International GNSS Service (IGS).

Problem definition

Getting reliable Ground Control Points (GCPs) for surveying and mapping projects is a major challenge in developing countries including Nigeria. Data from the existing Continuously Operating Reference Stations (CORS) is either not accessible or not available to users. Control establishment and mapping projects with GNSS receivers are carried out in differential mode with the use of at least two receivers. The receivers are expensive and the post processing software is costly. The existence of online GNSS processing services has provided alternative solution to this challenge. It is also necessary to evaluate the accuracy levels of these online processing centres and guide users on their application areas.

This study was aimed to carry out comparative analysis of online processing service centres and provide the accuracy levels of coordinates derived from the centres using different processing techniques.

The objectives set to achieve the aim of the study included project planning, selection and monumentation of observation points, GNSS data acquisition, processing and analysis of results.

Study area

The project site is Oyo town in Oyo State, Nigeria. Oyo town covers approximately an area of 28,454 square kilometres and it is located on latitude 7.8430°N and Longitude 3.9368°E. The selected stations for monumentation are located in the following areas:

i. Emmanuel Alayande college of Education main gate at Erelu, Oyo West Local Government Area.
ii. Bode Thomas High School along Oyo / Ogbomosho road, Atiba Local Government Area
iii. Along Awe / Iwo road, Afijio Local Government Area, Oyo.
iv. Federal College of Education (Special) main gate, Afijio Local Government area,
v. Federal School of Surveying, Oyo East Local Government Area

The selected points were beaconed with concrete pillars of cement, gravel and sand mixed in the proportion of 1:2:3 (one portion of sand, two portions of gravel and three portions of sand) of dimension 20cm x 20cm x 100cm.

Online GNSS service centres used

The study used the following online services:

i. Online Processing User Service (OPUS): This is operated by the US National Geodetic Survey (NGS). Users can upload dual-frequency GPS data collected with a survey-grade receiver in static mode. The centre can process the data either as static or rapid-static modes depending on the data span. Observation files under two (2) hours are processed as rapid-static whereas files between 2hrs. and 48 hrs. are processed as static. OPUS utilizes relative positioning for positioning with respect to three nearby CORS

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Figure 1: Selected Control Points (Red Squares) plotted in Google Earth

stations. The solution will be sent via the e-mail provided by the user within few minutes.

ii. MAGIC GNSS: The free online multi-constellation GNSS PPP service was developed by the Spanish GMV Aerospace and Defense Company, in 2008. This service supports not only GPS but also other GNSS satellites. Users can send the dual-frequency observation files via the service's web site or e-mail. The PPP-derived coordinates can be estimated in static or kinematic modes. The magicGNSS provides three different levels of usage as: a post processing service (for registered users), e-mail service (free) and real-time service. The results including coordinates and the reports are sent back to the users through e-mail.

iii. Canadian Spatial Reference System – Precise Point Positioning (CSRS-PPP): The service has been operated by Natural Resources Canada, Canadian Geodetic Survey since 2003. The online post-processing PPP service is free and users submit GNSS data to the service via web page with a valid e-mail address to which the processed results will be sent. It accepts single or dual-frequency data from GPS and GLONASS satellites by using the best available ephemerides (final, rapid or ultra-rapid), and can process the data approximately 90 minutes after data collection.

iv. Automatic Precise Positioning Service (APPS): The service is operated by NASA Jet Propulsion Laboratory, California Institute of Technology. User can send their observation files via web site, e-mail or service's ftp site. The PPP-based service provides static and kinematic processing modes by using JPL's GPS orbit and clock products.

v. AUSPOS-Online GPS Processing Service: This free online service provided by Geoscience Australia accepts only dual-frequency geodetic quality GPS data observed in static mode for more than 1-hour data span (preferably 2-hour). The service does not process kinematic data and other GNSS data. The data can be sent to the service through the web site or using ftp site. It utilizes a relative method for positioning by establishing a network consisting of the nearest 15 IGS stations using the best available IGS products. The result in Adobe PDF format includes station coordinates computed in ITRF2014 and other information will be e-mailed to the user when the processing is completed within few minutes.

vi. Trimble CenterPoint RTX (Real Time Extended): The free service operated by Trimble provides a cm-level of accuracy for positioning globally using dual-frequency data collected in static sessions for at least 60 minutes. The service is now available for other satellites (GLONASS, Galileo, BeiDou and QZSS).

Tables 1: Two groups of Online Processing Centres

S/N	Precise Point Positioning	Differential Positioning
1	MAGIC GNSS	Online Processing User Service (OPUS)
2	Canadian Spatial Reference System – Precise Point Positioning (CSRS-PPP)	AUSPOS-Online GPS Processing Service
3	Automatic Precise Positioning Service (APPS)	Trimble CenterPoint RTX

Table 2: Results from Precise Point Positioning Centres

	MAGIC GNSS (m)			CSRS – PPP (m)			APPS (m)		
STATION	EASTING	NORTHING	HEIGHT	EASTING	NORTHING	HEIGHT	EASTING	NORTHING	HEIGHT
FSS2/C1	606579.516	868635.436	321.690	606579.550	868635.441	321.596	606579.536	868635.451	321.546
FSS2/C2	607917.173	863609.119	349.254	607917.168	863609.135	349.238	607917.149	863609.138	349.251
FSS2/C3	602484.596	859950.704	300.570	602484.600	859950.734	300.544	602484.606	859950.732	300.570
FSS2/C4	600510.570	870406.310	299.743	600510.586	870406.329	299.727	600510.560	870406.320	299.743
FSS1/C1	604667.957	866959.286	337.531	604667.986	866959.293	337.517	604667.967	866959.289	337.535

Table 3: Results from Relative Positioning Centres

	OPUS (m)			AUSPOS (m)			Trimle CentrePoint (m)		
STATION	EASTING	NORTHING	HEIGHT	EASTING	NORTHING	HEIGHT	EASTING	NORTHING	HEIGHT
FSS2/C1	606579.525	868635.448	322.027	606579.548	868635.448	322.005	606579.531	868635.441	321.569
FSS2/C2	607917.147	863609.141	349.724	607917.139	863609.129	349.751	607917.137	863609.130	349.229
FSS2/C3	602484.600	859950.730	299.448	602484.596	859950.736	299.454	602484.605	859950.723	300.548
FSS2/C4	600510.568	870406.331	298.833	600510.562	870406.327	298.829	600510.560	870406.320	299.748
FSS1/C1	604667.971	866959.297	336.769	604667.963	866959.288	336.759	604667.964	866959.292	337.525

Table 4: Mean Coordinates for PPP and Relative Positioning Techniques

	PPP (m)			Relative (m)		
STATION	EASTING	NORTHING	HEIGHT	EASTING	NORTHING	HEIGHT
FSS2/C1	606579.534	868635.443	321.611	606579.535	868635.446	321.867
FSS2/C2	607917.163	863609.131	349.248	607917.141	863609.133	349.568
FSS2/C3	602484.601	859950.723	300.561	602484.600	859950.730	299.817
FSS2/C4	600510.572	870406.320	299.738	600510.563	870406.326	299.137
FSS1/C1	604667.970	866959.289	337.528	604667.966	866959.292	337.018

Table 5: Standard Deviations for PPP and Relative Positioning Techniques

	PPP (m)			Relative (m)		
STATION	EASTING	NORTHING	HEIGHT	EASTING	NORTHING	HEIGHT
FSS2/C1	0.017	0.008	0.073	0.012	0.004	0.258
FSS2/C2	0.013	0.010	0.009	0.005	0.007	0.294
FSS2/C3	0.005	0.017	0.015	0.005	0.007	0.633
FSS2/C4	0.013	0.010	0.009	0.004	0.006	0.529
FSS1/C1	0.015	0.004	0.009	0.004	0.005	0.439

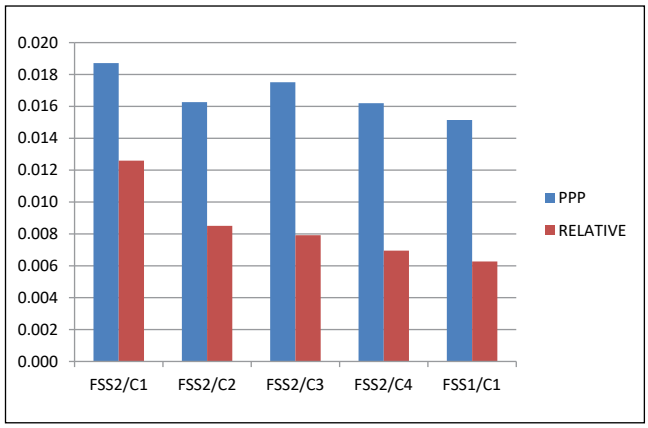

Figure 2: Standard error for Horizontal Positions

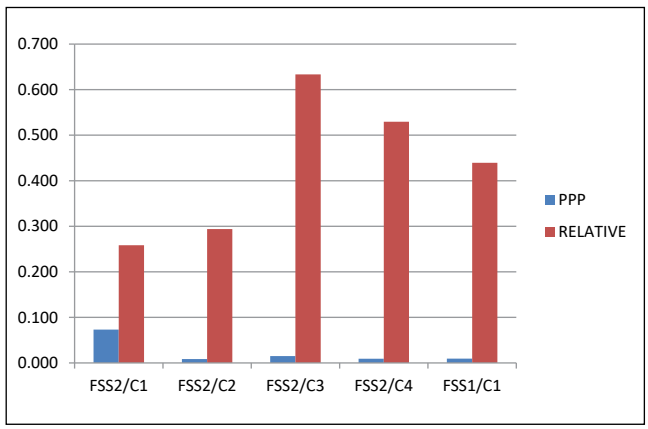

Figure 3: Standard Error for Vertical Position

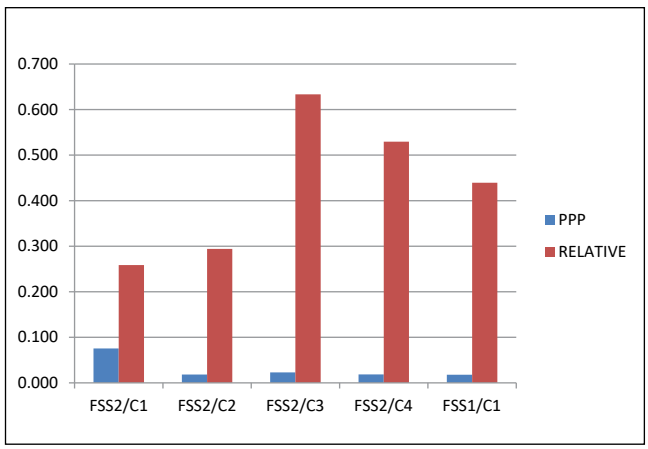

Figure 4: Standard Error for both Horizontal and Vertical Positions

Methodology

This involved the procedure and techniques adopted for the establishment of horizontal and vertical positions for the new control stations using GNSS positioning technique. GNSS receivers were properly selected and configured for the field observation. Two ground control stations established with Nignet (Nigerian Network of CORS) within the Federal School of Surveying campus were used as base stations to coordinate other newly established stations and observations lasted for two hours on each station occupied by GNSS receiver. During the observations, height of instrument was properly measured with tape and recorded.

The field observed data was downloaded and processed to obtained coordinates (X, Y and Z) of stations occupied. The downloaded data was first processed with proprietary software and uploaded to GNSS online processing centres for further analysis and more refined results. The processing methods can be grouped into two namely absolute (Precise Point Positioning) and relative (Differential) processing methods (Table 1).

The coordinates obtained from online services were projected to Universal Transverse Mercator (UTM) in Zone 31N using WGS 1984 as reference ellipsoid as shown in Table 2 and Table 2.

Table 5 shows standard deviations of the eastings, northings and heights obtained Online processing centres, standard deviation is a measure of the amount of dispersion of a set of values. A low standard deviation is an indication that the values tend to be close to the mean while a high standard deviation indicates that the values spread out over a wider range.

Ranges of standard deviations for the two positioning techniques as computed from Table 5 are:

a PPP technique

Easting Coordinates = 0.017 – 0.005 = 0.012m

Northing Coordinates = 0.017 – 0.004 = 0.013m

Heights = 0.073 – 0.009 = 0.064m

b Relative positioning technique

Easting Coordinates = 0.012 – 0.004 = 0.008m

Northing Coordinates = 0.007 – 0.004 = 0.003m

Heights = 0.633 – 0.258 = 0.375m

Examining the standard deviations in Table 5 and Figure 2, it is obvious that relative positioning techniques are more precise for horizontal positions. For height, Precise Point Positioning

Two ground control stations established with Nignet (Nigerian Network of CORS) within the Federal School of Surveying campus were used as base stations to coordinate other newly established stations and observations lasted for two hours on each station occupied by GNSS receiver. During the observations, height of instrument was properly measured with tape and recorded

(PPP) gives more precise results and it can be recommended that if users intend to establish control points in both horizontal and vertical positions, PPP is more preferable (Figure 3 and Figure 4).

Conclusion and recommendations

A comparative analysis of some online GNSS processing services for the establishment of ground control stations has been made. It was discovered that online GNSS processing services are reliable for users using either precise point positioning or relative positioning techniques. However, projects requiring high accuracy in vertical position or both horizontal and vertical position should adopt Precise Point Positioning techniques. Other factors influencing accuracy achieved include observation period which should not be less than 2 hours, height of instrument which should be measured accurately and setting the instruments away from objects causing multipath effects. The following are recommended:

i. Online GNSS data processing centres can be adopted for control establishment for surveying, mapping and engineering projects and GIS data collection
ii. To obtain high degree of accuracy, dual frequency GNSS receivers should be used in static survey method and observation should not be less than two hours
iii. There should be awareness among surveyors and other professionals on the functionality, reliability and dependability of online GNSS processing websites so that users can fully explore the potential of the online facilities in mapping and possibly cadastral applications in Nigeria and other parts of the world.

It was discovered that online GNSS processing services are reliable for users using either precise point positioning or relative positioning techniques. However, projects requiring high accuracy in vertical position or both horizontal and vertical position should adopt Precise Point Positioning techniques

References

AUSPOS - Online GPS Processing Service: https://www.ga.gov.au/scientific-topics/positioning-navigation/geodesy/auspos

Canadian Spatial Reference System (CSRS): https://www.nrcan.gc.ca/maps-tools-publications/tools/geodetic-reference-systems-tools/canadian-spatial-reference-system-csrs/9052#csrs

Ghilani, C. D. & Wolf P. R. (2012). Elementary Surveying: An Introduction to Geomatics 13th ed., Upper Saddle River, New Jersey Pearson Education, Inc., pp.331-397

International GNSS Service (IGS): The IGS at a Glance. http://www.igs.org/about (Accessed on 15th January, 2020)

Isioye, O. A., Moses, M. & Abdulmumin, L. (2019). Comparative Study of Some Online GNSS Post-Processing Services at Selected Permanent GNSS Sites in Nigeria. http://dx.doi.org/10.5772/intechopen.79924

MAGIC GNSS: https://magicgnss.gmv.com/# (Accessed on 17th January, 2020)

Online Positioning User Service (OPUS): What is OPUS? https://www.ngs.noaa.gov/OPUS/about.jsp (Accessed on 17th January, 2020)

(Accessed on 15th January, 2020)

The Automatic Precise Positioning Service (APPS): http://apps.gdgps.net/

Ulukavak, M. (2012). *Evaluation of GNSS Data with Internet Based Services: The Case of HRUH Station* (pp. 73-74). http://dx.doi.org/10.5772/intechopen.79064

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See inside **TRIUMPH-3, J-Mate, GNSS Signals** and more **>>**

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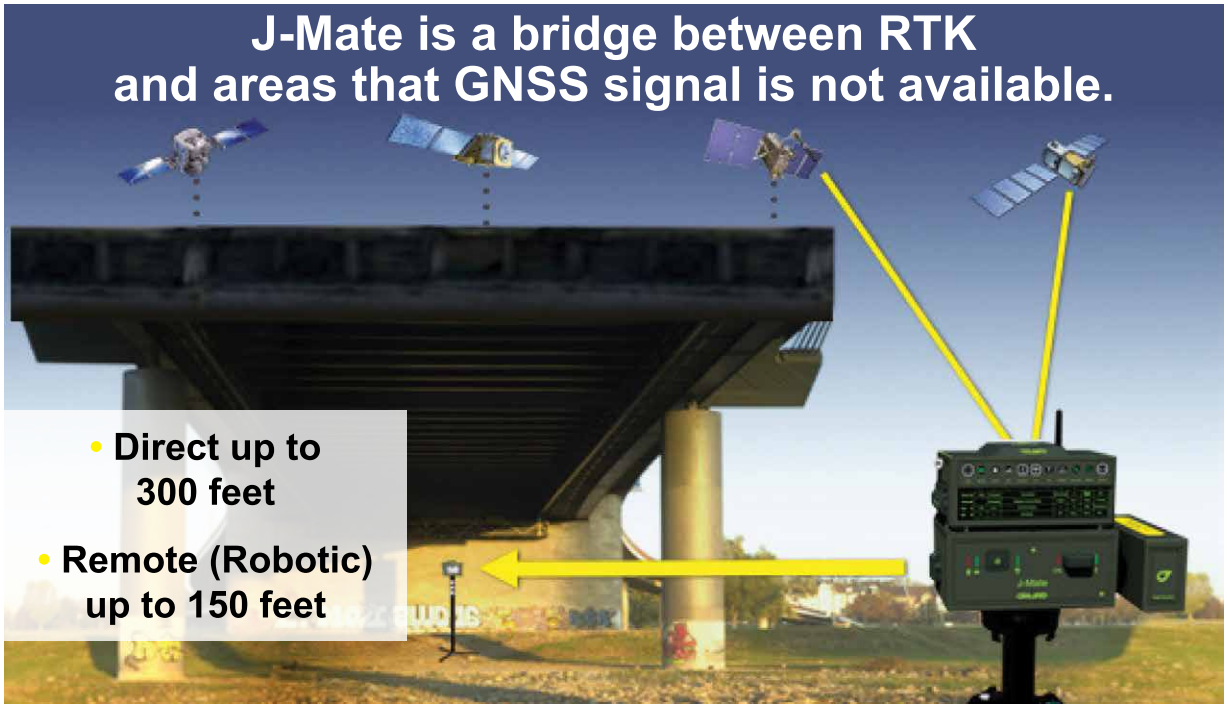
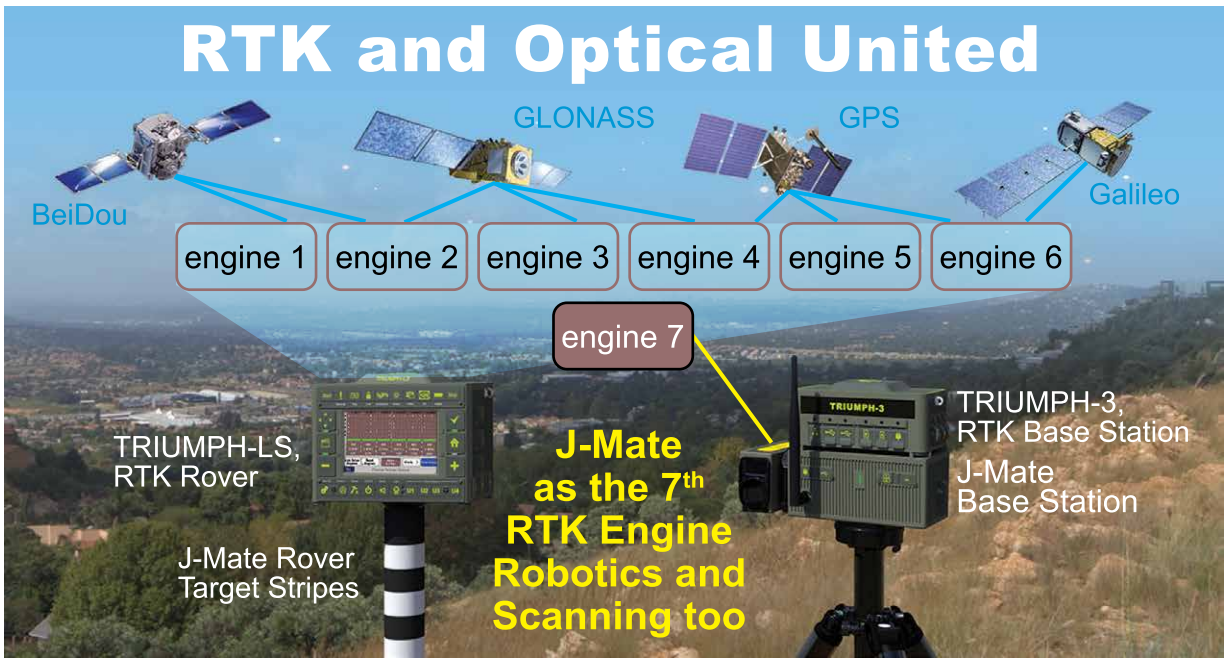


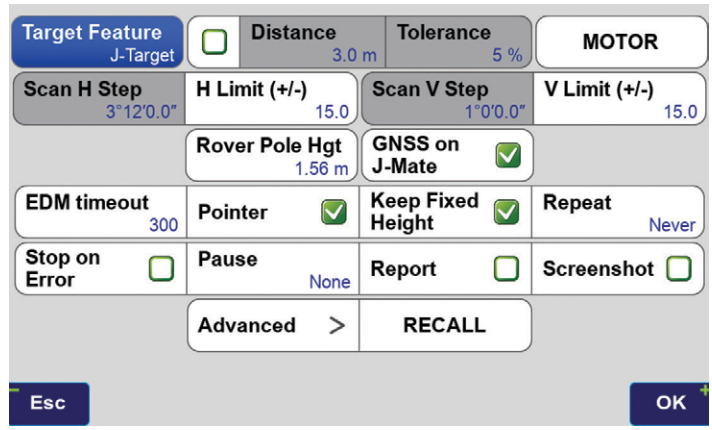
J-Mate is not a total-station. J-Mate and TRIUMPH-LS together make the "Total Solution" which is a combination of GNSS, RTK, camera, angle encoders and laser range measurements that together do, conveniently and cost-effectively, a lot more than a total station. For long distances, you use GNSS and for short distances (maximum of 300 feet in Direct mode and 100 feet in Remote/Robotic mode), you use the J-Mate along with the TRIUMPH-LS. Together they provide RTK level accuracy (few centimeters) in ranges from zero to infinity.



Searching and finding objects by laser and by Optics

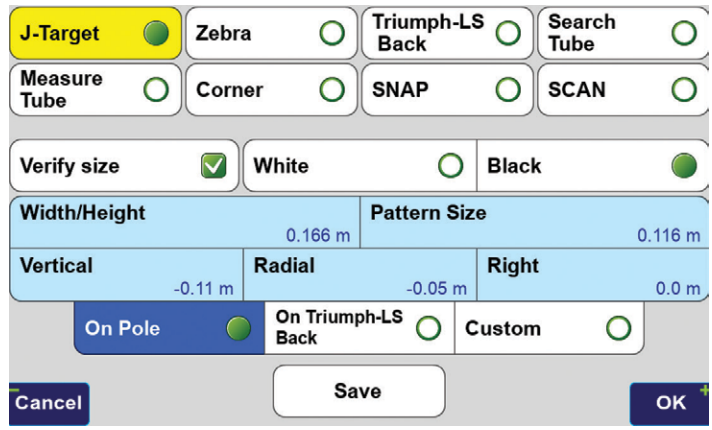
J-Mate has the unique feature of searching for objects by laser and by optics (camera).

Click button  and select “Target Feature” to see the setup screen for target selection and parameters. If you know the approximate distance to the target, click the check box and enter the distance and accuracy percentage. This will help J-Mate to ignore targets that are outside the range.



Horizontal and Vertical Limits are the limits that J-Mate will search around the starting point to find targets.

“Keep Fixed Height” check box, scans horizontally on fixed target height. You may rarely need to use this feature. It will reduce the scanning speed by a factor of 2.



“Laser time limit”

The time that it takes for a laser measurement depends on the reflective surface of the target and weather conditions (dust and moisture in the air).

On a good white reflective surface and in clean air, it takes about 50 milliseconds to have a laser reading. If there is no reflective surface, or the reflective surface is black, it may take up to 4 seconds to have a laser reading.

If the surface of the object that you want to scan is a good reflective surface, limit the laser time to a fraction of a second. This will cause the laser to skip points that do not reflect enough energy in the time limit that you specified. This will significantly increase the scan speed and will ignore points that are not possibly your target and reduces the chance of identifying a wrong object.

Target Features and its offset from the top of the pole are shown in the “Target Features” screen. You can change the parameters by selecting the “Custom” button.

TRIUMPH-LS Back: You can use this feature to search for the back of TRIUMPH-LS and measure to its center to make sure laser range measurement is not from an unintended object.

GNSS Signals in the improved TRIUMPH-LS with the new chip

1130	1140	1150	1160	1170	1180	1190	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300
GPS		L5		A			P2, L2C		B								
GLN					L3		C		CA2, P2		D						
GAL	E5A		E			E5B		F									
	E5-altBOC							G					E6		H		
Bei	B2A		I			B2B		J				B3		K			
	B2-altBOC							L									

1535	1540	1545	1550	1555	1560	1565	1570	1575	1580	1585	1590	1595	1600	1605	1610	1615	1620
GPS			CA, L1C, P1					M									
GLN								CA1, P1					N				
GAL			E1					O									
BEI			B1C					P									
	B1					Q											

GNSS bands for GPS, GLONASS, Galileo and BeiDou signals are depicted in the above figure.

There are total of 22 signals in 17 frequency bands labeled “a” to “q”. Note that GPS C/A, L1C and P1 are in the same band (m) and GLONASS CA/L2 and P2 also are in the same band (d) of the same satellite. In selecting signals for RTK processing, as an option, we may choose to select only one of such signals in the same band. We label this option as “No Same Frequency” option in signal selection strategy screen, discussed later.

GPS				GLN				GAL				BEI			
C/A M	1.0	8	8.0	C/L1 N	1.0	8	8.0	E1 O	1.0	6	6.0	B1C P	1.1	8	8.8
P1 M	0.8	8	6.4	P1 N	1.2	8	9.6	E5B F	1.2	8	9.6	B1 Q	1.0	9	9.0
L2C B	1.0	8	8.0	C/L D	1.0	8	8.0	E5A E	1.2	7	8.4	B2B J	1.2	9	10.8
P2 B	0.8	7	5.6	P2 D	1.2	7	8.4	Eboc G	1.5	6	9.0	B2A H	1.2	8	9.6
L5 A	1.1	5	5.5	L3 C	1.2	2	2.4	E6 H	1.1	8	8.8	Bboc L	1.5	8	12.0
L1C M	1.1	8	8.8									B3 K	1.1	10	11.0

We categorize the GNSS signals as shown in the above figure. The first column is the name of the signal and its designated signal letter (e.g. GPS C/A m). Signals with the same color are those that we discussed earlier as being in the same frequency band of the same system.

The second column is the quality indicator of that signal. Because GPS P1 code, for example, is encrypted and in recovery we lose about 10db of its signal strength we give this signal the quality indicator of 0.8. GLONASS signals also get lower score because of their FDMA signal structure which results in inter-channel biases, even though we reduce such inter-channel biases in our signal processing techniques. Galileo AltBoc and BeiDou AltBoc signals get quality score of 1.5 because of their wide band and signal quality.

The third column is the number of available signals for RTK.

The multiplication of the second and third column is shown in column four, which is an indication of the value of that signal for RTK.

The four super engines

This screenshot shows the four super engine screens. Each engine shows the signals that are used for that engine.

The numbers below each engine are:

- First line is the GDOP of the selected satellites for each engine.
- Second line is the number of signals used / number of signals rejected.
- Third line is epochs since the last reset.
- Fourth line is the solution difference from the first engine.
- Fifth line is the total run time.
- Clicking on each engine, restarts the RTK fix process.
- Long click on each engine to select signals for that engine manually as shown in the figure below.

This screen shows all signals tracked by the TRIUMPH-LS which is real-time indication.

For each system, the name of the signal and its designated signal letter and quality indicator (e.g. GPS C/A M 1.0) are shown. GPS and GLONASS Signals with the same color sideband are those that we discussed earlier as being in the same frequency band of the same system.

Next to the signal name, the top number in each cell is the number of signals tracked by the Rover and the number below that is the number of signals tracked by Base. The smaller number of the two represent the number of common signals between base and rover.

You can long click on the signal name to change the quality indicator of that signal.

Each system is sorted by the number of common signals multiplied by the signal quality indicator.

The number below the signal name is the percentage of noise in that band. Numbers above 30% hint possible spoofing in that band. In case of jamming the original signal and adding a spoofed signal, this percentage may raise to even 200%.

"Auto Setup Engine" button selects signals for each engine automatically according to the strategy option selected by user.

For selection strategy, hold the "Auto Setup Engine" which leads you to the following screen.

"Maximum Signal" box allows you to limit the number of signals used for each engine. Numbers above 60 limits RTK solutions to one per second. Numbers below 30 allows 5 Hz RTK.

The "No Same Frequency" check box selects only one of the GPS and GLONASS signals in the same band as explained earlier.

Click "Strategy" button to select the strategy for automatic signal selections for each engine.

You can long click on each engine and select signals for that engine manually.

In "System based" strategy, for the first engine all GPS signals are used (subject to the check box and Maximum Signal parameters) and then complemented with the best other signals up to the "Maximum Signal" limit. The other three engines are similarly selected by giving preference to GLONASS, Galileo and BeiDou, respectively

In "All the Best" strategy, the best signals among all systems are selected and identical signals are given to the four engines (subject to the Maximum Signal number and the No Same Frequency Check box).

No signal type will be selected unless at least four satellites transmit that signal.

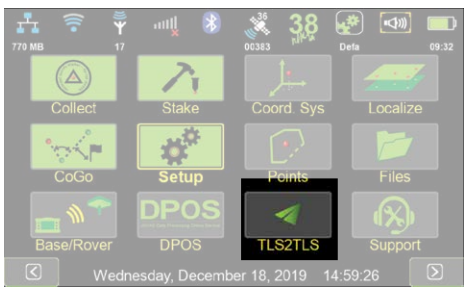
Each engine can accept maximum of 8 signal type. And each signal type can have maximum of 10 signals.

Clicking the "Reset Engines" button, resets all engines.

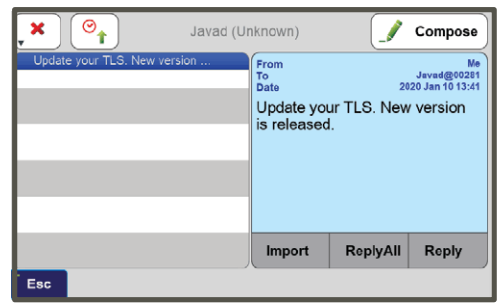
You can switch between "Convention Tracking" and Independent Tracking by clicking on this button. Conventional tracking users information from the L1 band to help other bands.

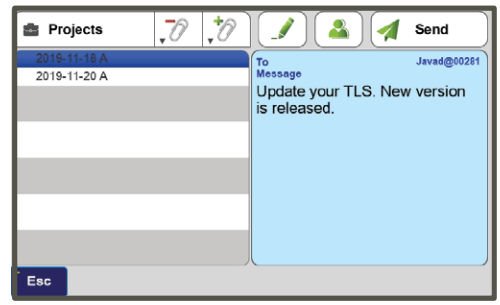
The number of the bottom right of the Figure 3 is the number of lost data from the base since the last reset. Long click to reset it to zero.

TLS2TLS



You can send and receive text messages and files from and to other TRIUMPH-LS units. In the Main screen click TLS2TLS and then in the "Compose" screen, click and enter names and serial numbers of the TRIUMPH-LS units that you want to communicate with. You can attach Projects, Screenshots, Images, Audio, GNSS RAW files to your text messages and send to the selected TRIUMPH-LS units.





The received messages are shown in the first screen. You can "Import" the attached files, if any, to your local unit. Click "Reply" to reply to a message.

You can reply to received messages by clicking the "Reply" (only to sender) or "ReplyAll" (to all recipients) buttons.

You may receive "Public" messages from JAVAD GNSS team. You do not to reply to them.

TRIUMPH-3

The new TRIUMPH-3 receiver inherits the best features of our famous TRIUMPH-1M.

Based on our new third generation TRIUMPH chip enclosed in a rugged magnesium alloy housing.

The TRIUMPH-3 receiver can operate as a portable base station for Real-time Kinematic (RTK) applications or as a receiver for post-processing, and as a scientific station collecting information for individual studies, such as ionosphere monitoring and the like.

It includes options for all of the software and hardware features required to perform a wide variety of tasks.

- UHF or Spread Spectrum Radio
- 4G/LTE module
- Wi-Fi 5 GHz and 2.4 GHz (802.11 a, b, g, n, d, e, i)
- Dual-mode Bluetooth and Bluetooth LE
- Full-duplex 10BASE-T/100Base-TX Ethernet port
- High Speed USB 2.0 Host (480 Mbps)
- High Speed USB 2.0 Device (480 Mbps)
- High Capacity microSD Card (microSDHC) up to 128GB Class 10;
- “Lift & Tilt”
- J-Mobile interface

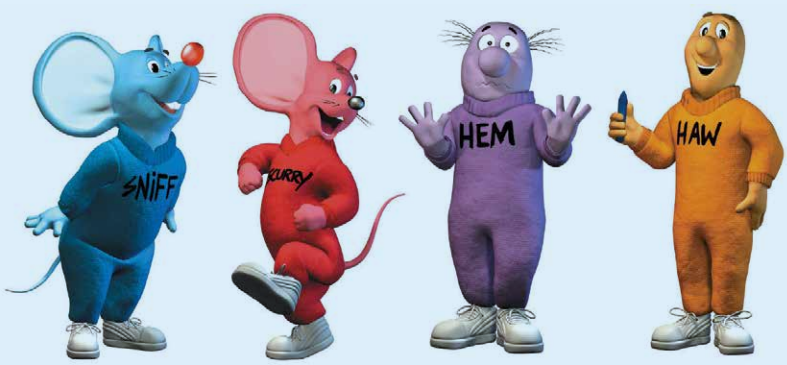
Ideal as a base station

Who Moved My Base?

Real story by Shawn Billings

I was surveying in a rural neighborhood with lots of trees near a Corps of Engineers lake. There were not many base locations nearby, so I had to find a place about a mile by road (or 3500' straight-line) from my site to set up the base. The choices were few, but I found a place that was clear near the side of a public road about 600-700 feet from a house. I set up and started my job. All was going well and I had about 30 minutes - an hour left before I would be finished with the job. It was promising to be a productive day! Then my LS reported that my base had moved!!! I ran for my truck and quickly navigated the windy roads back to where I set it up. Adrenaline was pumping as I considered that my base was likely stolen. I showed up, semi-relieved, to see a woman standing by her car, arms folded near where my base once stood. I immediately figured this was the property owner where I put my base and she wasn't happy with my trespass. She gave me a good verbal lashing. I simply wanted my base back so I sheepishly agreed that I was in the wrong for putting my threatening equipment on her property a five feet or so from the top bank of the road ditch. About thirty feet away, they had some old culvert pipes stockpiled. There, the owner had stuffed my still-running Triumph-2 on the tribrach and tripod into one of the culverts. The HPT435BT, also still running, was plugged into my large deep-cycle battery which was placed behind the culverts. I still don't know how she didn't damage any of it by moving it from the setup and shoving it into the 12" pipe. She took my picture as I loaded up my truck and I waived affably offering to give her a business card so she'd know who I was. She replied with a few more expletives and I was on my way. I ended up completing the job with my total station (the first time I've used it in many months). But I was extremely thankful for the base guard feature that immediately warned me of trouble at my base and even more thankful that I was able to recover it and that it is still in good working order.

To take advantage of the base guard feature, make sure that your Javad base receiver is calibrated. You can do this by connecting to the base in base/rover setup and then going to the calibrate screens in J-Field. Calibrations made while the base is connected will calibrate the base instead of the LS. Once done, be sure the base guard feature is checked on.



MISSION 2020

India needs the Land Titling project 'yesterday'! not tomorrow or day after. The paper was published in February 2010 issue of Coordinates magazine

Prof Prabhakar Misra is a name taken with reverence and held in high esteem in the goematics community in India. He has been involved in geomatics field for over five decades and his contributions to the domain have been immense. Educated from the Ohio State University, USA he had been the Director, Survey Training Institute and the Dean, Indian Institute of Remote Sensing, Dehradun. With his innovative thinking and immense contributions, he added many dimensions to the geomatics domain in India. We at Coordinates had the privilege of working with him and mentored by him.

We lost Prof. Misra on March 13, 2020. Here we re-publish one of his papers Mission 2020: Land Titling project.

Consider the scenario, date.1.1.2020: "Mr A buys property in Meerut, city in Uttar Pradesh (UP), India from Mr B in Dec 2019. The ownership-title that Mr B is the Owner, is guaranteed by the Government Registrar. As a matter of fact, all the properties with the names of their owner (s) are recorded centrally In the computer in the office of Land Survey Department of UP. the location like trees and wells, etc are all photographed on an aerial photograph. The coordinates of the building have also been recorded taking the halp of the most accurate technology of global positioning system (GPS). Central survey organization, an offshoot of the Survey of India and NSDI, had been entrusted with this titling project, which started in 2010."

Do you agree, with the above scenario? Doubtful? You don't have to be. Many countries of the developing world, namely, Thailand Vietnam and Philippines have finished substantial part of their land titling project United Kingdom have also enacted Land Registration Act, 2004.

Compare with the present status

Land Registration Act, 1908

Only documents are registered under this Act. Interestingly, for argument sake, Taj Mahal can be gifted by Mr.A to Mr.B and the gift deed can be registered. The property is only 'described' by the 'delineation' details of the boundary. The proper location in survey terms (coordinates) are not stated. Law Commission, in its sixth report, 1957 did take up this subject but made recommendations only to improve the provisions of the Act (Registration Act). Nowhere we find the 'vision' of guaranteeing the ownership of the property. It is this lacuna, a megaone, (of absolute ownership) which is being addressed in this paper.

Major and lasting advantages of land –titling system

Land titling project (LTP) will provide lasting and epoch making advantages to the nation. Some of those are:Assured ownership of the property The government, after due diligence, will guarantee the ownership. This will greatly enhance the trustworthiness of the thousands of land-transactions taking place in the country. People will have secure land-tenure, devoid of all hassles. Compare this with million of man day lost in going to courts, notices in the press and spending loads of money.

Reduce litigation regarding land and property

Look at these alarming figures! At one time (1980) West Bengal state had 80,000 writ petitions pertaining to only land related cases which keep going on and on for years. Consider the backlog in terms of all, the states and involved people. 'Pucca Registry' will greatly reduce land – related cases through better land tenure. Banks will find it easier to offer credit as it is already happening for regular Patta Holders .

Quality of life

The project on Land Titling is not only a technology project but it is indeed, a people-project guaranteeing major improvements in quality of life. Crores of low/high income persons alike will benefit from it. In Thailand where the fruits of such a project have reached the masses prove a better quality of life.

Super objectives of the project

- To create a state –wide, computer based, State Property Register acting as a source of providing information on the ownership of land / property in its final basis.
- The time taken to get the desired information/certificate should not exceed four hours (half-day) at the designated office (say, Tehsildars office)
- The process of obtaining the desired certificate should involve minimum legal support from professional community.
- Proper provisions will be made to update/ revise the records.

Sub-objective(s)

Municipal corporation, panchayat and such like organizations will be provided opportunity for strengthening the system.

Role of modern landinformation technologies (LIT)

LIT will play a major role in laying the strong foundation to the whole concept and operational methodologies of the Titling –Project. Specifically:

Field control on the ground

The laid-down accuracy will be such so as to withstand the requirement of most accurate measurement (area, length, etc).The requirements of the permanent – control points on the ground should meet the required imputs for relaying the boundary etc. of the plot. Undoubtedly, GPS will be the mainstay.

Survey of topographical details

Boundaries, topographical features and permanent objects/marks.

Revision policy of surveyed information and secondary data.

Criteria for surveys

Lessons based on the experience of Thailand –Titling project are to be incorporated in Indian project. Some of these points are mentioned below:

- In case, it becomes necessary, the property boundary should be recreated/relocated on the ground. It implies that adequate number of permanent markers/witnesses should be deliberately left on the ground.
- The accuracy-specifications of the survey should be able to cater to the cost of land, present and future and operations, for example, land – acquisition, etc.
- The technology and operations should be so designed so as to cater to the revision cycle, changes on the ground due to nature (floods etc.) or man –made activities e.g. mutations, transfer, sale, etc.

Recommended LIT

A methodology for undertaking modern cadastral surveys has already been suggested by the author in 2005. (2). It is briefly described as under.

Aerial photography of the area on 1:20,000 scale is recommended.

GPS Control – Differential GPS; all Trijunctions, (permanent marks/ pillars on the ground) are to be ground controlled. Sketches of all GPS control points to be made for helping photogrammetric process.

Photogrammetric process

Aerial triangulation (or similar process) combined with the Digital terrain models is to be completed. Photogrammtric rectification, plotting or Digital Orthophotos are to be prepared. Terrain will dictate the choice of technical process.

Cadastral records

Revenue authorities should take over this important operation. The fact remains that this is the most important phase of the project.

Legal operations

Allocating ownerships and preparation of records/certificates etc. putting information on computers.

Optional (yet important) information about land

- Heights of objects can be determined.
- Information about soils, vegetation, drainage, geology, etc. can be picked up with an eye on GIS mapping.

Unique Identity number to each plot/property in India

Government of India has already constituted unique identification authority (see box no 2). The idea behind this scheme is to provide unique number to each individual citizen of India. A similar plea is being made under the land titling project, to allot a unique plot number to each property in India irrespective of whether the property is rural or urban. The system should be based on GPS coordinates. It will one day, be possible to see the plot/building on internet for any place in India. The author has suggested that NSDI and Survey of India, in their newly evolved role, should, perhaps, take this as their objective. Space does not permit full discussion of this point. But surely, Survey of India, true to its name in real sense, will get connected directly to each land / property holder in India.The above mentioned land and property data-base will provide reliable, useful, timely inputs to many schemes including land acquisition and taxation. For USA plots, try zellow.com.

What other countries are doing in land-titling?

Some lessons

Thailand Government of Thailand (Land Survey Department) was assisted by Australian Aid Agency in undertaking the project for land titling in 1981. The project was designed, inter alia, to produce cadastral surveys and to issue title deeds. This project was recognized

Historical facts: The survey responsibility of cadastral (revenue) surveys was delegated to the state land surveys department in 1905. Consequently, the technology of surveys remained stagnant; without inputs from modern technology of aerial photography, photogrammetry, GPS, GIS etc. It in only in eighties (1981) that some thoughts on computer applications combined with aerial photography were given to produce revenue (patwari) maps – example from Madhya Pradesh. Currently, computerization of land records is being carried out throughout India.

as one of the most successful projects by the United Nations. It met all the objectives including establishment of Land Evaluation Authority.

Vietnam, Phillipines and Russia also have progressed well in the issue of Land Titles. There were initial difficulties pertaining to the institutional complexities of land ownership due to political doctrines. Russian project is, incidentally, managed by USA Aid Agency. These projects are well referenced on internet under Land Titling Projects.

Lesson from foreign projects

Some lessons are very vivid and inspire confidence that replication of Land Titling Projects are bound to succeed, if proper thinking in conceptualization, implementing, institution building and participation of all stake-holders is ensured. Most important factor for success is whole – hearted support from highest echelon of the Goverrnment.

To enumerate further, some other lessons are:

The time and money spent on court procedures presently in acquiring the title .is much more than evolving a simple procedure for Land Title Project. The benefits are widespread through the community.

The base is already available in the form of Land Survey Departments. The departments have to be guided, channelized, equipped, trained and mentored to deliver the result.

Most importantly, Government's strong will is required as it happened in NAREGA (National rural employment guarantee act) project in India.

Special points for urban properties

In principle, the main features of Land Titling Project will be fully applicable to the properties in urban areas. It is however, obvious that more rigorous methods of survey will be required. This is because of higher value of land. Surveys will have to be more accurate. Consequently, those technologies which give more accurate results will be employed. Some specific discussion is, therefore, needed.

Survey technology

In urban areas even 1 square foot of land has value. it in not only in terms of money but is also important to sort out encroachments and boundary disputes in courts. The technology of photogrammetry, in its accurate application, is capable of mapping even 10cm of ground. A larger scale of aerial photography, say, 1:6000 is recommended as compared to 1:20,000 for rural areas. In many cases in India, the mapping has been done on 1:1000 scale. Photogrammetry is a proven technology in India. It is also a fact that urban areas comprise conglomeration of buildings or close cluster of settlements which create shadows on an aerial photograph. In such cases, a partial map (whatever can be done) by photogrammetry can be produced. The partial map can be computed by filling in missing portions by ground methods.

Land use of town

Town planners need this information which can be obtained from aerial photographs and verification on the ground.

GPS control points and leveling bench marks

It is a prudent idea to create a close mesh of GPS and Level-Bench Marks in a big town. Engineers will need these points for their projects.

Environmental bench – marking of towns

Aerial photographs provide excellent data-base for these environment al teatures and vegetations and other environment features like lakes, etc.

Concept of ownerships of multistoreyed apartments, shops etc.

Multistoreyed buildings are common feature of a town. How do we determine the legal records, unique-property numbers? The problem can be solved by adopting space ownerships practices. the subject can be studies further keeping in view of the system adopted in Mumbai. Our practices could be compared with what is followed in western countries and Australia. Indeed, this could be a subject for further research under titling project.

Nilekani's unique : individual number Unique identification authority (UIA) is headed by Mr Nandan Nilekani, former CEO of famous Infosys. He is evolving a unique identification number for each citizen of India. Taking the cue from this UIA, it will be prudent that there should be a unique identity of all land and property in India. GPS technology will of course, be the mainstay of the system.How will this be evolved should be a matter of research, technical discussions and seminars.

External catalyst organizations will expedite the Land Titling Project

The titling-project will definitely need.to record the experience of other countries. We may have to borrow their experts. In such a case, it will be wise to have some collaborations with World Bank, Asian Development Bank or similar organizations. Even funding may be possible through these organizations. It is also experienced that foreign collaborative project gains momentum, priority and acceptability by our own government department in central, state or level.

Making a beginning

A good beginning could be made by the Ministry of Rural Development by creating an Advisory cum Steering Committee on the subject. After all Titling Project is a follow up of land records project under the Rural Development ministry. The committee may be constituted on a broad-base comprising academics and practitioners.

Conclusion

India needs the Land Titling project 'yesterday'! not tomorrow or day after. We need to make a good beginning through a Steering Committee, as mentioned, who will identify the main 'pillars' and the 'milestones' of the project. This is a mega-project which is expected to bring major change. Therefore all the principles of management of change will be applicable to this project also. The project should be evolved in such a way that is not only 'right' but is 'acceptable' to all, especially rural people.

A brand new project always generates need for training, research, standards and reference. Letthese be started on a sound footing. The research action can even be started now, ahead of titling project. The State Departments of Land Surveys have all the knowledge and wisdom. These must be utilized. There is no of a fresh technology. Every system/ technological input has been tested and tried in India. If properly managed, nurtured and monitored, the project on land-titling is bound to succeed.

References

World bank reports on land titling Bowman,Chakriya; Thailand Land Titling Project.

Misra, P; Cadastral Surveys in India, June 2005, Coordinates

Misra P; Cadastral Surveys in India-A critique, Seminar on cadastral survey organized by gisdevelopment Oct,2000

Searches on internet provide immense information on the subject.

We Miss You!

You remember?

You told us how *values* shape our *actions* and *lives*.

You asked us to work with *like-valued* and not with *like-minded*.

You professed *not to react* and instead calibrate the *responses*.

You practiced that the *reputation* is the *biggest asset*.

You advised against *scoring points*,

Rather focus on *drawing lines*, the bigger lines.

You guided us to be *professionals with ethics*

And practice *probity* in public life.

You emphasized to *think and think together*.

You mentored us on the fundamentals that the *domain* is more *important* than *individuals*.

We remember.

We remember and cherish every moment shared with you.

We *thank you* for being with us.

We *long* to have the same *brainstorming*…

Sometime, somewhere, *again!*

Prof Misra, we miss you!

– Bal Krishna and Sanjay Malaviya

CHC Navigation introduces the Apache3 | 2020 Edition

CHC Navigation has announced the availability of its Apache3 Marine Drone, which brings a series of new features and additional enhancements to make lake, river and coastal hydrographic surveys even more productive. Combining a dual GNSS positioning and heading sensor, a stable and reliable hull attitude and an IMU sensor, the APACHE3 USV allows an uninterrupted survey while passing under bridges. Its high-efficiency 8 m/s motors and absolute straight-line technology enable a fully automatic, pre-determined course in adverse current conditions.

Following is a brief interview with Mr. Francois MARTIN, Vice General Manager - International Division at CHC Navigation explaining more about APACHE 3

You have emphasized Apache-3 Marine Drone being 'highly cost-effective' could you please elaborate this a bit more?

With this new 2020 Apache3 edition of our Marine Drone, our Marine Survey & Construction division focused on making USV even more affordable for our users. We have essentially concentrated on improving its features to bring more productivity during bathymetric surveys and reduce the cost of ownership by focusing on the lifetime of the components, especially the propulsion motors, which are more subject to wearing. At the same time, our development efforts were directed at maintaining the same price level as its predecessor.

What are the unique features of Apache-3, making it exclusive amongst other similar solution available in the market?

The Apache3 is a complete solution for single-beam hydrographic surveys. It includes not only a GNSS RTK receiver but also a complete GNSS/IMU for accurate surveying during temporary GNSS outages due to bridges, river banks, etc. In addition, we have added all the necessary features to ensure high efficiency in all survey conditions. It includes an integrated radar for obstacle avoidance, a 360° camera when line of sight is lost, automatic return to base in case of low power, 4G and 5G LAN transmission for DGNSS corrections, overspeed motors to cope with high water currents and, on top of that, a high-end professional transducer.

What are the growth prospects of Marine Drone market worldwide and how CHC would like to capitalise the same?

The market for marine USVs is steadily increasing with the adoption of the technology as it enters its mature phase. We are also seeing the extension of the applications from traditional riverbed or seabed mapping to hydrology and environmental protection. The lower mobilization cost of the USV compared to traditional manned vessels also enables the emergence of new user groups, such as engineering companies for the investigation of dams or reservoirs, for example.

The fact that our R&D team is able to manage all stages of development, from hull design to the development of GNSS hardware and software, as well as on-board navigation algorithms, gives CHCNAV a strong capacity to provide differentiated solutions for marine drones. We already enjoy an established position in our domestic market and we expect strong international growth through our global sales network.

Next generation of photogrammetry and analytics software

Pix4D has released next-generation software addressing the modern-day professional challenges. Developed in close collaboration with customers and partners, Pix4Dsurvey, Pix4Dmatic, Pix4Dinspect, and Pix4Dscan will contribute to revolutionizing the way professional customers operate and deliver their services. *Pix4d.com*

Anna University helps Tamil Nadu govt to map Covid-19 cases

The Institute of Remote Sensing which comes under Chennai's Anna University, India is helping the state government agencies to map Covid-19 positive cases in the state.

When data comes in, the team physically marks it into the maps. Experts are using this data to prepare a grid that will help the state agencies work on their containment zones and buffer zones and also help them with how to operate resources.

The experts use satellite base mode sensing data and GIS.

The institute has taken maps prepared earlier for various projects they have worked on like the Tsunami, Disaster Management, drought, and water resources and have overlayed those maps together to create a wide grid.

Each patient's address is identified and located on this map. This they believe could also help authorities easily map surrounding areas of an active case and help local bodies identify a possible spread. Street details can also be accessed. *www.indiatoday.in*

Opens access to geospatial data for Ukrainians

The 'Verkhovna Rada' or the parliament of Ukraine adopted the Law of Ukraine "On National Geospatial Data Infrastructure" (bill No. 2370) which established free access to relevant information for citizens and economic entities.

The law establishes the legal foundations for the creation, operation and development of national geospatial data infrastructure, defining principles for its creation and development.

According to the law, a modern system of meeting the requirements of society in all types of geographic information will be formed, cross-sectoral integration of geospatial data and land register data will be provided, and basic and thematic geospatial data and metadata created by both public sector and monopoly enterprises will become available on the Internet.

It is proposed to finance the creation, operation and development of national geospatial data infrastructure at the expense of state and local budgets, funds of institutions, organizations and enterprises, contracting authorities in accordance with concluded contracts and other sources not prohibited by law. To create a national geospatial data infrastructure, existing geospatial data already created by public authorities will be used. Most provisions of this law enter into force on January 1, 2021. *www.ukrinform.net*

Excerpts from the Joint Statement on the Value of GIS in the Pandemic

The spread and effects of COVID-19 can be best understood considering space and time.

As governments are responding to COVID-19, more leaders are recognizing the value of "knowing the where." The importance of knowing where the outbreak is growing, where high risk populations are, where the hospital beds and important medical resources are, and where to deploy resources is essential. "Knowing the where" informs better decision-making.

In an effort to better understand the where, governments are recognizing the value of geospatial information and technologies and are engaging geospatial professionals to help them better understand the where to help them in their decision-making and response.

Geospatial professionals bring unique analytical and visualization skills to the table that help responders and decision-makers visualize where the pandemic is spreading more quickly and can make the important decisions regarding where response and resource needs need to be focused. The value of telling the story through a map coupled with a geospatial dashboard provides a view of the event not readily seen in a table such as a spreadsheet.

Beyond visualizing existing data, we can connect data from a location perspective, which enhances the value of the data sources being integrated. Equally important in this event is data on COVID-19 cases and testing packaged and shared in a way useful to scientists.

The information necessary to empower all partners already exists.

Current nationwide models and response efforts may not benefit from the details of local geographic parameters. Local or statewide models and response efforts may not fully take advantage of the data from other areas of the country. Hospitals are surveyed by both federal and state agencies, and the results of those surveys are not readily available to the hospitals working together to care for patients. Nationwide geospatial data will empower a coalition of participants with a better understanding of the spread and impacts of COVID-19 and improve mitigation actions.

The same data can be made available in different forms to empower people playing different roles in the response.

Researchers — epidemiologists — will benefit from nationwide COVID-19 testing data and data describing factors impacting the spread. This data needs to be as disaggregated as permissible under HIPAA and in a form readily digestible in models.

The case data could be aggregated to the same units of geography as a wealth of existing demographic data (Census tracts), which could explain and quantify local variances in the spread. Policy makers and those in emergency management can benefit from map and tabular dashboards, harnessing the power of the where by integrating data for analytics.

Blue Marble releases RDP-enabled license for Global Mapper

Blue Marble Geographics has added Remote Desktop Protocol (RDP) capability to Global Mapper Single User Floating licenses. The newly added RDP capability offers reliable, secure, and affordable access to a remote computer, allowing users of Global Mapper to maintain a high level of productivity in an off-site work environment.

With the RDP capability, users can now also access Global Mapper remotely over the internet from another computer. *bluemarblegeo.com*

Exploration Analyst software for ArcGIS Pro

This updated version of the popular software that allows oil and gas geologists and geophysicists to make better exploration decisions provides a range of new tools and features which further enhance these critical workflows.

Key to play based exploration (PBE) workflows is understanding how results of previously drilled wells inform the future prospectivity of a petroleum play. Included in version 2 of Exploration Analyst for ArcGIS Pro is the new Analyse Well Results tool, which allows users to investigate which wells succeeded or failed and to understand why, while identifying underlying spatial relationships.

Another important new feature within version 2 of Exploration Analyst for ArcGIS Pro is the Analyse Prospects tool which delivers important capabilities for prospect portfolio management, including allowing users to summarise prospects by stratigraphic stage, analysing prospect volumes against chance, and assessing play success prospect volume uplift scenarios.

MGISS helps MS Environmental protect world heritage sites

Centimetre accurate 3D computer visualisations are helping architects and townscape planners understand how proposed developments can affect UNESCO World Heritage Sites. The work by MS Environmental, using the latest satellite positioning and data collection technology from Mobile GIS Services (MGISS), has already included projects for several of UK sites.

MS Environmental (MSE) is a specialist in verified photomontages, also known as verified views and AVRs, which are computer generated images designed to show developments in their real world context. MSE approached MGISS in order to improve both the accuracy and ease of workflow for its field data capture operation. Requiring centimetre positional accuracy for each photomontage, together with a simple to use capture and recording system, MGISS implemented a new generation satellite positioning system including specialist data collection software.

MGISS designed a solution based around the Spectra SP80 GNSS Antenna which uses the unique Z-Blade technology to track all available GNSS signals to provide the most reliable measurements for the highest possible accuracies. *https://mgiss.co.uk*

Innovation in laser scanning with Pointfuse Software

California-based U.S. CAD is exploring the latest developments in laser scanning and working with Pointfuse to help shape the future of point cloud processing software following the completion of the Pointfuse authorized training program. The first in the US to complete the course, U. S. CAD will now work closely with Pointfuse to share knowledge within the AEC sector. Pointfuse software converts the millions of individual measurements captured by laser scanning, photogrammetry and mobile mapping systems into useable 3D mesh models. *http://pointfuse.com*

Improvement of Data Management and GIS Capability by The European Marine Energy Centre

The European Marine Energy Centre (EMEC), recently embarked on a project with marine data experts OceanWise to further improve GIS and data management capabilities. Throughout the project, it delivered training programs in data management, QGIS and supported EMEC to convert their existing diverse datasets into a geospatial database. They also linked QGIS to existing data systems and implemented metadata management across the business. OceanWise also assisted EMEC to update their data policy and strategy and prepare a roadmap to include data management as part of their existing business management framework. *www.oceanwise.eu*

Using drones to enforce EMCO

Police will utilise drones to conduct surveillance and monitoring of seven villages in Sungai Lui, Hulu Langat, Selangor, Malaysia, which has seen Enhanced Movement Control Order (EMCO) being enforced. *https://www.nst.com*

Officials tap 'Survey of India' to plan responses for Covid-19

Which is the biggest banquet hall in a neighbourhood that can be used as a quarantine facility for coronavirus disease (Covid-19) patients? Or, which are the entry and exit points of a containment zone, where police personnel can be deployed? These are the key questions that can be answered by a map -- created by the Survey of India in collaboration with the Department of Science and Technology (DST) -- to help officials working in Covid-19 war rooms.

"We have an existing map of the entire Indian topography. When we collect information, we also collect certain secondary information such as locations of hospitals and automated teller machines (ATMs) in an area that can be overlaid on the map. Besides, there're various other public databases, which can be integrated with this map to help the personnel working in Covid-19 war rooms to plan their responses better," said Pankaj Mishra, deputy surveyor-general, Survey of India.

The map comes with a mobile application SAHYOG, which can come in handy to add more geospatial data to provide localised delivery of healthcare services.

"We've looked at the guidelines of the health department to put together all the information that is needed for effective delivery of health services. More parameters can be added in line with the health department's requirements. For example, if they require information on the number of hotels and banquet halls in an area, the public databases already have around 70% of this data and our officers can do location tagging for the rest. The revised map will be available to the war room personnel within eight to 10 hours," said Mishra. *www.hindustantimes.com*

NSGIC issues joint statement on value of GIS during COVID-19 pandemic

The National States Geographic Information Council (NSGIC) has released a joint statement on the value of GIS during the COVID-19 pandemic, alongside its partners the MidAmerica GIS Consortium (MAGIC), Open Geospatial Consortium (OGC), Urban and Regional Information Systems Association (URISA), and American Association of Geographers (AAG).

"Galileo Green Lane" App

The European GNSS Agency (GSA) in collaboration with the European Commission has developed a mobile solution, the "Galileo Green Lane" App, to facilitate the free movement of freight, reduce waiting times at EU borders, and prioritize essential goods during the current COVID-19 pandemic response.

The app uses the positioning services of Galileo and is designed to address the needs of border control authorities and truck drivers, with two intuitive user interfaces.

Real-time visualisation

For border control authorities, the app provides a real-time visualisation of the situation at border crossings along with regular updates on the traffic flow situation. At the same time, the app provides Member States with a website where they can generate reports automatically, making it easier to comply with EU recommendations.

Several EU countries have welcomed the opportunity to use "Galileo Green Lane" and the app has been already been tested at border crossings in Hungary and the Czech Republic. Other countries such as France, Greece, Italy, Romania and Spain are about to start testing.

For truck drivers, the app provides a real-time visualisation of borders, through an EU-wide map indicating crossing times. This enables logistic companies and drivers to better prepare their routes, having advance knowledge of the waiting time at each border crossing. When drivers enter a geo-fenced area within a specified distance from a border, they receive a notification produced by the border officers on the current situation at that border. Their location is collected anonymously only when they are approaching the border and it is solely used to update the overall border picture. Crowdsourced information is aggregated, including data from the leading European real-time visibility platform Sixfold. *www.gsa.europa.eu*

FCC approves Ligado's application for 5G and IOT

The Federal Communications Commission (FCC) on On April 20, 2020, announced that it has approved with conditions Ligado's application to deploy a low-power terrestrial nationwide network in the L-Band that will primarily support 5G and Internet of Things services. The order approving Ligado's application was adopted without dissent and will promote more efficient and effective use of our nation's spectrum resources and ensurethat adjacent band operations, including the Global Positioning System (GPS), are protected from harmful interference.

"I thank my colleagues for coming together on a bipartisan basis to support Ligado's application," said Chairman Pai. "The vote at the Commission reflects the broad, bipartisan support that this order has received, from Secretary of State Mike Pompeo and Attorney General William Barr on the one hand to Senator Mark Warner of Virginia and

Congresswoman Doris Matsui of California on the other. This vote is another step forward for American leadership in 5G and advanced wireless services."

In the order approving Ligado's application, the Commission included stringent conditions to ensure that incumbents would not experience harmful interference. For example, the Commission mandated that Ligado provide a significant (23 megahertz) guard-band using its own licensed spectrum to separate its terrestrial base station transmissions from neighboring operations in the Radionavigation-Satellite Service allocation. Moreover, Ligado is required to limit the power levels of its base stations to 9.8 dBW, a reduction of 99.3% from the power levels proposed in Ligado's 2015 application.

The order also requires Ligado to protect adjacent band incumbents by reporting its base station locations and technical operating parameters to potentially affected government and industry stakeholders prior to commencing operations, continuously monitoring the transmit power of its base station sites, and complying with procedures and actions for responding to credible reports of interference, including rapidshutdown of operations where warranted. *https://docs.fcc.gov*

eCall: 2 years of saving lives

The EU launched its eCall emergency response system with the publication, on 31 March 2018, of the European eCall regulation, requiring all new car and light van types sold in the EU to be fitted with the system. Manufacturers were quick to respond, with Volvo Cars being the first to certify the system for use in its vehicles and the first to launch an eCall-equipped model to the market – presenting the V60 at the ITS World Congress 2018 in Copenhagen in September 2018.

European Commission services – specifically the Joint Research Centre – and the GSA helped pave the way for a quick and smooth uptake by the automobile industry, publishing a set of guidelines to help the eCall industry value chain to pre-test the accuracy of their new devices and understand how to reap the benefits of Galileo.

According to European Commission figures, 25,300 people were killed and 135,000 people were seriously injured in road accidents in the EU in 2017. While new automotive technologies have resulted in a sharp drop in the number of fatalities – which have fallen by 57.5% since 2001, the numbers are still high. By speeding up emergency response times by 40% in urban areas and 50%

in the countryside, it is estimated that eCall could help prevent 2,500 road deaths and save EUR 26 billion every year. *http://www.gsa.europa.eu*

ESA's Navigation Directorate supporting EGNOS and Galileo services continuity

In response to the ongoing Coronavirus pandemic, ESA's Directorate of Navigation has shifted to teleworking while also ensuring the continuity of essential tasks, in particular the continued delivery of positioning, navigation, and timing services of the Galileo and the augmentation system EGNOS.

In addition to ensuring business continuity in critical areas, the team is maintaining constant contact with the various stakeholders and several measures have been taken as follows:

The first two satellites of Galileo's Batch 3 are currently based at the ESTEC Test Centre in the Netherlands, for engineering tests ahead of launch. This test campaign has been suspended, based on the medical advice that too high a concentration of people would be needed on-site if testing were to continue.

These stored satellites are being monitored by staff visiting ESTEC every few days, to verify that all is in order.

Other Galileo-related testing continues with the aim of supporting future launches. ESTEC-based lifetime testing of the next set of rubidium atomic clocks is set to continue, involving on-site monitoring every few days.

The navigation R&D projects undertaken under the Directorate's Navigation Innovation and Support Programme (NAVISP) are continuing although at a somewhat slower pace, given the crisis. So are the Satellite Navigation projects financed by the EU's Horizon 2020 programme and which develop future technology for the EU satellite navigation projects.

Funding for safe drone navigation

The European Space Agency (ESA) has funded Ampyx Power, developer of a next-generation wind energy technology, and Omnisense, developer of locating and tracking solutions, to develop a robust fail-safe navigation system. The positioning solution will be used for automated take-off and landing of Ampyx Power's wind energy aircraft when applied offshore or over rugged terrain. The technology will be enabling as well for other drones in critical applications.

Ampyx Power develops Airborne Wind Energy Systems (AWES) using autonomous tethered aircraft as a means for generating electricity on the ground. The launch and land deck is smaller than the wing span of the aircraft. High accuracy, availability and integrity of the relative positioning between aircraft and platform is required during the final horizontal approach to ensure safe landing of the aircraft in the case of GNSS outage. The funding will cover the integration into the navigation solution of a local positioning system that seeks to provide 10 cm of relative positioning accuracy with 100 Hz update rate and an operating range up to 1 km. Ultra-wide band positioning techniques will be used to make this happen. *https://navisp.esa.int*

AeroVironment unveils Quantix™ Recon

AeroVironment has announced the availability of Quantix™ Recon, a lightweight, rapidly deployable, fully-automated reconnaissance solution that delivers high resolution, georeferenced terrain, vegetation and infrastructure imagery, providing ground forces with on-demand actionable intelligence.

With its unique hybrid VTOL design, Quantix Recon combines the vertical takeoff and landing advantages of a multirotor drone with the range, speed and efficiency of a fixed-wing unmanned aircraft. Featuring fully-automated flight operation, it surveys up to 1.6 square kilometers (0.6 square miles), or 20 linear kilometers (12.4 miles) per 45-minute

single battery flight. Multiple automated reconnaissance mode options allow users to choose between line (route), area and waypoint targeted data capture. Collected aerial imagery data is compatible with a wide range of available GIS analytical tools to facilitate further analysis. *www.avinc.com.*

Drones to patrol Nur-Sultan during COVID-19 lockdown

KazUAV, Kazakhstan's leading drone service provider and a member of Japan-based Terra Drone Corporation, has been working at the frontlines to keep communities safe amid the COVID-19 pandemic outbreak. Providing direct support to the operational headquarters set up to prevent the spread of coronavirus in Kazakhstan, KazUAV has been helping the Nur-Sultan Police Department to patrol the borders of the locked-down capital city with drones, ensuring 'contactless' surveillance and fast-paced operations. *terra-drone.co.jp*

Ascent Vision Technologies announces new CUAS System release

As the need to continue to adapt to the growing threat posed by small unmanned aerial systems (sUAS), Ascent Vision Technologies (AVT) has released the latest variant of the eXpeditionary Mobile Air Defense Integrated System (X-MADIS), offering next-generation portable, on-the-move counter sUAS capabilities.

The newest version of the X-MADIS incorporates several new hardware components for enhanced ruggedness and on-the-move accuracy in rough terrain. It also offers improved power distribution and simpler setup and deployment. To ensure no threat goes undetected, the X-MADIS combines radar with a radio frequency (RF) detection sensor for reliable detection, classification and locating of commercial sUAS. *https://ascentvision.com*

SPS986 GNSS smart antenna

Trimble SPS986 GNSS Smart Antenna can be used as a GNSS rover system or as a base station, and with Trimble's CenterPoint RTX service it can deliver GNSS positions to 2 centimeter accuracy worldwide via satellite/IP, without need for a base station fast. An onboard sensor shows verticality on the field controller screen; in the dark or hard to reach locations, work more efficiently and save time when you can't easily see the rod bubble. Using the SPS986 Smart Antenna and Trimble Siteworks Positioning Software, capture accurate points while standing, walking or driving the site in a vehicle, even if the receiver is not level.

Access™ 2020 field software

Trimble Access™ 2020 field software is now available on the Trimble® TDC600 rugged mobile device powered by Android. This combination offers surveyors the ability to leverage their familiar workflows and survey instruments while using an Android OS platform. For surveyors looking to use a smart-phone style mobile device to collect data in the field, the Trimble TDC600 running Trimble Access 2020 provides an optimal solution with its lightweight, rugged design. It is also ideal for surveyors looking for a lower-cost platform with the new Trimble Access software and workflows.

Tractable's AI to help Japan's drivers recover from car accidents

Tokio Marine, one of the world's largest property and casualty insurers, is to use an AI solution to process auto damage across its insurance operations in Japan, to help drivers recover more quickly from car accidents.

The AI solution, created by Tractable, uses computer vision technology to look at photos of car damage, making sense of it as a human would, in near-real time. It will use the AI to understand the full range of repair decisions available to it, including recommended repair, paint, and blend operations, as well as the labour hours required. Using AI in this way accelerates how quickly insurers can remotely understand both what has happened to a car after an accident, and what needs to happen next - helping insurers and repairs to agree on repairs more quickly, and getting customers back on the road faster. It's the first time that a major Japanese insurer has deployed an AI auto damage assessment solution in this way. *tractable.ai*

Multi-band RTK receiver by SkyTraq

SkyTraq has announced a 12mm x 16mm size PX1122R multi-band RTK receiver for centimeter-level accuracy positioning applications. It works with GPS/QZSS L1/L2C, Galileo E1/E5b, GLONASS L1/L2, and Beidou B1I/B2I signals concurrently.

The PX1122R has RTK initialization time under 10 seconds and maximum update rate of 10Hz. It can be configured as RTK base or RTK rover. As RTK rover, it receives RTCM 3.x data from an RTK base, or raw measurements from another PX1122R RTK base, to provide 1cm + 1ppm accuracy RTK position. When configured in base mode, it can output RTCM 3.3 data or raw measurement data. The PX1122R is designed to deliver reliable, centimeter-level accuracy positioning for both emerging autonomous precision guidance and IoT precise positioning applications, and also the traditional surveying and precision farming applications. *www.skytraq.com*

Kolmostar's instant cold boot GNSS Module

After being recognized by IoT World conference, as one of the most innovative Consumer IoT Solutions earlier this year, Kolmostar's ultra-low power, instant cold boot GNSS module JEDI-200 and its Evaluation Kit (EVK) are now fully released. It is specially designed for IoT applications such as pet and personal object tracking, livestock tracking, fixed and nomadic logistics, infrastructure tracking and shared economy. *www.kolmostar.com*

GNSS-disciplined OCXO designed for telecomms, marine navigation

A new series of disciplined oven controlled crystal oscillators (OCXOs) incorporates an internal GNSS receiver with a 1PPS output, compatible with an external GPS, GLONASS, BeiDou or Galileo source. The IQCM-112 series from IQD is housed in a 14-pin 60mm square package.

When coupled to an external aerial via the incorporated SMA connector, in the event of the loss of the GNSS signal the highly specified 10MHz OCXO will switch-in with a holdover capability of 1.5 µSeconds for a 24-hour period, maintaining lock until restoration of the reference signal. The design incorporates an internal adaptive algorithm which enables the module to 'learn' the parameters of the GNSS signal after a period of 3 days of lock so that the holdover function can start in the event of signal failure.

Depth management system for the Danish Hydrographic Office

Teledyne CARIS and the Danish Geodata Agency (DGA) have announced the successful completion of the project to implement a new depth data management system. The scope of the project program included delivery of CARIS Bathy DataBASE, migration tools, system configuration and implementation. The project also delivered a range of training and consultancy. The depth data management system provides the Danish Hydrographic Office efficient storage and management of depth data while supporting the current and future requirements, both internally and externally.

Cobham secures UK contract for GNSS anti-jamming

Cobham Aerospace Connectivity will research advanced GNSS anti-jam techniques for the United Kingdom Ministry of Defense (UK-MOD). The research contract was awarded by the Ministry of Defense's Defence Equipment and Support (DE&S) office. Under the contract, Cobham will develop means to provide assured and resilient position

navigation and timing (PNT) information derived from GNSS. The company has extensive background in advanced antenna technology and sophisticated signal-processing capabilities.

PCCW Global and UniStrong collaboration

The collaboration between PCCW Global and UniStrong will extend the value of this technology further, linking satellite positioning to 5G mobile networks to provide positioning data accurate to within centimeters, thereby creating advantages that will unlock a wealth of new services for telecommunications providers rolling out new networks to support Internet of Things (IoT), smart cities and the aviation industry. This integration of leading edge technologies will also enable the provision of smart aviation solutions for airport authorities. Based on high-precision positioning and navigation technology, new airports will be able to leverage smart civil construction works that will facilitate safer and more efficient airport operations. *www.pccwglobal.com*

HC977 Triple-Band Helical Antenna with L-band

The lightweight HC977 helical antenna is designed and crafted for precision positioning and covers the GPS/QZSS-L1/L2/L5, GLONASS-G1/G2/G3, Galileo-E1/E5a/E5b, and BeiDou-B1/B2/B2a frequency bands, as well as L-band correction services. Weighing only 42 g, the HC977 features a precision-tuned helix element that provides excellent axial ratios and operates without the requirement of a ground plane, making it ideal for a wide variety of applications including unmanned aerial vehicles (UAVs). *www.tallysman.com*

MakeItAccurate GNSS correction service

Klau Geomatics has launched MakeItAccurate, a global GNSS data correction and processing service. It takes data from any GNSS receiver on drone or survey equipment and makes it accurate. Users can now achieve centimeter (cm)-level accuracy without the need for base stations, real-time kinematic (RTK) links, data from Continuously Operating Reference Station (CORS) or other external inputs. It requires only the raw GNSS data from a drone to produce a highly precise trajectory and turn the traditional autonomous 3-5m GPS accuracy to 3-5 cm anywhere in the world.

Estonian Railways selects Hexagon

Estonian Railways Ltd., has selected Hexagon's Geospatial division to implement a transportation system that will automate and digitize the railway's infrastructure maintenance, construction and traffic management processes. The combined asset management system and GIS platform will support the company's more than 700 employees to efficiently manage assets and workflows.

Powered by Hexagon's GeoTrAMS, a web-based system for tram and light-rail infrastructure, and GeoMedia, a flexible GIS management platform, Estonia Railway will be able to visualize assets on a map while integrating with other companies and external systems. Hexagon's state-of-the-art registry will serve multiple information systems and users at the same time, centralizing the use of asset and spatial data while avoiding data duplication and ensuring that users have access to the most up-to-date information.

Developing 3D infrared sensors for unmanned vehicle navigation

U.S. military researchers are asking for industry's help in developing computationally intensive 3D infrared sensors that use triangulation and ambient signals in thermal images to create sensors accurate enough for unmanned vehicle navigation.

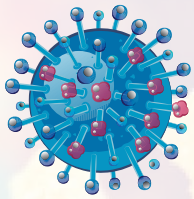
Officials of the U.S. Defense Advanced Research Projects Agency (DARPA) issued a broad agency announcement (HR001120S0045) for the Invisible Headlights project. It seeks to quantify the measurable information from ambient thermal emissions to create 3D vision. The project seeks to help researchers understand the useful information contained in ambient thermal emissions, and enable passive 3D vision for unmanned vehicle navigation. The project has two primary goals: understand the useful information in ambient thermal emissions; and enable passive 3D vision for autonomous navigation.

An ideal sensor might be able to extract many orders of magnitude more data about the environment than is attainable using conventional infrared sensors. Enabling passive 3D vision for autonomous navigation will require near-zero noise and orders of magnitude greater measurement diversity than conventional sensors -- particularly at high speeds. More than likely this will require completely new types of infrared sensors.

Qinertia, SBG Systems' PPK software now supports third-party IMUs

SBG Systems' popular INS/GNSS PPK software called Qinertia now covers all surveyors' projects by offering a license dedicated to GNSS post-processing. Open to the world, it supports all major GNSS receivers and is now open to third-party IMUs. Qinertia has been designed to offer a comprehensive suite of post-processing software to the geospatial world. It accepts all major GNSS manufacturers, and supports proprietary protocols from Novatel, Septentrio, Trimble, and Ublox for a straight-forward workflow.

It is the first full-featured post-processing software to offer a native support for Ublox F9 RTK receivers reducing the workflow as a simple "drag and drop" to guarantee data integrity and accuracy. It has been designed to help surveyors get the most of their survey very easily with a simple workflow, powerful quality control tools and leading edge tightly coupled algorithms. All of this is now offered to any surveyor with the new support of third-party Inertial Measurement Unit (IMU) or GNSS receivers. Several IMU and INS have already been successfully integrated with Qinertia including LN-200, LCI-100 and µIMU. *www.sbg-systems.com*

Tracking C  VID

COVID-19 collaboration platform launched

Companies aiming to help healthcare responses to the Covid-19 crisis can now collaborate via a new online platform.

Spearheaded by InterTradeIreland and TechIreland, the cross-border platform allows businesses to see quickly, in and beyond their region, who they can work with to combat the many supply chain and manufacturing challenges generated by the pandemic and meet pressing public need.

Presented as an interactive map, it will initially focus on healthcare innovation supports – but will soon expand to include broader economic and societal responses to coronavirus. It will also contain links to public tenders.

Already more than 100 businesses and supports are featured on the map. It highlights more than 10 key categories including PPE, contact tracing, ventilators, among others. *https://echalliance.com*

Blockchain based new App for COVID-19

The United Kingdom's Open University has developed a COVID-19 proof-of-immunity app that combines blockchain with a privacy-preserving data solution from web inventor Tim Berners-Lee.

The prototype app, undergoing testing as of April 29, would support the proof and verification of tamper-resistant test results for COVID-19 antigen tests and vaccination coverage.The solution could ostensibly be used to provide frontline workers, healthcare professionals and the wider public with reliable immunity certificates that would be stored on a distributed, immutable and trusted blockchain-based registry.

Alongside consortium blockchain technology, the app uses solid "pods" — an acronym for the personal online data stores developed by world wide web inventor Tim Berner-Lee's web decentralization project Solid.

Each user would be asked to provide proof-of-identity before antigen testing, which would then be hashed and recorded to the blockchain registry. Once test results have come in, they would be issued as a digitized immunity certificate to a solid pod on the user's phone.

A verifier would then be able to check the authenticity of any certificate by using their own mobile device to send a hashed version of the certificate to the public registry to seek a match. *https://cointelegraph.com*

StopCOVID: France's controversial tracing app

The French app StopCovid, which aims to trace people who have tested positive for coronavirus in order to slow the spread of the illness, will most likely be ready by early June. Last week, the French government postponed a debate on the tracing app project after many questions were raised over privacy issues.

Over a dozen apps are in development across Europe. The EU has called for the projects to be harmonised, but the continent is divided on how to align the technology's potential with privacy concerns. *www.euronews.com*

Galileo positioning aiding COVID-19 reaction

Since the outbreak of the coronavirus earlier this year, many apps have been developed that use satnav-based location data to monitor the global spread of the virus and to map outbreaks of the COVID-19 disease. Satnav based apps are also proving their usefulness by helping people to implement social distancing in queues and other public spaces.

Romanian company RISE has developed an app called CovTrack, which monitors people in your vicinity made identifiable via Bluetooth connections to your mobile phone and stores the identification data of these devices.

The app developed on a pro-bono basis, is a spin-off from the existing AGORA project for festival management, supported through ESA's Navigation Innovation and Support Programme (NAVISP), focused on future navigation technologies.

ESA's partner agency the GSA, European Global Navigation Satellite System Agency, working with the assistance of the European Commission, has put together a repository of such apps, available here. *www.esa.int*

Containment measures avoid 200,000 hospitalizations in Italy

Researchers have modeled the effects of containment and social distancing measures implemented by the Italian government to prevent the spread of COVID-19. Their findings show that contagion transmission was reduced by 45% in March. The model will now be used to analyze possible future scenarios.

Since the beginning of the COVID-19 pandemic, mobility restrictions and social distancing measures implemented by the Italian government have avoided at least 200,000 hospitalizations and, over time, reduced contagion transmission by 45%. *https://actu.epfl.ch*

The new smartband iFeel-You

A wearable smartband to support people in dealing with COVID19 pandemic at work or in everyday life: this is the prototype, called iFeel-You, that researchers at IIT-Istituto Italiano di Tecnologia developed

using their expertise in designing sensorized suits capable of monitoring human body parameters. The smartband is able to alert users when their body temperature is higher than 37.5 degrees and the distance to another person is too close to be safe.

While reading the movement of the human body, the smartband releases radio signals from which the distance from another bracelet can be retrieved; when two smartbands are in proximity, they vibrate, thus emitting an alert signal that helps people respect social distancing. The frequency of the radio signal is 2.45 GHz, the same of Bluetooth, but IIT developed a proprietary protocol for an easier and faster detection of human proximities. *www.eurekalert.org*

'Teamplay myCare Companion – Pandemic'

Vital medical resources will be freed up in regional Victoria in Australia as Bendigo Health becomes one of the first hospitals in Australia to roll-out telemonitoring which will be used for suspected COVID-19 patients. It has been tested on current geriatric patients to ensure its viability in the testing for readiness. The digital care application, teamplay myCare Companion 'Pandemic' delivered by one of the world's leading medical technology companies Siemens Healthineers, allows clinicians to remotely prioritise and manage patients based on their clinical needs, and has the capability to be rolled out to any healthcare service across the country.

The cloud-based remote monitoring system, built on a proven secure platform, supplies doctors and nurses with a dashboard of daily updated symptoms and health vitals to remotely stay on top of their patients' health. Symptom tracking and the use of monitoring devices, such as thermometers and pulse oximeters, will track whether the condition of the patient is deteriorating. This data will be collected and transmitted to the hospital via a secure network. The new solution also offers the remote care team the ability to securely communicate with the patient thus providing feedback and reassurance to patients who are being cared for while in home quarantine. *www.siemens-healthineers.com*

MTC, Oman forms Technological Innovation Committee

The Ministry of Technology and Communications (MTC) announced the formation of the Technological Innovation Committee to counter Coronavirus (Covid-19). The committee is headed by Eng. Azza bint Sulaiman al-Ismaili, Minister of Technology and Communications and the membership of representatives from Ministry of Health, Telecommunication Regulatory Authority (TRA), Sultan Qaboos University (SQU), the Research Council, Public Establishment for Industrial Estates "Madayn", Oman Technology Fund (OTF) and Oman ICT Group.

This step comes in coordination with the Supreme Committee for Dealing with COVID-19 and in line with government's efforts to curb the spread of this virus by adopting IT solutions as modern IT alternatives in dealing with its impact. This committee, which will be held continuously until combating coronavirus, will undertake supervising all IT initiatives directed to counter coronavirus, identifying priorities and requirements to ensure diversity of initiatives and avoid redundancy. *http://omannews.gov*

Iranian tech firms at forefront of battle against coronavirus

Iranian knowledge-based companies have forged six research and development agreements with academic and research centers, as well as the vice presidential office, to work on possible COVID-19 vaccines.

Iranian technology ecosystem has moved to the frontier of those combating the novel coronavirus, by working on treatment and vaccination, the vice president for science and technology said. Over 76 treatment projects have been devised by Iranian medical specialists and researchers, the efficiency of which are currently being examined in laboratories. *https://financialtribune.com*

$5 million for technology to recognise mask-covered faces

Israel's Corsight AI, which has developed technology to recognise faces concealed by masks, goggles and plastic shields, raised $5 million from Awz Ventures, a Canadian fund focused on intelligence and security technologies. Corsight said that it will use the funds to market the platform and to continue development. *https://in.reuters.com*

New Pandemic Management System by HK govt

Hong Kong's Smart Government Innovation Lab has been putting out a slew of innovations develops by its various incubatees.

Recently, one of its supported firms developed a solution, called Chainstopper, is a platform developed by Customindz to help humanity overcome the COVID-19 pandemic by supporting citizens and government health authorities to:

- Conduct self-diagnosis at the convenience of home without fear of stigma
- Facilitate safer movement of the public by authenticating healthy vs infected people with a digital health card to eliminate the risk of exposure
- Alert citizens when entering a hazardous zone or when getting into proximity to an infected person(s)
- Track primary, secondary and tertiary contacts of newly identified cases using GIS, telecom and Bluetooth data
- Manage cases and track key information about cases effectively
- Alert officials if self-isolation/ quarantine cases are moving out of their defined zones

www.opengovasia.com

Rapid Supplier Connect to tackle supply chain shortage

IBM has announced IBM Rapid Supplier Connect, a blockchain-based network

designed to help government agencies and healthcare organizations identify new, non-traditional suppliers who have pivoted to address the shortage of equipment, devices and supplies needed for COVID-19 relief efforts.

Suppliers and buyers currently joining the network include hospitals and other organizations such as Northwell Health, New York's largest healthcare provider, and The Worldwide Supply Chain Federation, which is onboarding more than 200 American suppliers from its 3,000 global community members.

XDBOT set for Covid-19 cleaning duties in Singapore

Developed by researchers from Nanyang Technological University, Singapore (NTU Singapore) the eXtreme Disinfection roBOT (XDBOT) can be wirelessly controlled via a laptop or tablet, removing the need for cleaners to be in contact with surfaces.

Professor Chen I-Ming, project leader and a roboticist from the NTU Robotics Research Centre, said the XDBOT was conceived when COVID19 cases started to spike worldwide in mid-February and disinfection efforts were being stepped up at Changi Airport, local hotels and hospitals.

The XDBot was developed by NTU scientists working with Transforma Robotics and two other NTU spin-offs, Hand Plus Robotics and Maju Robotics,along with industry partners Asia Centre of Technologies (ACOT) and Tungray Singapore Pte Ltd.

Developed and built on the NTU Smart Campus, the robot went from a theoretical concept to an operational prototype in two months.

According to NTU, XDBOT can navigate semi-autonomously in any environment using LIDAR (Light Detection and Ranging) and high-definition cameras, while its arm is controlled by a human operator. *www.theengineer.co.uk*

MyEG unveils AI-powered Covid-19 risk profiling system

MY E.G. Services Bhd (MyEG) has developed an extensive artificial intelligence-powered (AI) coronavirus (Covid-19) risk profiling system.

Malaysia's eGovernment services provider said the system has capabilities that include historical geolocation and anomaly tracking for travellers.

It is now making the technology available to the governments of Malaysia and the Philippines. *www.nst.com*

Voluntary coronavirus monitoring app in Israel

Around 1.5 million Israelis have downloaded a mobile app in the past week that alerts users who have crossed paths with a coronavirus patient, according to the Health Ministry, helping to improve tracking of the pandemic.

Under a ministry initiative, developers created the app "HaMagen" - Hebrew for The Shield using open-source tools so it can be quickly deployed in other countries at no cost. Users' personal and location data remain on their phones and are not available to others, so operators of the app cannot trace individuals without their knowledge.

The app allows users to decide whether to report their exposure to the coronavirus to the ministry. *https://in.reuters.com*

COVID-19 website and application launched in Nepal

Government of Nepal has unveiled a new online portal as a one-door system to provide all kind of national information and data related to the COVID-19 pandemic. It has also introduced a new mobile application that will track real time information about people in isolation or at quarantine.

People can now log into the website of National Disaster Risk Reduction and Management Authority or directly log on to covid19.ndrrma.gov.np to get detailed information about the COVID 19 situation in the country. The website shows up-to-date number of active cases, number of people recovered, total deaths, and number of people quarantined or isolated. It also displays province-wise data.

Meanwhile, the government also introduced a mobile application called Co Buddy which will give real time information about the movement of people placed in quarantine. For this, those in quarantine or isolation facilities need to install the application and have access to the internet. This will then automatically provide information about the movement of patients. *https://thehimalayantimes.com*

AIIMS Delhi to deploy robotics

As India's healthcare system grapples with increasing cases of COVID-19, robotics brand Milagrows' advanced AI-powered robots – Milagrow iMap 9 and Humanoid ELF – will be tested in the advanced COVID-19 ward at AIIMS, Delhi.

Manufactured in India, the Milagrow iMap 9 is a floor disinfecting robot that can navigate and sanitize the floors without any human intervention. The robot moves around autonomously without falling, avoiding obstruction while planning its own path, guided by LIDAR and advanced SLAM technology. Milagrow's patented Real Time Terrain Recognition Technology (RT2RT) scans at 3600, 6 times per second to make a floor map in real time with an accuracy of upto 8mm over a 16m distance.

The Milagrow Humanoid ELF enables doctors to monitor and interact with contagious COVID-19 patients remotely with no person-to-person contact, thereby significantly reducing the transmission risk. *https://cio.economictimes.indiatimes.com*

Pune, India to fight COVID-19 with Sanyam

The Pune Municipal Corporation has launched an app, viz. 'Sanyam' to keep

track of the home quarantined. They have been asked to download the app, with the GPS-always on mode. "Every ten minutes, the app speaks with the server and refreshes the location of the quarantined people. It collects the data of their geolocation and in case they breach the threshold area, the command centre executive will alert them with a green, red alert depending upon the distance.

A GIS analytics tool is developed for the 1500 strong field survey team working in the containment and buffer zones. The field data gathered by the team is superimposed on the maps on the dashboards of the command centre. The data then, using heat mapping technologies and predictive analytics, guides in marking the buffer zones. These feeds are provided to the citizen centric Information, education and communication (IEC) activities *www.expresscomputer.in*

Tamil Nadu, India to set up Data Analytics Center to fight COVID-19

The Government of Tamil Nadu has partnered with HCL to set up a state-of-the-art Disaster Management – Data Analytics Center to strengthen the State's disaster management efforts in the face of the COVID 19 pandemic. HCL is also helping improve and expand the state's disaster management helpline (1070) through technological upgradation, manpower assistance and effective reporting mechanisms.

The Disaster Management Center of the Government of Tamil Nadu (in Ezhilagam Building, Chepauk, Chennai) is responsible for the overall management of disasters across the entire state. *www.expresscomputer.in*

Dashboard to predict Covid-19 spread by IIT Delhi

Researchers at the Indian Institute of Technology-Delhi have developed a web-based dashboard to predict the spread of deadly Covid-19 in India. The mobile-friendly dashboard, named as PRACRITI – PRediction and Assessment of CoRona Infections and Transmission in India, gives a detailed state-wise and district-wise predictions of viral cases in the country.

The projections are given for a three-week period, which is updated on a weekly basis. The researchers believe that such a platform will be highly useful for healthcare bodies, local and central authorities, to efficiently plan for different future scenarios and resource allocation. *www.expresscomputer.in*

Covid-19 app, chatbot launched for people in Bihar, India

The mobile application called Bihar ka Sathi app is available for download on the Google Play Store and it provides assistance pertaining to the virus outbreak to the people in Bihar. In addition to Covid-19, the app also provides assistance with respect to complications in pregnancy and unavailability of food.

In addition to the app, the initiative called iBihar.org has also launched a web-based chatbot that provides information about various facets pertaining to the virus outbreak such as latest figures, travel advisories, mythbusters, donation options and professional advice by medical professionals etc. *https://tech.hindustantimes.com*

Robots used in Bengaluru hospital

A leading private hospital in Bengaluru deployed two robots to screen patients and protect healthcare warriors from coronavirus. "The 'mitra' robots interact with people using facial and speech recognition and screen them for Covid-19 symptoms like fever, cough and cold. They also protect healthcare warriors from being infected," *https://cio.economictimes.indiatimes.com*

Rajasthan uses technology to fight COVID-19

Rajasthan state in India has launched Rajasthan Social Media Platform (RSMP) app. All the health workers who are doing health surveys, visiting every household in the vulnerable districts have to download the RSMP app and upload the survey related information of the citizens. This information uploaded on the app will be visible on a dashboard to the respective district state health medical officer (SHMO) and other officials. The same app can also be downloaded by the citizens to register their information. There is a logical separation maintained to protect data privacy. *www.expresscomputer.in*

Automated COVID-19 Live Monitoring App

The Telangana government, India has deployed India's first automated 'COVID-19 Monitoring System App' to identify, undertake live surveillance, track, monitor, and provide real-time analytics. The app, devised by Vera Smart Healthcare, is helping officials and even the Chief Minister's Office to keep track of the situation on a real-time basis.

The app enables live surveillance, monitoring, tracking, reporting, and major bulletins. The analytics by the app also facilitate assurance to the stakeholders by providing the *www.news18.com*

BMC, India makes public GIS map of COVID-19 affected areas

The Brihanmumbai Municipal Corporation (BMC), India has made public the GIS map of COVID-19 affected areas in the city on its website, besides setting set up a 'war room' to monitor the viral infection in the city and take steps to prevent its spread.

The civic body had said that with the help of the maps, residents in those areas could take precautions more vigilantly, and people visiting those places for any work could take preventive measures. The maps of the areas where there are higher number of coronavirus cases will be posted on the BMC website to provide information about it to the public. *www.moneycontrol.com*

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International Conference on Localization and GNSS (ICL-GNSS 2020) (Virtual)
2 - 4 June
Tampere University, Finland
https://events.tuni.fi/icl-gnss2020

July 2020

GI Forum
7 - 10 July
Salzburg, Austria
www.gi-forum.org

Esri User Conference (Virtual)
13 - 17 July
San Diego, USA
www.esri.com

AEC Next Technology Expo + Conference
July 27-29,
Chicago
www.aecnext.com

August 2020

XPONENTIAL 2020
August 9-12
Boston, USA
www.xponential.org

September 2020

Commercial UAV Expo Americas
15-17 September
Las Vegas,
www.expouav.com

7th International Conference on Geomatics and Geospatial Technology (GGT) 2020
21-24 September
Royale Chulan, Kuala Lumpur, Malaysia.
http://ggt2020.uitm.edu

ION GNSS+ 2020
21 - 25 September
St. Louis, Missouri, USA
www.ion.org

October 2020

INTERGEO 2020
13 – 15 October
Berlin, Germany
www.intergeo.de

International Symposium on Satellite Navigation (ISSN 2020)
21-24 October
Nanjing University of Information Science and Technology, Nanjing, China

10th IGRSM International Conference and Exhibition on Geospatial & Remote Sensing (IGRSM 2020)
20-21 October
Kuala Lumpur, Malaysia
http://igrsm.org/igrsm2020

AARSE2020
26-30 October
Kigali, Rwanda
https://aarse2020.org

November 2020

23rd ICA Workshop on Map Generalisation and Multiple Representation (ICAgen2020)
5 - 6 November,
Delft, The Netherlands
http://varioscale.bk

Autodesk University
16-19 November
Las Vegas, USA
www.autodesk.com

European Navigation Conference 2020
22-25 Nov
Dresden, Germany
www.dgon.de

December 2020

Amsterdam Drone Week & UAM Summit
December 1-3
www.amsterdamdroneweek.com

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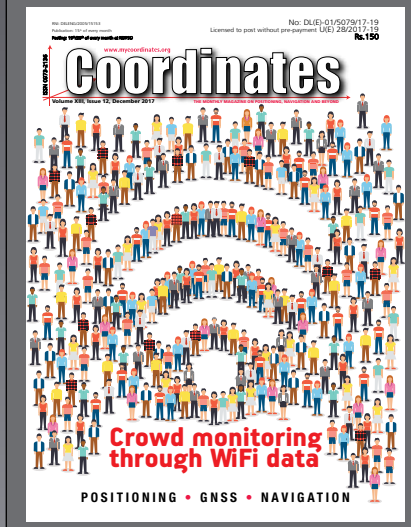

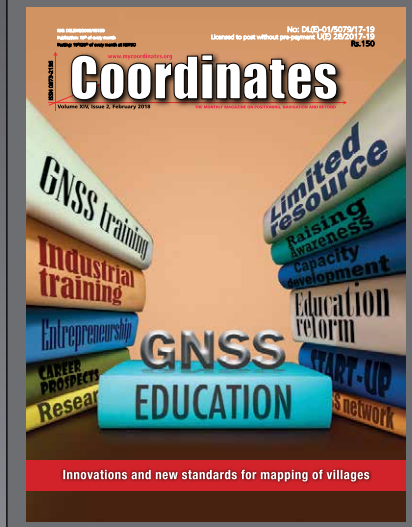

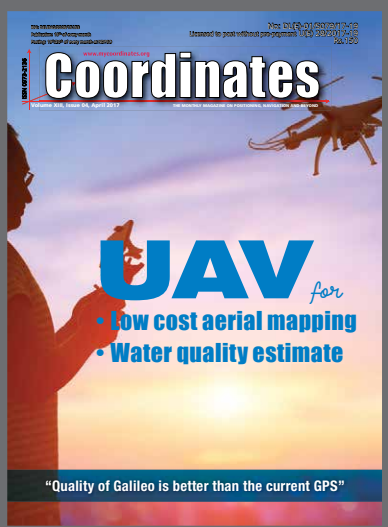

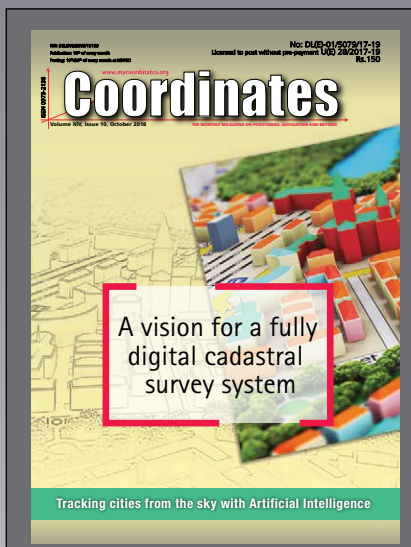

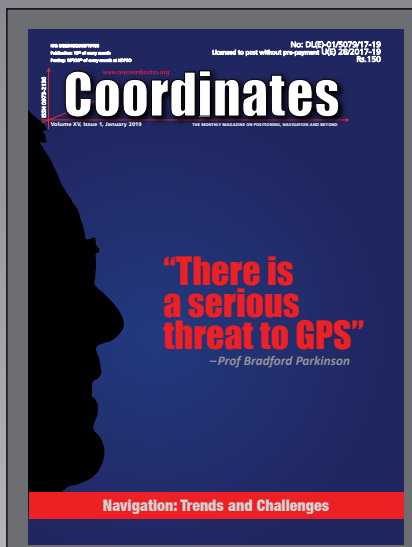

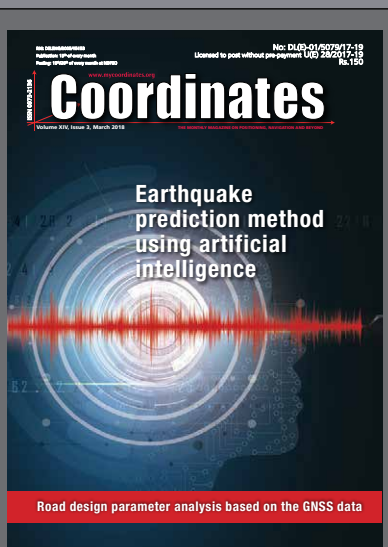

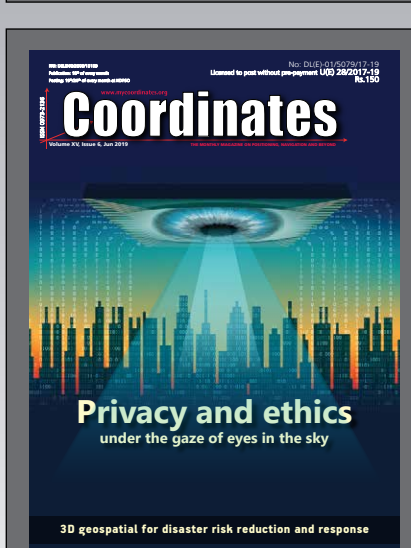

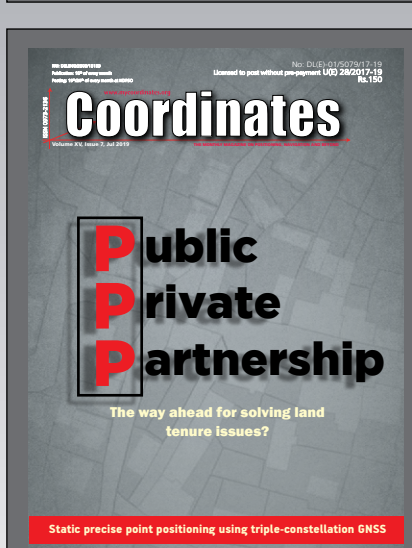

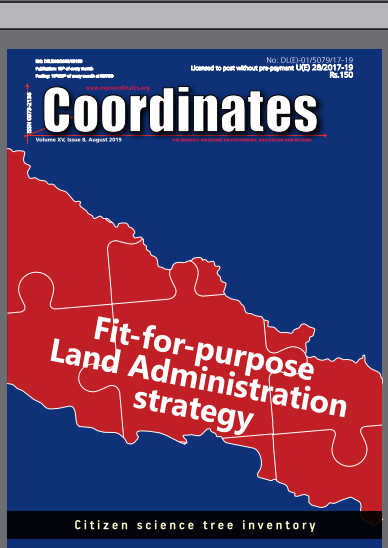

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