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THE MONTHLY MAGAZINE ON POSITIONING, NAVIGATION AND BEYOND

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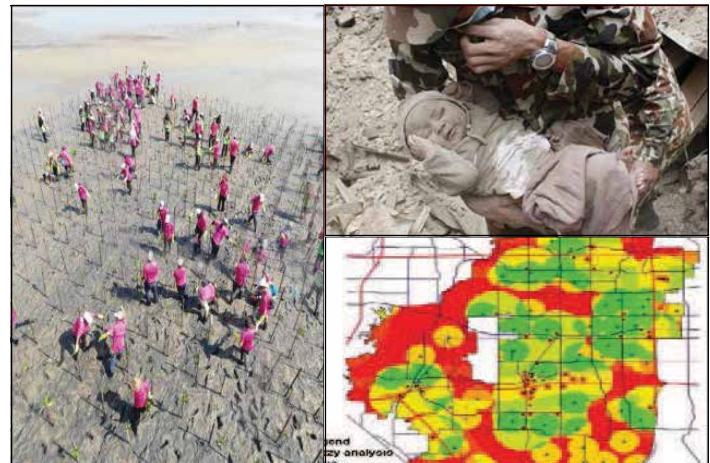
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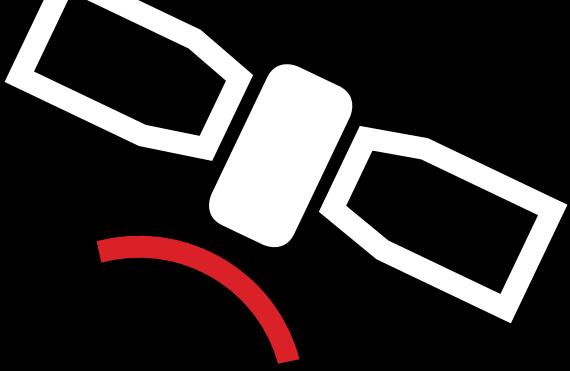
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Galileo outage

An outage

That lasted a weeklong (11th July'19 onwards)

Again re-emphasizes the GNSS vulnerabilities.

As stakes are high, so are the worries.

There will be plausible explanations

To such technical incidents

Yet they do not lessen the likely consequences.

Voices making the case for complementarity among GNSS systems

And lobby for back-up system

Gain further credence.

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Development of fit-for-purpose land administration country strategy

The paper discusses the specific strategies to implement the proposed land policy in Nepal



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Existing Nepalese Land Administration System (LAS) only deals with the formal or statutory land tenure system. Out of total arable land, approximately 75% is formally registered in the national cadaster. Remaining 25% with estimated 10 million physical parcels, mostly owned by socially and economically deprived (SED) classes are outside the formal cadaster and under constant fear of eviction. Further, unrecognized land tenure restricts the settlers for getting any compensation and government grants. Nepal Government is working on an integrated and consolidated land policy to address this shortcoming. The policy is aimed to recognize and respect all land tenure types. Therefore, the Nepalese LAS requires a new and innovative solution to be able to deliver security of tenure for all which is affordable, flexible and can be implemented to deliver results in a relatively short period. The Fit-for-Purpose (FFP) approach to land administration has emerged to meet these requirements. In this context, Nepal Government decided to develop land administration strategy for implementing progressive provisions outlined in the new Nepalese Constitution, existing and proposed land policies in compliance with international instruments such as the Voluntary Guidelines on the Responsible Governance of Tenure (VGGT), the New Urban Agenda, Sustainable Development Goals (SDGs) and human rights frameworks. This paper outlines the process in developing such a strategy in Nepal based on FFP approach. Further, the paper summarizes the results of the FFP country level strategy for Nepal with reference to the

guiding principles and key provisions for providing universal security of tenure across the entire country. The study finds that the FFP strategy is feasible and can be applied in developing countries as a quick and low-cost solution with reasonable accuracy to support good land governance to support continuum of land rights.

Introduction

Existing Nepalese land administration system (LAS) only deals with the formal or statutory land tenure system. This includes only land that has been registered in the national cadastre. Almost 28% of the total area in the country is arable, around 75% of which is formally registered in the cadastre whose tenure is secured. The LAS does not deal with non-statutory or informal land tenure which is estimated to be approximately 25% of the total arable land and settlements and are outside the formal cadaster. In the lack of any firm records, this is grossly estimated to be around 10 million physical parcels on the ground. This means that a significant amount of the Nepalese population is living in informality without any spatial recognition and without security of tenure.

Mainly three types of non-statutory land tenure in the Nepalese society exist (Joshi, Chhatkuli, Panday, & Dev, 2017) as mentioned below:

- i. The land on which rights of the settlers are recognized but not formally registered and categorized as Non-formal. The right is socially unchallenged and established. Such

- land can be registered under the existing legal framework though it has not been materialized due to technical and logistical reasons
- ii. The land on which rights of the settlers are neither legally recognized nor registered in the official cadastre is termed as In-formal. The settlers have been occupying the land for quite a long time. Their possessions are normally accepted and not challenged by the society. However, the land cannot be registered under the existing legal framework
 - iii. Illegal holding of settlers over private or public land is termed as illegal possession or encroachment. The land originally belongs to some other private or legal person, institution, Government or public/community which is being captured and settled by the other group of people and in general such tenure is neither socially nor legally recognized

Given the numerous ways of land use and their possession, their identification needs a simple, basic and understandable system. The challenges set by the overall global sustainable development agenda requires good land governance which will only be achieved when effective land administration systems are fully operational. Therefore, novel solutions are required that can deliver security of tenure for all, are affordable and can be quickly developed and incrementally improved over time. The FFP approach to land administration has emerged to meet these challenging requirements. The study aims at implementing progressive provisions on land tenure and management as outlined in the new Constitution, and in compliance with international concepts and (best) practices as outlined in the Sustainable Development Goals (SDGs), Global Land Tool Network (GLTN) tools and Voluntary Guidelines on the Responsible Governance of Tenure (VGGT) components.

The FFP approach to land administration offers a viable, flexible and practical solution to provide security of tenure for all, quickly and affordably, and to enable control of the use of all land. It provides

a new, innovative and pragmatic solution to land administration where current land administration solutions are not delivering. The solution is directly aligned with a country specific needs, is flexible to accommodate several types of land tenure, and can be upgraded when economic opportunities or social requirements arise. It is highly participatory, can be implemented quickly and will provide security of tenure for all. Most importantly, the FFP approach can start quickly using a low-risk entry point that requires minimal preparatory work. It can be applied to all traditions in land tenure across the globe.

Nepal has adopted federal system wherein state power including executive, legislative and judicial authorities are distributed within Federal, Provincial and Local Level Government bodies. Implementation of land administration falls mainly under the jurisdiction of local level government. Therefore, local level governments will now have to provide land administration services with limited technical human resources as well as infrastructure.

In this context, Nepalese land administration (LA) must undergo a thorough transformation to meet quick and affordable solutions necessitated for allocation of land and recognition of tenure after the Gorkha-earthquake and the state restructuring into a federal system.

Problems and challenges of unsecured tenure of land in Nepal

Five representative examples are presented here to highlight the challenges of unsecured tenure of land in Nepal:

- i. Figure 1 became viral in the world media during 2015 Gorkha earthquake. The baby seen in the picture below is Mr. Sonish Awal, son of Mr. Shyam Awal who has been living in Sanothimi area of Bhaktapur District for more than two decades. Their house was destructed by the earthquake and the baby was buried under the collapsed house who was successfully rescued after 22 hours. Nepal Government decided to provide compensation to the earthquake victims who lost their houses. When Mr. Awal claimed for the compensation, the government asked him to produce the land ownership certificate of his land/destroyed house. Unfortunately, Mr. Awal didn't have one as the land was not registered in the Official Cadastre. As Mr. Awal was a genuine earthquake victim who lost his home and the whole world knew about his story, the government later changed the policy and he could get compensation later. Because of the informality, he was previously denied the government's grant for rebuilding his house.
- ii. Nepal is to develop a fast track highway joining Kathmandu to the Terai area of Nepal. The alignment has been fixed. However, when the project started, there were several households already settled and cultivating the land along the proposed alignment. The government decided to compensate the landowners who would lose their lands and/or houses because of the proposed highway. Unfortunately, many of the settlers/land holders did not have the land registered in their name as the land belongs to the government (Eilani land). The lands, according to the record, already belong to the government so they cannot be compensated to the people for the same. On the other hand, the people have been occupying and using the lands for decades. After Nepal Government formed a high-level taskforce by cabinet decision (Republica, 2011), compensation was paid to the owners of unregistered land too. There are several such cases of informality which have been creating severe disturbances on the pace of development and construction of large infrastructures in the country.
- iii. Informal settlement of Thapathali, on the bank of Bagmati River is well known area in Kathmandu, the Federal Capital City. More than five hundred families have been living there for decades. Some of them have developed their colony with permanent houses where the



Figure 1 Mr. Sonish Awal as recovered from debris caused by Gorkha Earthquake 2015 (Photo Source: kathmandutoday.com)



Figure 2 Thapathali Sukumbasi Area being demolished by Nepal Government (Photo Source: The Critiques)



Figure 3 Classroom after Nepal Earthquake (above), children studying in temporary classroom (below). Photo Source: The Kathmandu Post (above), VSO International (below)

municipality and other service providers have provided basic urban infrastructures and utility services such as roads, drinking water, electricity supply and telephone. However, the area is officially public land and the settlers have occupied it informally without having any proof of ownership. When Nepal Government decided to use the land for public infrastructure development, the settlers did not agree to leave the place claiming that they are landless, and the government should allow them to reside on the land. In 2011 AD, then Government forcefully evicted some of the settlers and destroyed the houses built on the land (Figure 2). This action of the government was very much criticized by various human right agencies and international humanitarian organizations. The government has withdrawn the

decision and the problem still exists. The government doesn't have any records on who are living there, how many of these families and for how long. This is causing further proliferation of slums, obstructing development activities and worsening the beauty of the city.
iv. Similarly, many people occupied land of some other land owners in some part of the country mainly in the western Terai during decade long Maoist conflict. The then rebel's administration registered land transactions of sometimes the captured land or in other cases due to inaccessibility to the government land registry office. Now, after Comprehensive Peace Agreement, the legal title-holders or landlords are claiming back their land as they are the legal owners with formal titles, however, thousands of the households have already settled and claiming that they

have bought it/registered from the Maoist formed local government. Nepal Government doesn't have any proper cadastral database on how much land has been captured, where are they and how many households are living on such lands with informality. This kind of informality is disturbing social peace and harmony in the society.
v. More than three thousand public schools' buildings were either destroyed or partially damaged in districts affected by the 2015 Gorkha Earthquake. The schools' activities are being conducted in temporary houses (Figure 3) in adverse environmental conditions. Though Nepal Government has allocated budget for reconstructing these schools, more than one thousand schools are unable to build the schools' building. These schools do not have land owner certificate in the name of the school. As the schools

do not have the land ownership certificate the building permit cannot be issued, and they cannot build class rooms on such land.

Going through these representative cases, it can be concluded that a Fit-For-Purpose (FFP) land administration system is required in Nepal to record the existing situation of informal land tenure quickly which is affordable and require fewer human resources and infrastructure. It further necessitates to test such tools in identification, verification and recording (IVR) of spatial and non-spatial data/information on informal land tenure.

Motivation for preparation of FFPLA strategy for Nepal

Constitution of Nepal, Land Use Policy 2015 and Land Policy (in Cabinet of Ministers)

The Constitution of Nepal promulgated in 2015 has the following key mentions on land rights, security of tenure and land management.

- Every citizen shall have right to proper housing [Article 37(1)]
- No citizen will be evicted from or encroached on the housing, except in accordance with law [Article 37(2)]
- Landless Dalits (so called untouchable cast) will be given land for one time [Article 40(5)]
- Implementing international treaties and agreements to which Nepal is a State party [Article 51.b.(3)]
- Guaranteeing good governance by ensuring equal and easy access of people to services provided by the State and making public administration clean, competent, impartial, transparent, accountable and participatory [Article 51.b.(4)]
- Abolishing dual ownership and implementing scientific land reform [Article 51.e(1)]
- Discouraging absentee landownership and land consolidation for enhancing productivity [Article 51.e(2)]

Land Use Policy, 2015 and the National Land Policy (draft under discussion in

cabinet) are designed to ensure how these constitutional provisions are implemented.

VGGT and other commitments in the international platform

A good land administration system should follow VGGT Guidelines, Universal Declaration of Human Rights (UDHR), International Covenant on Civil and Political Rights (ICCPR), International Covenant on Social, Economic and Cultural Rights (ICESCR) and other international treaties and covenants related to human rights and rights to the access of property and economic resources.

Emerging technology and GLTN tools

A land tool is a pragmatic way to solve problems in land administration and management. It is a means of implementing principles, policies and legislation into action. It consists of a wide range of methods: from a simple checklist for conducting a survey, a set of software and associated protocols to an extensive set of guidelines and approaches. For land tools to provide benefits to the poor, vulnerable, disadvantaged groups and women, they need to have the following features (GLTN, 2018):

- Affordable
- Equitable and gender-responsive
- Governance
- Subsidiarity
- Sustainable
- Systematic, large-scale
- Pro-poor

The Global Land Tool Network (GLTN) is a coalition of global, regional and national allies contributing to poverty alleviation through land reform, improved land management and security of tenure especially with the development and dissemination of pro-poor and gender-responsive land tools.

“Breaking the poverty cycle by contributing to poverty alleviation through land reform, improved land management and security of tenure” is the objective of GLTN. To meet its objective, GLTN has developed 2 Social Tenure Domain Model (STDm) and Gender Evaluation Criteria

(GEC) which are being tested in many countries. Further, it has developed 16 more significant land tools. These tools are embedded in 5 predominant themes and to address 8 cross cutting land related issues.

Sustainable Development Goals (SDGs)

Land governance is about how effectively and efficiently policies, processes and institutions by which land, property and natural resources are managed. A comprehensive land governance necessitates a legal governing framework as well as operational processes for executing policies reliably within a country in a sustainable way. Land administration systems provide an infrastructure for implementing land policies and land management strategies in support of sustainable development. Access to resources including land and security of tenure for Ending Poverty (SDG 1.4), Zero Hunger (SDG 2.3) and Gender Equality (SDG 5a) are required in addition to Safe, Resilient and Sustainable Cities and Human Settlements (SDG 11).

The LAS should allow the implementation of land policies to fulfil political and social objectives and to achieve sustainable development goals. Good land governance should also be a means of supporting the 17 sustainable development goals (SDGs) which has 169 targets. A good land governance requires these core dimensions of the global agenda to be followed for empowering people through tenure security, food security, access to land and natural resources, and no land conflicts.

Developing strategy for implementing FFP in Nepal

The process of developing FFP strategy included extensive desk study and review of appropriate literature, interview with relevant stakeholders such as high-level government officials, land right activists working in the area, civil society organizations, academicians and targeted people. Several workshops and seminars were organized at central and local levels and results from the recent

studies on locally existing tenure typology in the country and the application of FFP approach for tenure security in post-earthquake disaster in pilot areas were also taken in consideration. The FFP strategy fully dwells with the three framework components: Spatial, Legal and Institutional (Enemark, McLaren, & Lemmen, 2016)

The FFPLA approach recommends that the activities of recording and registering land rights should be conducted by administrative institutions under delegated authority wherever possible. It will minimize the amount of time involved in recording and registering land rights. The FFPLA is primarily aimed at being implemented as national level programs to deliver security of tenure for all. It is a pro-poor approach that recognizes and legalizes all legitimate rights throughout the country. However, it requires political commitment up front to design and execute such national level programs within a short timeframe and at affordable costs. In cases where this political commitment is not yet in place or where there is large categorizes of ambiguous occupancy rights, the FFP approach may well be implemented incrementally through local pro-poor recordation initiatives, which starts by recognizing and recording legitimate rights as found in the local communities. These local initiatives may gain enough momentum and acknowledgement to eventually trigger wider incremental change which eventually lead to national recognition with corresponding changes to the legal and regulatory framework. The local pro-poor recordation initiatives can therefore work in parallel and be a supportive component of the national recordation process or act as a driver for change to help a country adopt the FFPLA approach.

As numerous types of land occupancy with ambiguous rights exist in Nepal, it may be considered that recognition and recordation of such informal lands start by local pro-poor recordation initiatives followed by national level programs (Figure 4). The national approach is shown in the center column starting by recognizing the various kind of tenure types to be enshrined in the land laws.

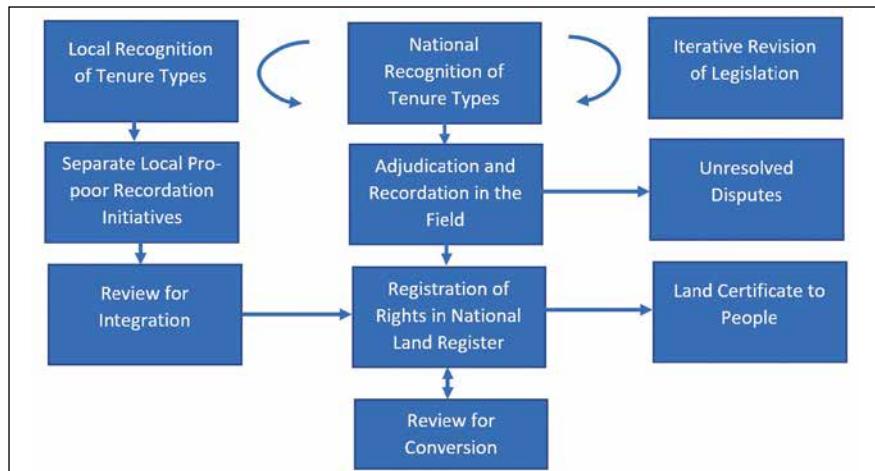


Figure 4 FFP Process for Recognizing, Recording and Reviewing Land Rights (Enemark et al., 2016)

On this basis the mapping and recording in the field can be undertaken through a participatory approach and the result can be recorded in the land register. The local approach is shown in the left column. This approach will identify and record the actual legitimate land rights through a participatory approach. These rights can then eventually be considered and recognized at national level and entered into the land register.

The paper discusses the specific strategies to implement the proposed land policy in Nepal focusing on addressing informal/non-statutory land tenure and its management according to the Fit-For-Purpose concept. The spatial, legal and institutional frameworks to be designed and implemented for proper management of such land tenure are briefly discussed.

Spatial framework

The spatial strategies to be adopted for administering informal land tenure are:

Mapping and recording non-statutory/informal land tenure

To deal with these kinds of non-statutory tenure issues, capacity of the government needs to be increased. To undertake timely, cheaply and sufficiently adequate survey for areas not yet surveyed, appropriate (Fit-For-Purpose) approaches should be applied to acquire the parcel boundary data, and, at the same time, by using a participatory approach, the various kinds of tenure held by people can be recorded.

Currently, Nepal doesn't have database on informal/non-statutory land tenure and such settlements in official cadastre. Most of the landless people have occupied government or public land or are leaving in other legal owners' land as tenants without secured or formal rights on it. It is very unjust that the existence of such people on such land is not even recorded in the official register.

Constitution of Nepal has ensured right to housing for every people. This situation is considered as violation of human right according to the Universal Declaration of Human Right and other conventions. Therefore, serious efforts are needed to recognize informal land tenure. To deal with the informal tenure, VGGT principles should be adopted according to which, the state should do the following (FAO, 2012):

- Recognize and respect all legitimate tenure rights
- Safeguard legitimate tenure rights
- Promote and facilitate enjoyment of legitimate tenure rights
- Provide access to justice to deal with infringements (violation) of legitimate tenure rights
- Prevent tenure disputes, violent conflicts and corruption

To implement these principles, mapping and recording informal land tenure is the first step. In absence of such recognition of the settlement and land tenure, many complications are seen during rehabilitation and resettlement of earthquake and flood victims. Quick and efficient mapping of such land tenure and settlements can

be done by using different techniques. High resolution satellite images can be one for mapping. Participatory methods should be applied for adjudicating rights of individual/family in the plots. It can be verified by the community involvement as well. Dense settlements can also be mapped and recorded in the same way e.g. using drones. Point cadastre can also be an alternative for fast and efficient record maintenance. Opensource software can be used for keeping the data. STDM promoted by GLTN/UNHABITAT can be a solution.

Focus on security of tenure for all

The main purpose of land administration systems is to provide security of tenure for all. The other purposes include enabling access to credit and investments, facilitating valuation and taxation, planning and control of the use of land and natural resources, supporting land development, and providing land parcel and land owners information to support decision making on land policy. The systems should identify and delineate the occupancy as well as

the use of the individual land parcels. It should be established according to the purpose. Security of land tenure only requires satisfactory identification of the land parcels and buildings on satellite/aerial images or on a map. It does not need accurate boundary surveys using sophisticated equipment and highly skilled human resources with longer survey time as well as high budget requirement.

Accuracy of parcel boundaries should be seen as a relative issue and can always be upgraded over time. Accuracy requirement is obviously lower for low value lands in rural areas than in densely built up and high value urban regions, where accurate field surveys may sometimes be justified. This principle is also being practiced by Nepal Government by producing different scales of cadastral (1:500 for municipalities to 1:2500 for rural areas) and topographic maps (1:25000 and 1:50000). The registration of legal and social tenure rights requires identification of physical land parcels and objects. The identification through visible boundaries

as seen in the aerial/satellite imagery will be adequate for securing and recording the connected legal and social land rights. Non-visible boundaries can be captured by supplementary measurement using handheld GPS or conventional field surveys, for example. If occupants want the exact boundary delineation for some specific purpose, it can be measured and registered at their costs.

Official inventory of state land is still not realized completely in Nepal. Therefore, mapping of government and public land and creating an inventory of such land is necessary. To deal with this, rights, restriction and responsibility (RRR) over the land and land-based resources should also be well defined. Community user groups can be created and Standard Operating Procedure (SOP) of use of such land can be developed in the leadership of local institutions. Various state of the art but cheap and efficient techniques can be used for creating such inventory. Along with high resolution satellite images, drone images and orthophoto (in case of



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high value land in urban areas) can also be used as per specific need and availability.

Legal framework

The existing legal framework in Nepal does not completely address several provisions made in the new constitution and as proposed in the draft for a new national land policy. Therefore, an appropriate legal framework should be designed for addressing the newly enacted constitutional provisions and the relevant policy issues at federal, provincial and local levels.

A new Land Administration and Management Act

A new unified Land Administration and Management Act (LAMA) should be drafted and enacted based on the several existing acts, to improve efficiencies, streamline overlapping provisions and address gaps.

Addressing informal tenure

New legal provisions should be made to recognize informal tenure and safeguard the rights of informally settled people. The Continuum of Tenure approach (Du Plessis, J. ; Augustinus, C. ; Barry, M. ; Lemmen, C. ; Royson, 2016) can be adopted for recognizing informal tenure rights of these people. In this approach, any types of relations of these people to land are recognized and recorded as it exists on the ground.

Using the STDM approach, Identification, Verification and Recording (IVR) of the people's association and relation to land can be recorded.

Alternative Dispute Resolution (ADR) mechanism and Provision of land tribunal

Majority of the disputes registered in different courts are related to land. The court procedures are lengthy, time consuming and costly. Most of these disputes can be litigated with the involvement of community and/or appropriate mediation methods outside of the court, which can be cheaper, faster

and even address the issue with mutual understanding and trust to end it up with a win-win situation. Therefore, the new legislation should have provisions of Alternative Dispute Resolution (ADR) mechanism such as community involvement and third-party mediation in local level. Judicial Committee under the chairmanship of Deputy Mayor/Vice Chairperson of the local government is a good move in this regard.

Land disputes have several dimensions and need specific skills, technology and human resources. Therefore, the new legislation should have provision of constituting Land Tribunals to deal with complicated land disputes, which cannot be resolved by the local efforts. This can facilitate the court process to achieve quality justice in less time and at lower cost.

Land banking

Land owners who have been involved in the profession other than agriculture can contact the bank for sale, mortgaging, leasing and financing. The small holders, landless, squatters, peasants etc. can be allocated the land stocked at the bank for their livelihood, employment, economic strengthening and entrepreneurship development.

Management of state land

Surveying, mapping, record management and security of all state land should be clearly defined in the new legal framework. Various overlapping and contradictory provisions exist in the current legal system. Various laws allocate the responsibility of state land protection and management to different institutions. It creates confusion and dispute over the jurisdiction and consequently the protection and management of state land cannot be done efficiently and effectively. Hence, a new clear and unambiguous jurisdiction should be defined, and roles and responsibilities should be allocated to appropriate institution, which can protect, use and manage all state land optimally.

Selection of appropriate technology

New legal systems should be designed in such a way that it can adopt Fit-For-Purpose approach to deliver good, cheap and fast services and ensure 'Good-enough' land governance.

Institutional framework

For the implementation of the provisions proposed in Land Policy, it is vital to develop and strengthen institutional framework in three levels of government. Several informal discussions have been conducted with various experts, professionals and stakeholders. The main strategies suggested for creating institutional framework for implementing FFPLA are categorized under three broad topics: Federal and provincial land authority, Local land authority; and other institutional issues.

Federal and provincial land authority

Strengthening/restructuring national land agencies such as Survey Department, Department of Land Reform and Management, etc. is needed to develop a consolidated and unified land authority at federal level.

Provincial level land agency should be established which should be responsible to deal with the state level functions as described in the constitution. This structure will be new as there are no such institutions present currently in this level.

Local Land Authority

Local level institution on land management should be established to deal with the local level functions. This structure will be new as there are no such institutions present currently in this level. However, the district level offices can be merged and restructured to some extent in order to address the local needs. The local land authority will be responsible for addressing the following land administration issues:

- Surveying and mapping: The local land authority may consist of a surveying and mapping unit which would be responsible for preparing and updating cadastral maps and databases

- Land ownership management and registry: Land tenure and ownership management unit is also needed within the local land authority, which would be responsible for land ownership transfers, registration of deeds regarding land transactions, buy and sale, inheritance, land records maintenance and updating etc.
- Alternative dispute resolution (ADR) mechanism: Local land authority should consist of some Alternative Dispute Resolution (ADR) mechanism for land dispute resolution.
- Land tribunal: Land Tribunal is another institutional mechanism that can be developed for efficient and effective land dispute resolution.
- Community user's groups: Best and optimum use of land and land-based resources can be ensured by involvement of community in land management process. Nepal has a very good experience of community forest management which is considered as one of the best examples in the world. Similar approach can be adopted in local land use and land management in community level. Various under-utilized
- and abandoned barren lands can be highly productive and income generating resources if they would be handed over to community. Therefore, community user's groups can be formed, and certain types of land can be handed over to the group for its proper use and management.
- Land valuation: Land valuation unit is needed in the local government. Policy, acts, standards can be formulated in collaboration with the federal and provincial agencies and can be implemented by the provincial institutions in association with the local government.
- Land use planning: A specific land use planning and technically facilitating agency may also be needed at the local level. However, the policy and act formulation, decision on technical standards can be done at federal and provincial level. This unit will be responsible for formulation and implementation of local land use planning.
- Land banking: Land bank, land stock market in local level should be established. However, the policy, acts, standards should be formulated at the federal and provincial levels.

Other Institutional issues

On top of institutional setup at federal, provincial and local levels, the following additional set ups are recommended:

- Professional organizations and associations: Professional organizations and associations may play important roles for continuous professional development. Land administration and management sector in Nepal can also benefit from making appropriate institutional mechanisms to accommodate different professional organizations and collaborating with them for good reasons.
- Survey licensing board: Survey licensing board is needed at the federal and provincial levels to decide on the qualification and skill needed for surveyors. This board may be responsible for awarding appropriate license for private surveyors.
- Private surveyors: Private surveying companies/individuals can be provided license to carryout surveying and mapping functions. In the current tradition of governance, roles and duties of the government are squeezing

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- and are limited to the regulating, coordinating and facilitating tasks.
- Human resources: Nepal is producing roughly 120 Geomatics Engineers/ Senior Surveyors, 150 Surveyors and 200 Assistant Surveyors annually. Some of these human resources are consumed by the private companies, some of them use to go abroad for higher study and some other in foreign employment and remaining in the government sector. Each local government unit will be looking for such human resources in near future to run their land administration functions. To fulfill this need, some short-term packages including basic surveying, measurement and mapping skills, basic GIS, GPS and image interpretation techniques and basic social and legal know-how of land administration can be developed and training courses can be conducted. These human resources, after getting appropriate license, may be involved in various surveying and mapping jobs as per requirements.
- Infrastructure and ICT: Physical infrastructures are necessary for sustainable capacity development. Current institutions need basic IT facilities for delivering their services effectively and efficiently. Land administration services also needs modernizing. Application of IT for transparency and winning peoples trust, appropriate infrastructures are most essential for this purpose.
- Tools and techniques: Appropriate institutional capacity is needed to handle the various tools and techniques of land administration and management in different levels. Appropriate institutional capacity can be required to accommodate, modify and customize the systems, making templates, developing uniform and consistent guidelines, standard operating procedures and working manual. A technical team and coordination mechanism would be very important for ensuring effective implementation and achieving consistent results throughout the local government within/among the provinces.

Conclusion

Nepalese land administration system is not yet complete and up-to-date. Official cadastre doesn't have a coverage of the entire country. Informal land tenure is not yet recognized and recorded in the official cadastre. FFPLA approach can be a good concept to incorporate and apply in Nepal. This concept in one hand may successfully be adopted to address the current issues in informal land tenure system; on the other hand, this can be good enough, cheap and fast in comparison to the existing technology and methods of LAS.

Various issues and limitations are identified to improve the spatial, legal and institutional aspects of LAS. Nepal has recently enacted the new constitution. It has made many remarkable and progressive provisions to make land administration system more equitable, inclusive, pro-poor and gender responsive. Various other provisions such as local governance act, National land use policy etc. have been made to achieve good land governance. New land policy is under discussion and expected to be endorsed by the government soon. These documents have made several new provisions which may not be easily implemented with the existing and traditional Standard Operating Procedure (SOP) adopted by the government. Hence, new Fit-For-Purpose approach should be suitable for implementing these provisions.

Recommendations

The following are the recommendations:

- Fresh field work and study should be conducted at some locations (at least two: one in rural and another in peri-urban area) regarding the appropriateness of data acquisition and processing using Fit-For-Purpose approach
- Standard Operating Procedure (SOP) and Working Manual should be developed before implementation
- Standard Template for uniform use of tool should be developed. Also, appropriate tool should be customized to fit Nepalese context
- Short-courses focusing application of FFPLA should be launched

- Capacity of local governments should be developed regarding application of FFPLA

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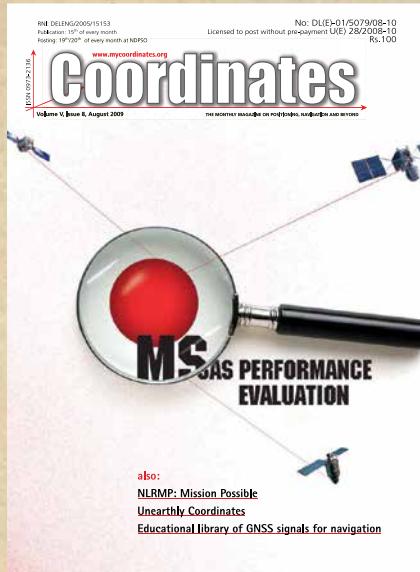
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The paper was presented at FIG Working Week 2019 Hanoi, Vietnam, April 22–26, 2019. ▶

In Coordinates

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An interview

Alexander Wiechert

CEO, Vexcel Imaging on the present and future trends in photogrammetry

What is your opinion about global sensor market, LIDAR and photogrammetry? What according to you are key points to enhance its growth?

We see the global sensor market growing in the coming years and photogrammetry will continue to gain market share constantly. When Lidar became available, some said that photogrammetry will be replaced by Lidar. This did not happen; the opposite happened. What we currently see is the re-launch of photogrammetry, the digital multi-ray photogrammetry. Huge mapping projects such as Microsoft Bing maps (former Virtual Earth) have chosen digital multiray photogrammetry as the underlying production methodology because of the outstanding ratio between collection efficiency, achievable accuracy and processing automatization, and capability of DSM and DTM generation as well as classification results.

MSAS performance evaluation under ionospheric conditions

In order to examine the capabilities of MSAS, we compare the positioning performance of MSAS and Single-Frequency precise point positioning (PPP) at 7 GPS reference stations from northern Japan to southern Japan selected from the network of over 1200 stations that make up the GEONET

Nyo Mi Saw Tokyo

University of Marine Science and Technology, Japan

Dr Nobuaki Kubo

Associate Professor Tokyo University of Marine Science and Technology, Japan

Dr Sam Pullen

Senior Research Engineer, Stanford University, USA

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Emanuela Falletti

Istituto Superiore Mario Boella – Navigation Lab, Torino, Italy

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A comparison of fuzzy logic based and artificial neural network approach to urban planning issues

This work is an attempt to review the two approach and the context which gives better result for each of the method



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Artificial intelligence is useful in solving urban planning challenges. Fuzzy logic, neural networks combined with geographical information system and sometimes Cellular automata can be very effective in simulating different aspect of the urban planning problems. They can integrate rule based definition with explicit, interactive and heuristic decision making processes. This work is an attempt to review the two approach and the context which gives better result for each of the method. The methodology employed is simple, a good numbers of journal papers were reviewed comprehensively, some of the papers were fuzzy logic based, some others were neural network based and the last sets of papers combined both fuzzy logic and neural network in solving urban planning problems. Based on the analysis and results obtained, it is recommended that depending on the nature of the problem, a combination of the both approach will give the best result.

Introduction

Spatial data analysis is very essential part of urban planning and management. Most of the data used in urban and regional planning and the assessment of economic, environmental and social sustainability of a city or region have a spatial component, as economic and human activities occur in space and time. Influence of economic and human activities on the regional landscape is neither well defined nor uniform (Manca and Curtin 2012). Some of these data are also inherently ambiguous,

as urban planning is a democratic process involving inputs, usually in the form of verbal communication, from participants with diverse interests and values (Feng and Xu 1999). Spatial vagueness, interpersonal differences in perception and imperfect information create uncertainty in spatial information. While researchers have argued that issues related to vagueness, imprecision and ambiguity in human judgement should find a proper place in the formal planning and evaluation process (Feng and Xu 1999), there is a challenge in processing such data, especially in the geographic information system, for urban planning. ‘Traditional Boolean logic, which is crisp, deterministic, and precise in nature’, implicitly assumes that objects in spatial database and their attributes can be uniquely defined. It does not model the fuzziness, uncertainties and imprecision in geographic information and human decision-making processes (Sui, 1992). Hence, the integration of GIS and fuzzy set theory has practical significance in spatial data analysis for urban and regional planning. There have been considerable applications of fuzzy system in urban planning, such as applications for defining landscape regions, urban design, evaluation of accessibility to urban services, transportation modelling, transportation management and operation optimization, ecological planning and sustainable development.

Ambiguity in urban planning

Urban planning and regional planning

is a complex process. There is the need to evaluate planning decision using the environmental, physical, social and financial conditions and effects using data that are qualitative and quantitative in nature. "It is a decision making process involving stakeholders with diverse socio-economic and political backgrounds and interests. Consequently, it is a process of integrating and balancing"

'Binay Adhikari & Jianling Li (2013) noted that "the current Boolean logic used in conventional GIS software lacks the capacity of modelling ambiguity as demonstrated in Figure 1. In this example, X-axis is the distance to highways while Y-axis is the level of certainty in categorizing distance to highways in three classes: high, medium and low. Figure 1A shows the imprecision in linguistic definition of proximity to highway in the three classes illustrated in the pink, blue and green lines. Figure 1B shows how Boolean logic in GIS models the linguistic classification into precise and crisp categories. Assuming a symmetrical distribution of data, linguistic definition of proximity to highway by nature contains data with various degrees of uncertainty as shown in the shaded area. The data complexity is further illustrated in Figure 1A, where distance x can have two different values, y_1 and y_2 , representing its degrees of certainty that simultaneously exist in different categories. However, Boolean logic in GIS handles such uncertainty by classifying the imprecise data into three categories with 100% certainty. Although classifying the distance into numerous categories can be done to create more refined gradual results, it is time consuming and ineffective

in modelling data variation. Fuzzy logic adds two important advantages to analysing 'imperfect information'. First, it models vagueness inherent in linguistic arguments. Secondly, it models fuzziness in defining categories wherein one entity can fall simultaneously in more than one category. 'Imperfect information is information which in one or more respects is imprecise, uncertain, incomplete, unreliable, vague, or partially true.

100% certainty

Why fuzzy logic in spatial analyses and urban planning

Fuzzy logic is important in planning because planning is carried out within a multi-judgment, multivalued, multi-objective process or environment, it needs to meet certain specifications of the fuzziness in that environment. "An environment with a multi-objective, multivalued, and multi-judgment nature needs to take into account the influential or intervening factors and to give them a share in its equations". "Otherwise, it will be accused of eliminating some influential factors from the list of those intervening on an arbitrary and selective basis. And this compromises its legitimacy and justifiability".

The process of contemporary planning involves a great deal of coordination, modification, justification, and reconciliation. The large number of stakeholders and beneficiaries as well as the vast number of involving factors makes almost every initial plan, planning decision, or even policy subject to reconsideration. This reconsideration rarely occurs only

behind closed doors. Even if it happens there, the final outcome is still subject to careful scrutiny by traditional decision takers, by politicians, or recently, by the public, by the interest groups. More often, the procedure of planning, no matter whatever the form, entails negotiation. Negotiation basically forms an inevitable part of the process of planning, especially among contemporary accounts of planning.

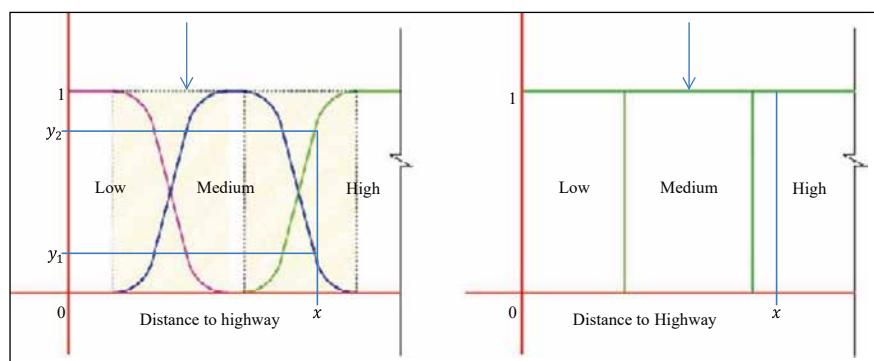
Artificial neural network

"Cities are open and non-linear complex systems, mathematical equations have limitations in simulating such systems" According to Anthony Gar-on yeh and Xia Li (2003), artificial neural networks (ANN) have the capability of mapping nonlinear features. Artificial neural networks can be used to recognize and classify patterns through training or learning process. Studies indicate that neural networks provide levels of performance superior to those of conventional statistical models because neural networks can handle well the uncertainties of spatial data (Openshaw, 1993; Fischer and Gopal, 1994). "Geographical analysis is usually based on incomplete and inconsistent data due to the complexity of nature. Classical quantitative methods cannot be used to solve complex spatial decision problems which are highly assumption-dependent and application-specific". Neural networks have been widely and seemingly extremely successfully applied in many disciplines that have a high degree of hardness.

Case study 1: Simulating urban encroachment on rural land using fuzzy controlled cellular automata in a geographical information system

In this case study, am going to compare results of two cases in which fuzzy logic was used in urban planning, and two cases where neural network was used, again I will present another instance where the two methods were combined together and then do my conclusion.

In the first case scenario taken from the



A. Imprecision in linguistic terms

B. Precision model of linguistic terms in GIS

From the various case studies undertaken, it is observed that fuzzy logic is more suitable and effective when the boundary is not crisp. When the degree of uncertainty or ambiguity is high, fuzzy logic gives a better result than neural network. Fuzzy is particularly useful when handling imprecise and ambiguous data. Fuzzy logic proves to be very effective in clustering especially when each spatial unit has its own separate profile

journal article titled “Simulating urban encroachment on rural lands with fuzzy-logic controlled cellular automata in a GIS” by F. Wu (1997) , fuzzy logic was used in simulating urban encroachment on rural lands. The behaviour of feature conversion was captured by fuzzy logic, Cellular automata was used to in conjunction with Fuzzy logic to simulate global pattern from local rules and implemented in a geographical information system using ARC/INFO software. “ By providing a series of simulation scenarios, the study reveals potential hazardous consequences inherent in some development policy that would jeopardize sustainable development and demonstrates that the approach is a useful tool to provide decision support” F. Wu (1997) “Local Government were required to zone high quality agricultural land in a compulsory protection zone to help protect valuable agricultural land, land development was carried out according to preference of individual project outside the zone”. Site selection was largely a product of uncoordinated local decision making process. There was the need to identify the determinant of land conversion and simulation of development scenarios through microscopic models. Based on the study, some assumption of land development simulation was made. This model does not assume a fixed exogenous rate of land conversion, making it differ significantly from usual land allocation models that usually allocate development according to an assumed growth rate. “Rather this model, this model treats the land simulation as a game, leaving the rate of land conversion to be determined by land competition. The aim of the study according to the author was to “identify how different rules of development can lead to different spatial forms, urban development scenarios were produced through hypothetical yet possible policy alternatives”.

This model was applied to Guangzhou, a fast growing city in southern China. Due to its proximity to Hong Kong, the city

has experienced growth as a result of manufacturing, housing development and a mix of inward investment. Encroachment on rural land was a major problem. ‘Located in the Pearl River Delta, the metropolis has already been densely populated. The massive loss of quality agricultural land has jeopardized the sustainability of the region. The study focused on competition process which mainly involved three types of policy goals: urban development, preservation of cultivated land and preservation of orchards’. The initial state of the land use for simulation was classified from a Landsat TM-5 image, processed with a supervised classification method using PCI, a remote sensing software.

Methodology

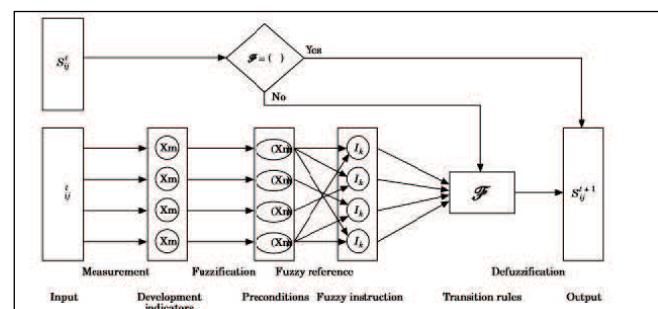


Fig 2. The procedure of definition of transition rules

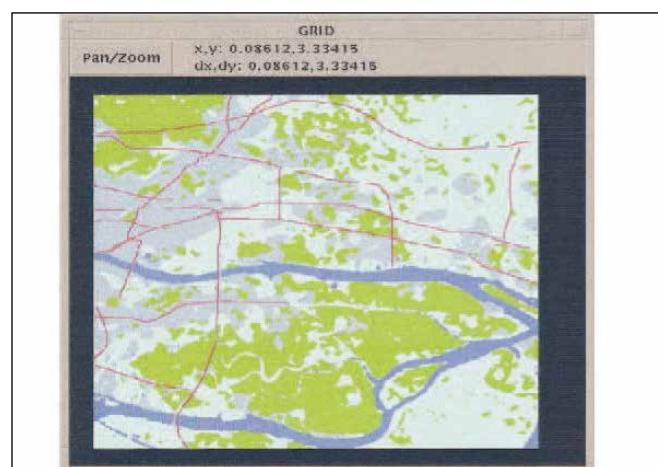


Fig 3.The baseline scenario of simulation (classified from Landsat TM-5 image). The urban built-up area is shown as grey; cultivated land as light green, and woodland as dark green

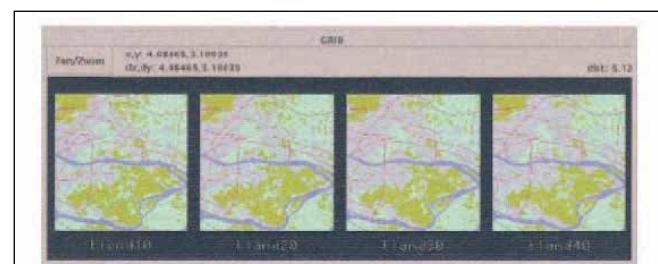


Fig 4. Baseline scenario of simulation (S1) (Note: tland 10 represents the state at iteration no.10).

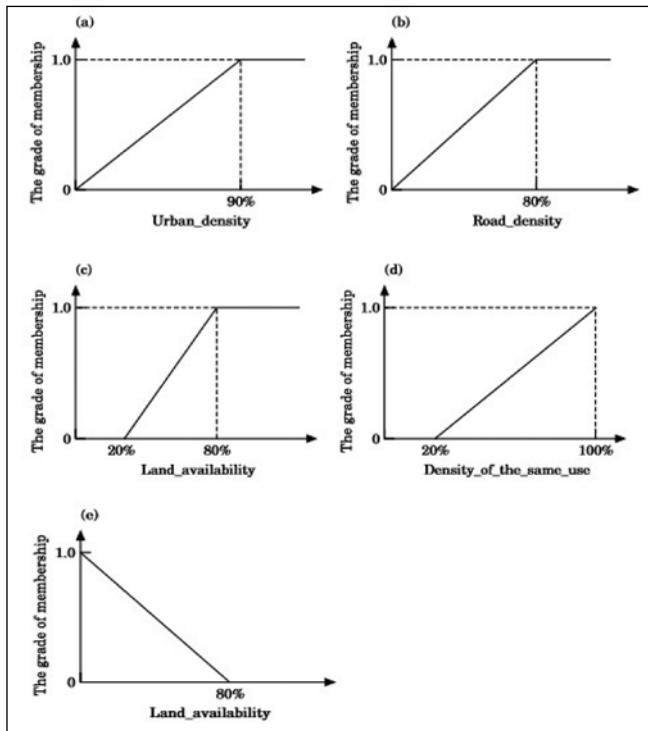


Fig.5. Fuzzy membership functions of several linguistic variables used in the study: (a) good access to existing urban land uses; (b)good access to existing roads; (c)enough vacant land is available (d) surrounded land is mainly in the same use; (e) vacant land becomes limited

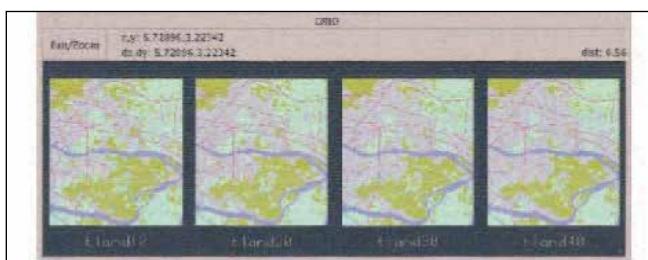


Fig. 6. Scenario of highway -promoted development (see note in Fig 5)

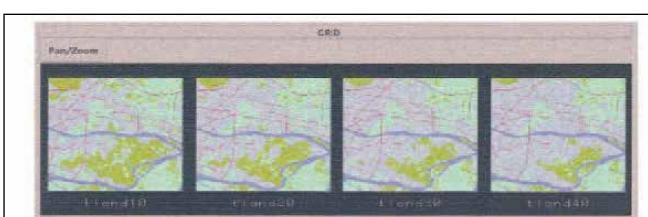


Fig. 7. Scenario of relaxing the control over woodland (S3) (see note in Fig.5)

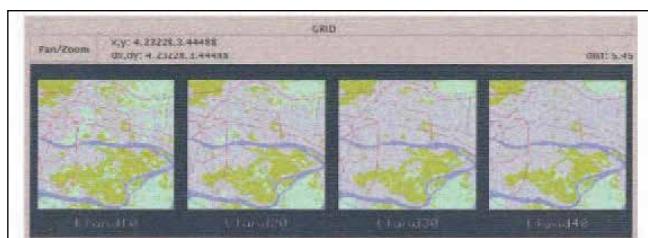


Fig. 8. Scenario of relaxing the control over cultivated land (S4) (see note in figure 5)

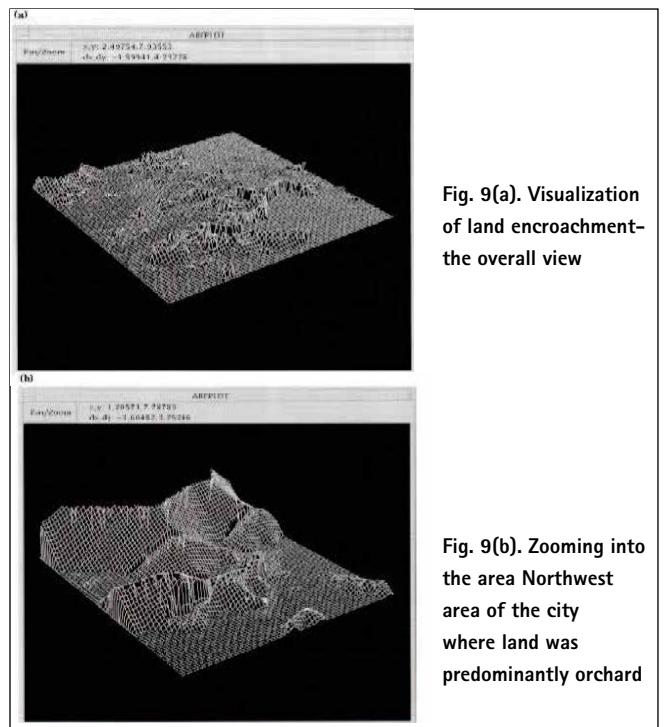


Fig. 9(a). Visualization of land encroachment-the overall view

Fig. 9(b). Zooming into the area Northwest area of the city where land was predominantly orchard

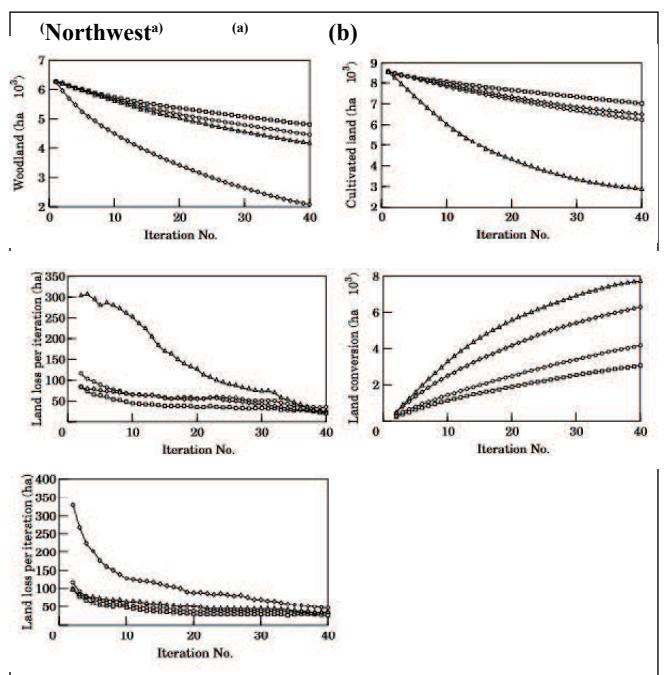


Fig 10 (a, b, c, d, e)

Analyses and discussion of result for case study one

Figure (1) represents the procedures that defines the transition rules, the initial state of the land determines the instruction to be invoked. If no instruction is invoked, i.e., the set F is empty, the next state of the cell will be the same as its previous state. For multiple instruction, the development situation from the

neighbourhood space is evaluated. Development situation is represented by indicators X_m which in this case is counted as the number of pixels belonging to different land uses. The next step is fuzzification which is to apply a predefined membership function to the actual values. The next stage is inference which is to deduce truth for firing an instruction. The final stage is, defuzzification is used to convert the set to crisp number, ie the discrete state of land use at the time $t+1$.

In the first case study, four simulations were run by iterating land development rules. The simulation was not based a specific time-scale, no imposition of projected conversion rate was made on the simulation. The first simulation, represent a baseline situation were membership function is applied (Figure 4). The second simulation is a hypothetical policy alternative, which stresses the role of transport in urban growth, it assumes accessibility has a stronger effect on urban growth. The third and fourth simulation assumed that the control over cultivated and woodland would be relaxed. This is achieved through modification of membership function of uniformity and land availability of the baseline simulation. It can be said that the simulation exercise is hypothetical because the transition rate is not linked to some empirical phenomena.

Figure 7 and 8 show the result of the third and fourth scenarios respectively. Relaxing control over woodland will lead to an increase in the growth rate of urban area, however relaxing control over cultivated land seemingly would lead to disastrous land encroachment. Figure 10(a) and (b) plot the decrease in cultivated and woodland. The interesting finding is that the loss of cultivated land and the loss of woodland are interrelated. The loss of one type of land would increase the risk of another type. For instance, encroachment on cultivated land will lead to increase in the development intensity of the area. Figure 10(c) and (d) suggest that land loses could occur very soon after relaxing control. Within the first 10 iterations, the land loss is obvious. The rate of land loss is decreasing over the simulation due to the increasing counteractive

forces of preserving agricultural land. Figure 10(e) shows the accumulative land conversion from agricultural to non-agricultural uses. The fourth simulation clearly shows that a significant amount of land was converted in the study area.

Visualisation of land encroachment

Figure 9(a) Show a three dimensional view of simulated land encroachment in the third scenario that is the assumption of relaxing control over woodland. Those areas where there is no land use change are displayed as a flat surface. Shaded in dark is the urban built-up area at the beginning of the simulation, while the light shaded area is agricultural land. The height represent the timing of the land encroachment, which is the iteration number during which the site experience land conversion. Therefore, the encroachment is visualized as a surface on which the most recent conversion is displayed as the highest ridge. From the zoom in clip (9b), it can be seen that most encroachment occur at the urban-rural fringes, penetrating along favourite land uses (in this case, woodland because the cultivated land is still under control) and squeezing underdeveloped agricultural land by surrounded urban land.

Case no: 2-Modelling ambiguity in urban planning using fuzzy logic

This case study is taken from a journal article titled Modelling ambiguity in urban planning.

Fuzzy membership function

The membership function used

to create the fuzzy sets are:-

Linear membership function:

$$\mu_{Low}(x) = \begin{cases} 1, & x < \varphi_1 \\ \frac{\varphi_2 - x}{\varphi_2 - \varphi_1}, & \varphi_1 \leq x \leq \varphi_2 \\ 0, & x > \varphi_2 \end{cases}$$

$$\mu_{Medium}(x) = \begin{cases} 0, & x < \varphi_1 \\ \frac{x - \varphi_1}{\varphi_2 - \varphi_1}, & \varphi_1 \leq x \leq \varphi_2 \\ 1, & \varphi_2 < x < \varphi_3 \\ \frac{\varphi_4 - x}{\varphi_4 - \varphi_3}, & \varphi_3 \leq x \leq \varphi_4 \end{cases}$$

$$\mu_{High}(x) = \begin{cases} 0, & x < \varphi_3 \\ \frac{x - \varphi_3}{\varphi_4 - \varphi_3}, & \varphi_3 \leq x \leq \varphi_4 \\ 1, & x > \varphi_4 \end{cases}$$

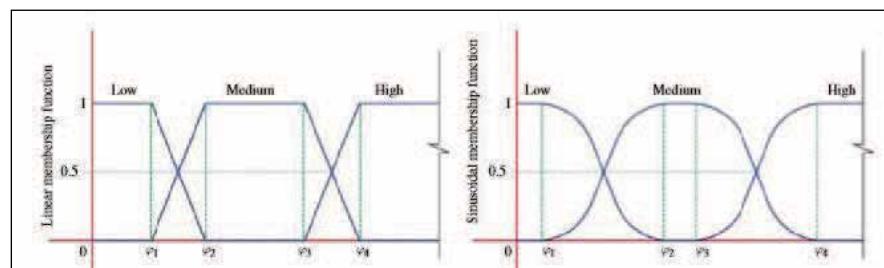
Sinusoidal membership function:

$$\mu_{Low}(x) = \begin{cases} 1, & x < \varphi_1 \\ \frac{1}{2} \left(1 - \cos \left(\pi \frac{x - \varphi_1}{\varphi_2 - \varphi_1} \right) \right), & \varphi_1 \leq x \leq \varphi_2 \\ 0, & x > \varphi_2 \end{cases}$$

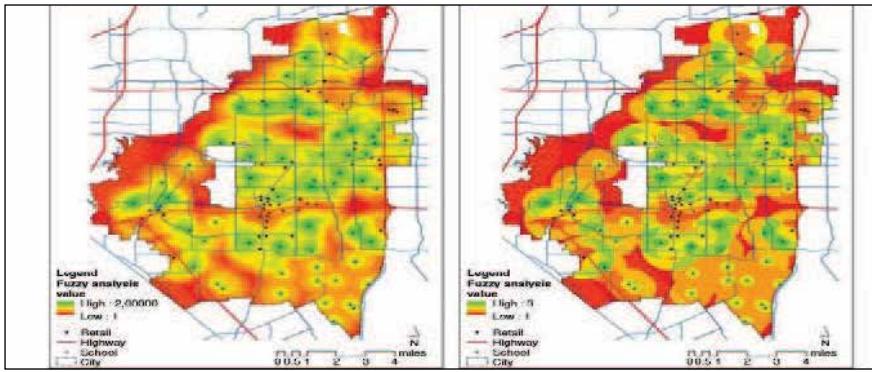
$$\mu_{Medium}(x) = \begin{cases} 0, & x < \varphi_1 \\ \frac{1}{2} \left(1 - \cos \left(\pi \frac{x - \varphi_1}{\varphi_2 - \varphi_1} \right) \right), & \varphi_1 \leq x \leq \varphi_2 \\ 1, & \varphi_2 < x < \varphi_3 \\ \frac{1}{2} \left(1 - \cos \left(\pi \frac{x - \varphi_3}{\varphi_4 - \varphi_3} \right) \right), & \varphi_3 \leq x \leq \varphi_4 \\ 0, & x > \varphi_4 \end{cases}$$

$$\mu_{High}(x) = \begin{cases} 0, & x < \varphi_3 \\ \frac{1}{2} \left(1 - \cos \left(\pi \frac{x - \varphi_3}{\varphi_4 - \varphi_3} \right) \right), & \varphi_3 \leq x \leq \varphi_4 \\ 1, & x > \varphi_4 \end{cases}$$

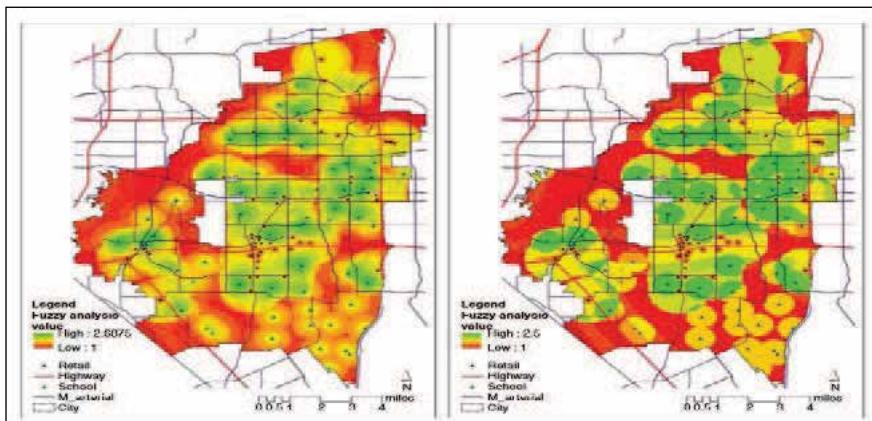
Where x is the input data; $\mu_{low}(x)$, $\mu_{Medium}(x)$, $\mu_{High}(x)$ are membership functions defining the low, medium and high categories φ_1 , φ_2 , φ_3 and φ_4 are constant and they define critical values where membership function are shown in the figure 10



(Figure 10(h)-Graphical illustration of linear and sinusoidal membership function



(Figure 10(i)-Model results of Scenario # 1



(Figure 10(j)-Model results of Scenario # 2)

Results

Analyses and conclusion for case two

This result shows that fuzzy logic has advantage over Boolean logic in modelling ambiguity. This was known by comparing the suitability for residential development locations using data from the city of Arlington Texas. Factors that were considered are: - Suitability to different amenities like transportation facilities, retail centres, schools, activity centres, recreation centre etc. Three major factors were identified and taken out, they are: - Proximities to schools, retail centres and highways. Because the perception of proximity to the three types of facilities in terms of near or far varies by individuals, these data are ambiguous with no clear boundaries.

The results of scenario #1 and #2 are displayed in figure 10(i) and figure 10(j) respectively, visually when the two maps in each scenario were compared, the fuzzy logic model produces a more refined map with gradual transition of suitability rating than the Boolean logic model does.

Case study no: 3 Simulation of development alternatives using neural networks, cellular automata, and GIS for urban planning

The material for this case study is taken from an article written by Anthony Gar-On and Xia Li (2003) on the above subject. The study is an attempt to integrate neural network and cellular automata for development alternative. It is demonstrated in the paper that development alternatives can be simulated by incorporating planning objectives in cellular Automata.

An artificial neural network is devised to estimate development probability based on the inputs of the sites attributes. Artificial neural network is good at handling complex relationship between site attributes and urban growth.

According to Wu and Webster (1998),

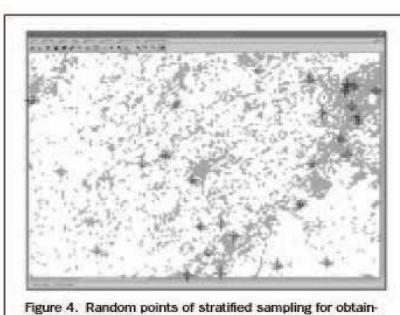


Figure 4. Random points of stratified sampling for obtaining training data sets.

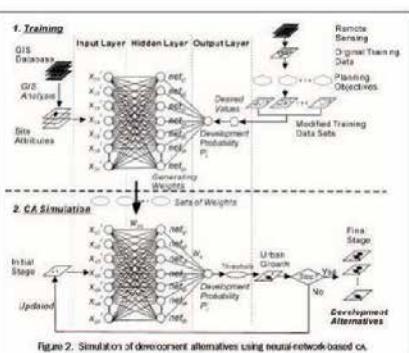


Figure 2. Simulation of development alternatives using neural-network-based CA.

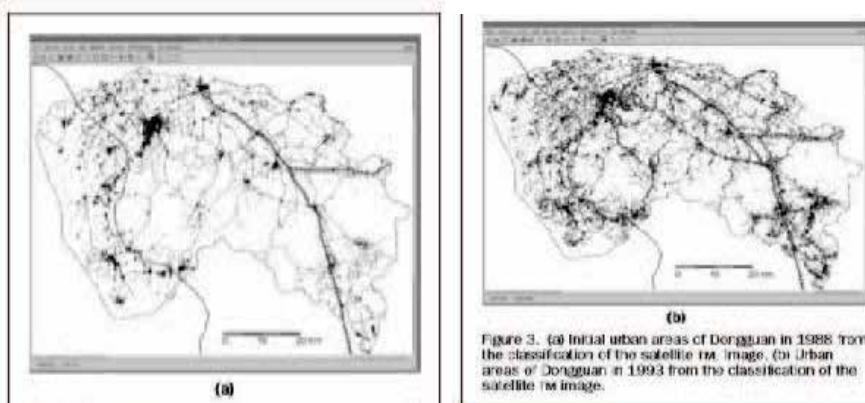


Figure 3. (a) Initial urban areas of Dongguan in 1988 from the classification of the satellite TM image. (b) Urban areas of Dongguan in 1993 from the classification of the satellite TM image.

in conventional urban cellular models, development probability is central cell is usually estimated according to its neighbourhood conditions (attractiveness), such as developed quantity (density) and proximity variables. The proposed model consists of two separate parts— training and simulation (Figure 2). “The training is based on the back-propagation procedure which can generate optimal weights from a set of training data. Remote sensing and GIS data are used to provide the empirical data to reveal the relationships between site attributes and urban development.”

Results and analyses

Analyses of result for case 3

The neural network was trained to obtain the parameter values so that the simulation can be executed. The training data were from the classification of the 1988 and 1993 satellite TM images. The classification provides the empirical information about urban development in the period (Figures 3a and 3b above under case studies 3). The classification results were imported to ARC/INFO GRID in grid format as training data. Although the original TM images had a ground resolution of 30 by 30 m, the cell size was reduced to 50 by 50 m by a resampling procedure for faster simulation. The total number of cells is 588 by 776. Data encoding was carried out for the training data. The overlay of the two images reveals where urban development has taken place. The urban areas were 16,234.6 ha in 1988, but they increased to 41,087.9 ha in 1993 according to the classification of the satellite.

Conclusion

From the various case studies undertaken, it is observed that fuzzy logic is more suitable and effective when the boundary is not crisp. When the degree of uncertainty or ambiguity is high, fuzzy logic gives a better result than neural network. Fuzzy is particularly useful when handling imprecise and ambiguous data. Fuzzy

logic proves to be very effective in clustering especially when each spatial unit has its own separate profile.

Neural network has been found to be a useful technique for regression and classification like problems like image classification. Neural network proves very useful particularly when the problem is highly non-linear. It is also good in handling mixture in data types. The strength of neural network is that they make no assumptions regarding the distribution of the data, it can be very effective when there is redundant data. Neural network is good and objective in assigning weight to different causative factors. The problem with neural network is that they operate like a black box in nature, again, relationship among neuron are quite complex and no way to determine best network structure.

Our recommendation is that a combination of the two methods (Fuzzy logic and Neural network would be the most effective depending on the situation that is to be applied. It is observe that the combination and integration of the two approach can provide a synthetic spatio-temporal methodology for the analysis, prediction and interpretation of urban growth and problem. Combining the both method where need be simply means that the two system will complement each other in the area where the other is not very effective.

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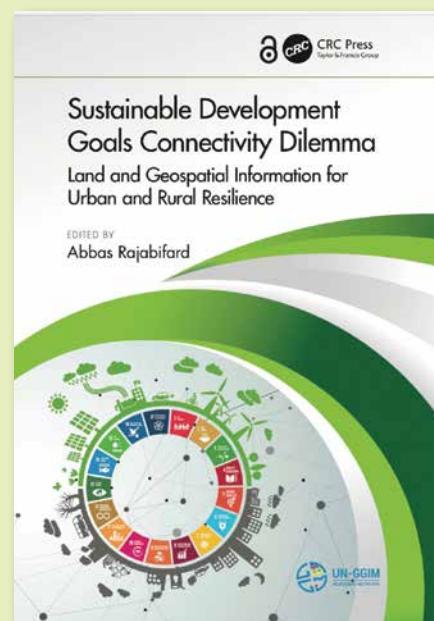
Open Access Book

Sustainable Development Goals

Connectivity Dilemma: Land and Geospatial Information for Urban and Rural Resilience

The Academic Network of United Nations Global Geospatial Information Management (UN-GGIM) chaired by Prof Abbas Rajabifard has launched the Book on Sustainable Development Goals Connectivity Dilemma-Land and Geospatial Information for Urban and Rural Resilience, at the Ninth of United Nations Global Geospatial Information Management (UN-GGIM) Session in NY on 7th August 2019.

The book was edited by Prof Rajabifard with contribution of many experts with diverse academic and professional backgrounds who examined connectivity and developed strategic pathways. The book introduces a holistic and new approach to sustainable development, brings together social, economic, and environmental dimensions of sustainability, highlights the significance and the role of geospatial information in sustainable development, and examines urban and rural interdependencies in the context of strengthening resilience.



The book is available for free download from the CRC Press. ▶

Where Have You Been with Your TRIUMPH-LS Lately?

Brent Newton

"Used trajectory and canoe for river..."



see full letter and more feedback inside >>

Timothy S. Guisewhite

1737 NC / SC boundary surveyors ran a line due west along what they believed to be the 35th parallel. When they hit the old Charleston- Salisbury road they realized they were 12 miles too far south of their target. In 1772 they took a turn north and went around lands granted to the Catawba Indian Nation and then south to the Catawba river.

This stone was set in an 1813 retracement of the 1772 line and marked NC SC AD 1813.

I was too close by not to give the LS a chance to take part in a little history!!



FL



Aaron S

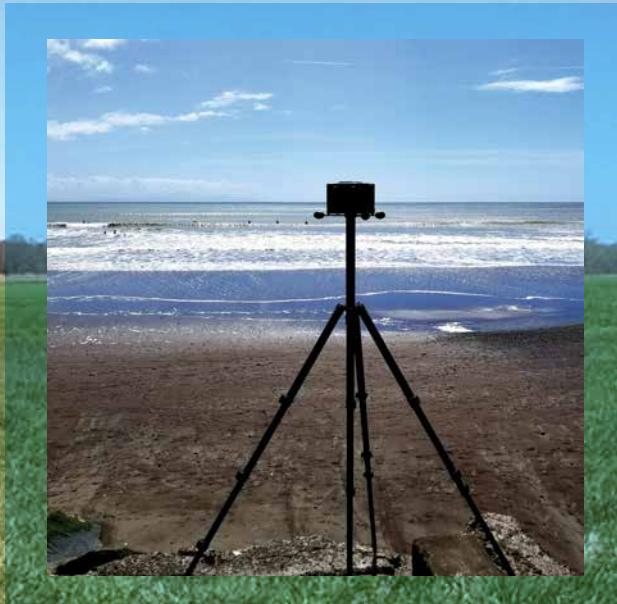
Here's where I had my demo unit in northern Minnesota. Still 30"+ of ice out there - so I've heard. No way I'm walking on any ice if there's water on top. OF COURSE it was clicking away collecting points on "boundary" mode, regardless of the thick branches overhead, and the white pines blocking half the sky in the second pic.



Brent Newton

Used trajectory and canoe for river.

Actually for most of this river I had multi engine fixed shots. I did have it to accept float shots, but I believe I have shots close enough to spot the bad ones. Took shots every 5' or 5 seconds. I would stop and wait on fixed solution in critical curves. It was a lot of fun. 2.5 miles in 1/2 a day.

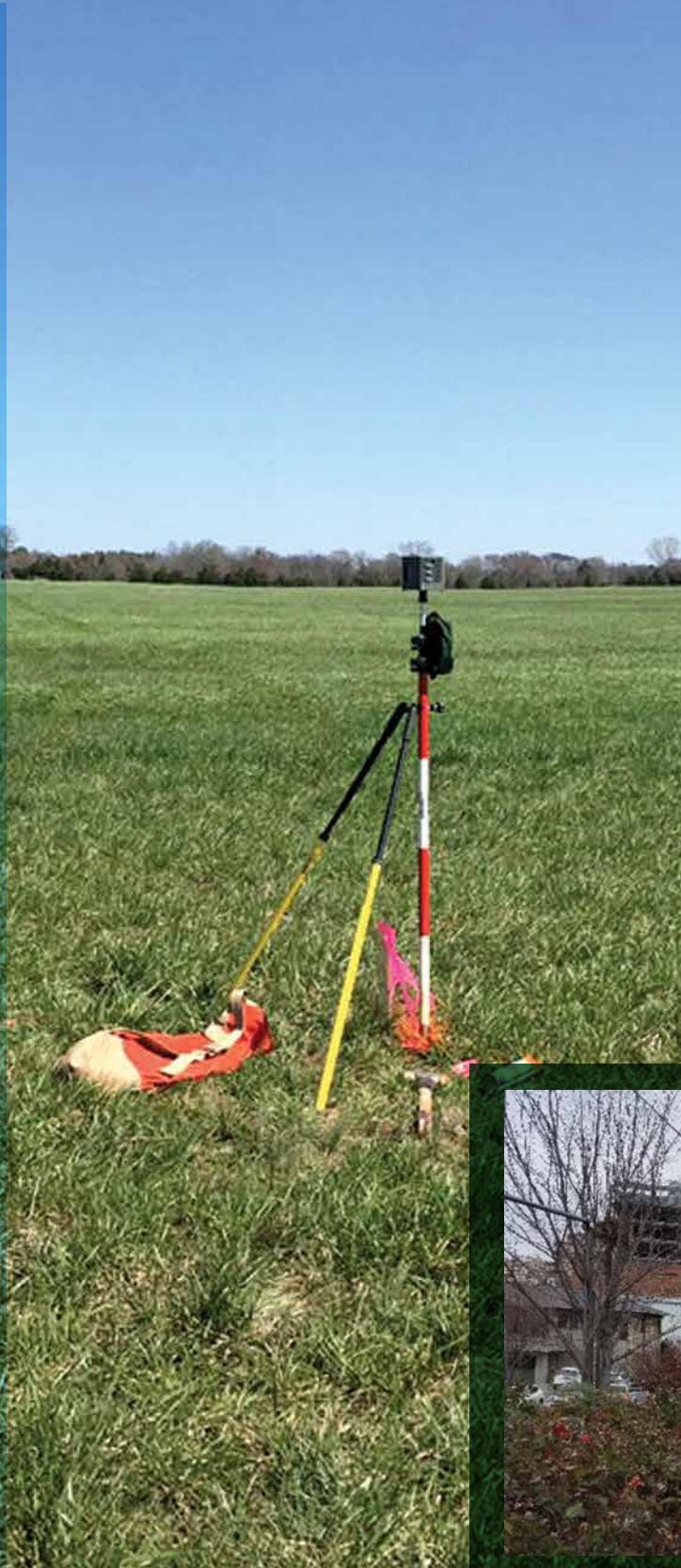




Darren Clemons

Had a pin Monday directly under about an 18" cedar. Was on a survey I had done previously about 8 years ago, so I had design points and had snapped in and was staking back to everything less than a tenth so I had that extra benefit of already having a point to check if (well lets not beat around the bush WHEN I got the shot).

I intended to possibly get two PPK shots here to compare to my design point and within each other when I got back to the office. When the first PPK session completed in 15 minutes, I had something similar to 85,730,3 for the RTK solution. It had kicked to phase two once, then locked onto a "bad" group, did a fail jump and then had added several more epochs back into the lead group. Basically I had 100% confidence this RTK was good. As soon as I stored the shot I inversed to my design point at that location and got 0.06'. No second PPK necessary! Then for the cherry on top, I processed the PPK at the office at it was 0.05' from the RTK I stored. Just an amazing Surveying machine!





Pappassurveyor

Deep in the woods had to let it sit for a long time.
Played around with some image filters also.



Garrett Dendy

I'm fairly new to RTK surveying, but either the cottonmouths or the mosquitos would have ran me out of that beaver slew if I were traversing around it. The LS is my first GPS and I move so much faster, collect more data and I see better accuracies.



Wes Cole

ALTA in downtown Asheville on the south slope, a rapidly developing area particularly among the microbreweries. No complaints on the sweet smell of beer brewing!

Ran control yesterday around the site with an S5, checked into one control point today with the LS/T1M base/rover at N: 0.01, E: 0.03, H: 0.00. One of my guys tied in the boundary with the robot today while I worked on the physical, 200+ points in less than 2 hours with the LS. Very productive before the rain came in.



Bob Farley

No cool pictures to show, but I checked in yesterday to a traverse I did in 2007 with my Topcon Robot and Sokkia Locus receivers.

2007 vector is N70d07'27"W 5,535.63', Javad vector is N70d07'40"W 5535.59'. The DPOS coordinates on the Northwest corner coordinate are within 0.24' horizontally and 0.41' Elevation. As rough as the area is with moderate tree cover; This is as good as it gets!

Nate The Surveyor

3 fixed and verified shots here.... YEAH! In less than 10 minutes!

Monte King

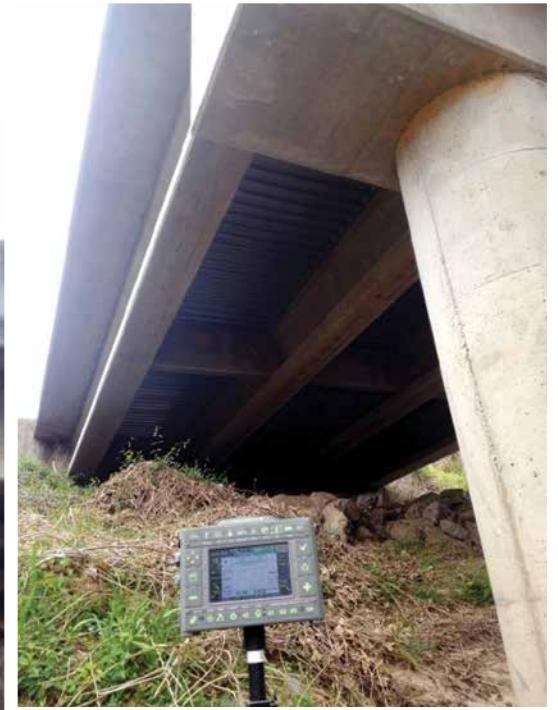
Here is a couple pics of a survey I did in April/May on Martha's Vineyard for the Wampanoag tribe. A walk on the beach!! This was a resurvey and posting of line, used the stake line feature a lot! One boundary was a 50 ft offset from mean high tide so elevation was involved! The LS made all the difference in the world as because of travel costs there was an extreme desire to complete it in a timely manner which was accomplished thanks to the LS and T2 particularly beast mode!





Adam, PLS

Mclin Creek at Old Catawba Road -
Criss sections for no rise cert.



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/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

Citizen science tree inventory

The purpose of this paper is to present the approach of using the GeoTrees system, an integrated mobile data collector embedded with Quick Response (QR) code technology, to support a citizen-based tree inventory



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Citizen science programmes have been conducted for several decades to make use of the collective intelligence of local people in supplying scientific data. In developed countries, volunteer efforts to update urban street tree records have been common due to the recent advancement and low cost of mobile technology. In Malaysia, motivation to conserve the green space through replanting trees is soaring due to various campaigns at schools and in the community and corporate sectors. However, limited resources to conduct a tree inventory after planting or replanting events have led to difficulty in monitoring the conditions of trees that have been planted. Therefore, the purpose of this paper is to present the approach of using the GeoTrees system, an integrated mobile data collector embedded with Quick Response (QR) code technology, to support a citizen-based tree inventory. This system offers a low-cost solution in tree inventory whereby any mobile-enabled citizens could participate in tagging trees using their own Smartphone. End users are able to record basic tree data, including species name, diameter and height after tagging a tree with a QR code. The system also provides a tool to report post event activities such as tree watering and pruning. As a conclusion, engaging citizens in tree inventory using digital mobile technology could offer an alternative way to support in providing supplementary data toward a comprehensive database for monitoring the sustainability of urban green space and forest in Malaysia.

Introduction

Most people love to live in a natural environment compared to the packed and unhealthy environment found in urban areas. The concept of green campus, city

and resident existence is evidence on how people love to stay among nature. Nevertheless, this concept cannot beat the wonder of natural forest. Natural forest can promote healthy lifestyle (Elmendorf, 2008) and even improve human happiness.

Many campaigns to preserve and conserve forest have been conducted around the globe, the most popular is tree planting. Various organisations, corporate companies, schools and authorities have actively implemented tree planting. However, such organisations, companies and schools only care about planting the trees, not monitoring them. This is due to limited time and resources to conduct a tree inventory after planting events. As a result, the young trees soon wither and die.

Forest and urban forest management requires an inventory, as agreed by Bond and Buchanan (2006), Andreu et al. (2009) and Woodall et al. (2015). Without tree inventory, it is difficult to conduct monitoring of the planted trees, such as tracking a tree's survival and growth. Implementation of tree inventory for tree management has been carried out for a long time (Bassett, 1976; Tate, 1985) by many organisations, research groups and even individuals. Trees data collected in a tree inventory can help organisations, researchers and stakeholders to analyse, understand and plan for a better future with minimum effect on the environment. These data can be used for charting trees' status and diversity (Raupp et al., 2006; Sjöman et al., 2012; USDA, 2014), monitoring carbon sequestration (Chave et al., 2005; Feldpausch et al., 2012; Herold & Skutsch, 2011), combat pests and diseases in urban trees (Vecht, 2014) and monitor forest fire risk (De Longueville, 2009).

Tree inventory has been implemented

by many projects, either by professional individuals and organisations or by non-professional citizens through volunteered geographic information (VGI). Several studies, for example by, Butt et al. (2015), Kitahara et al. (2010) and Roman et al. (2017) have involved non-professional citizens in tree inventory and data collection. Butt et al. (2015) used indigenous peoples' field measurement to assess carbon stock in Amazonian Guyana and inexperienced undergraduate students were involved in Kitahara et al.'s (2010) study for tree data collection, while Kitahara et al. (2010) used volunteers as citizen scientists who were trained for roughly six to seven hours in urban tree inventory. This study proposes the use of non-professional citizens to maintain the trees and contribute data using GeoTrees application, a tree inventory application that collects tree data using Smartphones and updates information in real time.

Inventory and monitoring using GeoTrees

GeoTrees application

This study is motivated by the vision that tracking tree growth can be conducted

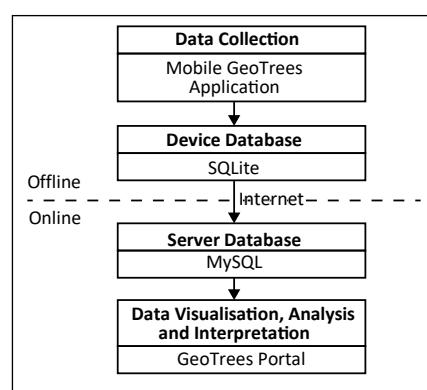


Figure 1 Workflow of data storing and visualisation in GeoTrees.

using a low-cost mobile tree collector. Tree data can be provided by citizen scientists involved in the programme. To realise this vision, this study implements tree inventory and monitoring using an application called GeoTrees. GeoTrees application consists of two parts: (1) Mobile GeoTrees, which acts as a mobile data collector, and (2) GeoTrees Portal, which visualises, analyses and interprets the data for public use. Mobile GeoTrees saves the data into the device database and syncs it to the database server via the Internet. Figure 1 shows the workflow of the GeoTrees process in storing data

GeoTrees application uses Quick Response (QR) Code as an identification tag that can be generated in the GeoTrees Portal. These generated identification tags store the unique identity (ID) for each tree. During the planting process, this tag will be tied on the tree's trunk and stored to the database using Mobile GeoTrees application. Data of tree size (i.e. tree names, diameter and height) and auxiliary data are included in this data collection and the data will automatically appear in the GeoTrees Portal. Using the ID tag, citizen scientists can monitor and update the tree data while the public can check the details of the trees.

Quick response codes

Teaching machines to read common textual documents is a complex challenge. This is because of the variety of fonts, styles



Figure 3: QR Code uses by GeoTrees application. This QR Code can be generated in the portal.

and language in which the text can be written. To overcome this problem, George Laurer has created a code (Weightman, 2015) which based on Woodland and Silver's patent of an automatic classifying apparatus and method that classifies things using photo-response to line method, subsequently known as barcode. This technique is a linear or one-dimensional (1D) barcode that can be read by machines quickly and easily. Using barcode, there is less issue of the fonts and styles as the bar or parallel lines represent as characters based on width and spacing. Figure 2 shows the examples of barcode.

In 1994, the Japanese company Denso-Wave introduced Quick Response (QR) Code (Rouillard, 2008), a two-dimensional (2D) barcode. It was initially used for high speed content decoding for inventory tracking of vehicle parts by the same company. The 2D barcode is classed into two classes, stacked (i.e. PDF 417) and matrix (Aztec Code, DataMatrix (SemaCode) and QR Code) (Rouillard, 2008). However, QR Code is more popular, especially in Asia. This is because it is low-cost, easy to implement and easy to use. Any device with a camera can be used as a QR Code reader as long as it been installed with QR Code software or tool. Even though RFID and NFC technologies are considered latest generation, they require a special dedicated device to operate or read (Falas & Kashani, 2007). Figure 3 shows the OR code used in this study.

The uniqueness of QR Code is the capability to encode Japanese Kanji characters (Falas & Kashani, 2007) and error correction capabilities (Rouillard, 2008). QR Code encodes information into five data modes (Barrera et al., 2013; Denso Wave, 2017) which are numeric, alphanumeric, byte/binary, Kanji and data bits (mixed). The Kanji data mode makes it convenient to use in Japan. Error correction capabilities ensure data can be restored even when substantial parts of the code are distorted or damaged (Rouillard, 2008).

GeoTrees Mobile Web Application

There are four main components of GeoTrees application as follow;

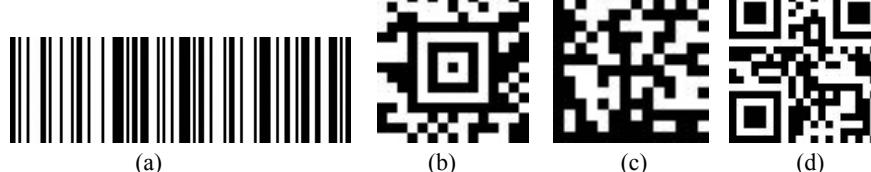


Figure 2: Example of different barcodes from left: (a) 1D Barcode, (b) Aztec Code, (c) DataMatrix and (d) QR Code.



Figure 4 GeoTrees interface for registering new tree record and update existing tree record.

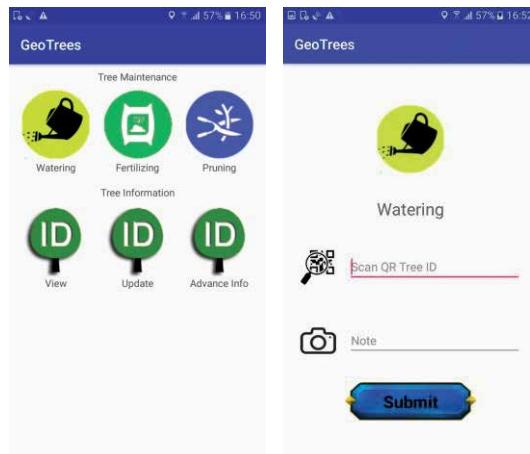


Figure 5 GeoTrees interface for maintaining and monitoring of the existing trees.

a) Register a new tree record

Registering a new tree requires location-based data that can be automatically collected using a device's Global Navigation Satellite System (GNSS) chipset built into the devices. Users are required to provide certain data, such as a tree ID (by scanning the QR Code tag), tree name, tree diameter, tree height, date planted and tree image. Once submitted to the system, the tree's record will be available online at GeoTrees Portal for viewing. Figure 4 shows the main user interface of GeoTrees mobile application.

b) Update existing tree record

Updating existing tree records uses the same interface and collects the same data. However, not all data need to be updated. Users can update only several data that are capable to obtain and provide. The updated data will be stored separately from existing data, but will show as new updated data in the portal.

c) Maintain and monitor a tree

Maintaining and monitoring the trees requires users to go to the field. Users may conduct the maintenance activities for the tree, such as watering, fertilising and pruning. After every activity, users are required to record such activities using the Mobile GeoTrees application (see Figure 5). This process is to inform GeoTrees that such activities have been conducted by the user. Tree mortality can be recorded in a tree maintenance module. The dead trees will be removed from map viewer in the GeoTrees Portal. However, the data are still accessible in the data table. That means that replacing the dead tree with a new one on the same spot requires registering a new record.

d) GeoTrees Portal

All the recorded trees are stored in the database server and can be viewed in GeoTrees Portal. Using Google Maps API, all tree records are shown in the interactive map which presents the location based on the ground. Figure 6 shows the three case studies that have

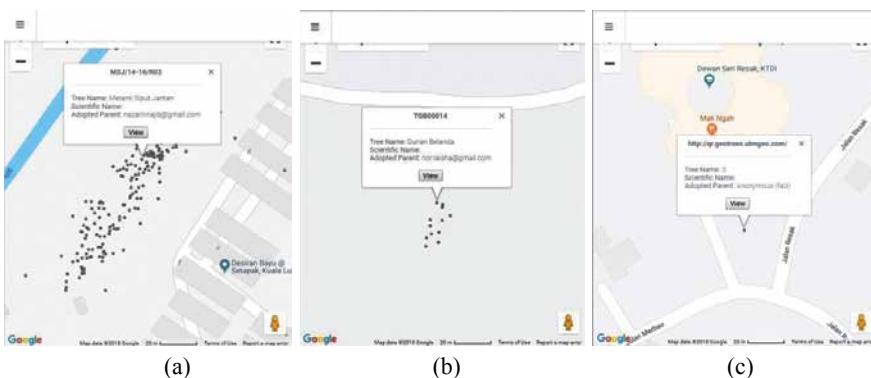


Figure 6 Map viewer in GeoTrees Portal show the study area at (a) Seri Rampai, Kuala Lumpur, MRSN Tun Ghafar Baba, Melaka and (c) Universiti Teknologi Malaysia, Johor.

INFORMATION UPDATE				
TREE HEIGHT	TREE DIAMETER	CANOPY HEIGHT	CANOPY DIAMETER	UPDATED BY
0.78 meter	4 cm			mfsyukri033@gmail.com (2018-08-25 14:10:56)
0.9 meter	1.3 cm			mfsyukri033@gmail.com (2018-07-26 12:25:09)
0.9 meter	1.3 cm			mfsyukri033@gmail.com (2018-07-26 12:18:28)

ACTIVITIES		
DATE	ACTIVITIES	NOTE
2018-09-07 17:44:06	Watering	by: mfsyukri033@gmail.com
2018-09-06 18:50:54	Watering	by: mfsyukri033@gmail.com

Figure 7 Figure shows the activities and data update in GeoTrees.

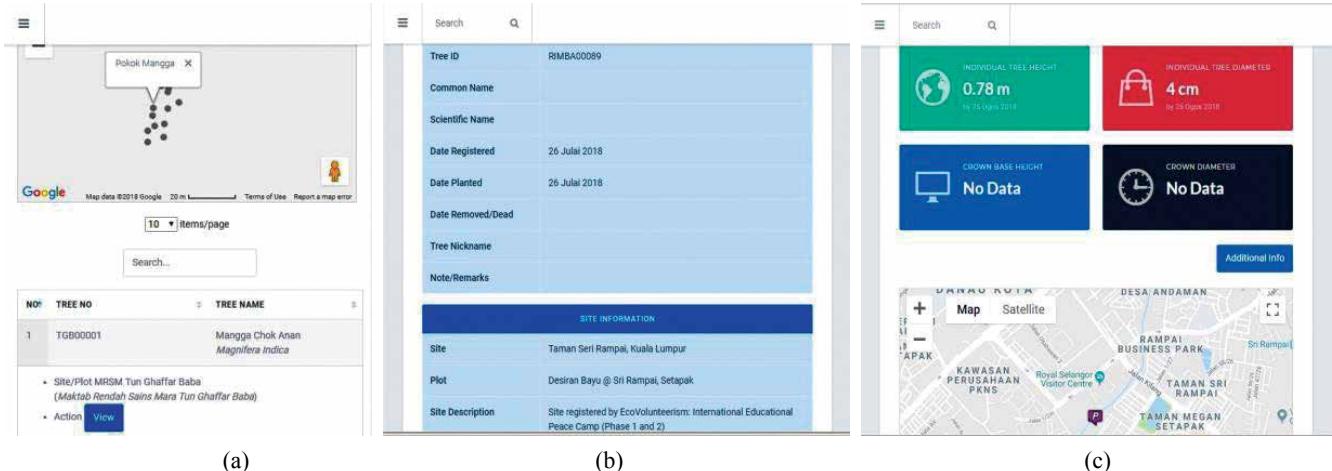


Figure 8 Figure shows (a) the list of tree record in GeoTrees Portal and the detail of the recorded tree in (b) and (c).



Figure 9 volunteers planting tree in UTM Johor Bahru



Figure 10 Volunteers involves in Eco Volunteerism in Seri Rampai, Kuala Lumpur.



implemented the GeoTrees application, which are Seri Rampai, Kuala Lumpur, MRSM Tun Ghafar Baba, Melaka and Universiti Teknologi Malaysia, Johor.

The data can also be viewed in detail in tabular form (see Figure 7). This function makes it easier to understand. Figure 8 (a) shows the list of trees that have been recorded in GeoTrees. This list can be filtered based on tree ID, tree name and plot name. Users can search for tree ID directly in the search section. Figure 8 (b) and Figure 8 (c) show the individual tree detail of the selected tree.

In the additional information page, detailed activities and information update logs are shown. This log is the record of activities conducted by users and acts as review material for users. Users' latest activities will be shown in table with information on what activities have been done and when.

Using GeoTrees application, the group leader can monitor the public users' activities and work performance in near real time. The log shows how the trees are treated and what is the status by just a few clicks.

Case study

Tree Planting at Universiti Teknologi Malaysia, Johor

Universiti Teknologi Malaysia (UTM) Johor Bahru Campus has implemented the GeoTrees application in its tree planting programme. This programme is running under the myTREEvolution and UTM Campus Sustainability (UTMCS) campaigns' to promote sustainable lifestyle among university students. This campaign objective is to reduce air pollution, to promote a healthy lifestyle and to improve environmental

awareness among the campus community. Figure 9 shows the event in UTM.

This programme was conducted on 22 February, 29 March and 30 April 2018 for tree planting while maintenance and monitoring are still running continuously. In total, 276 trees were planted throughout the campaign in the four zones. Figure 6 (c) shows maps of trees planted at one of the four zones. Among the 276 trees planted, five shrubs died and another seven *Hopea Odorata* species were injured due to garden maintenance.

Eco Volunteerism at Seri Rampai, Kuala Lumpur

The International Education Peace Camp: Eco Volunteerism campaigns was conducted by the Kuala Lumpur Jungle Ambassador. This campaign was conducted in two phases, which involved volunteers from several schools from all over Malaysia. This

campaign aims to nurture interest among students in conserving and preserving nature. The first phase involving 110 primary school student volunteers was held from 16-18 April, 2018 and the second phase was held on 25 August, 2018, which involved primary and secondary school student volunteers. In total, 110 trees have been planted in the first phase of the campaign, which also involved help from the US Navy volunteers.

In this event, participants were introduced to a sense of care and respect for our planet's resources and how to participate and move proactively toward a green environment via planting a tree. All planted trees were registered in the GeoTrees application. Figure 6 (a) shows the map of the planted trees during this campaign. The map may help in recording and monitoring the green area and can be used to calculate how much carbon is reduced by planting trees. Trees will become a



Figure 11 Citizen science programme in MRSM Tun Ghaffar Baba, Malacca.

necessary asset to sustain the connectivity of green area, improving biodiversity shelter and securing the forest species.

Tree Planting at MRSM Tun Ghaffar Baba

Tree planting activity at MRSM Tun Ghaffar Baba, Malacca is part of an activity conducted under the Geospatial Across the Community programme. This activity was held on 9 April, 2018. This activity was conducted to encourage students in taking part in citizen science programmes. The volunteers were taught on how to plant and maintain the trees and monitor the trees' progress using GeoTrees application. This citizen science event involved 85 students of MRSM Tun Ghaffar Baba. Through this activity, the students gained knowledge on tree planting and maintenance, and how to reduce carbon footprint. Figure 11 shows the event in Malacca.

Mangrove Replanting at Pantai Cahaya Negeri, Negeri Sembilan

ON Semiconductor, Senawang, in collaboration with the Forestry Department of Peninsular Malaysia, Universiti Malaya (UM) and Universiti Teknologi Malaysia, has conducted a mangrove replanting event called Lestari Bakau 2018 to promote awareness on mangrove degradation in Malaysian waters. In total, 800 *Rhizophora Mucronata* were planted at Pantai Cahaya Negeri, Negeri Sembilan with participants involving volunteers from the ON Semiconductor and students from UM and UTM and Port Dickson Polytechnic.

GeoTrees application was used to record and monitor the newly planted mangrove trees. In this event, all participants were divided into groups and each group planted 160 *Rhizophora Mucronata*. All trees were tagged with QR Codes ID for monitoring in the future. Figure 12 shows the map of newly planted trees during this event and Figure 13 shows the snapshot during the event.

Conclusion

The urban forest and green space require constant monitoring, hence, a systematic tool to register and update tree inventory is essential before further analysis can be made. This paper presents the approach of using an integrated mobile data collector embedded with Quick Response (QR) Code technology to support a citizen-based tree inventory. This system offers a low-cost solution in tree inventory whereby any mobile-enabled citizen could participate in tagging trees using their own Smartphone, although the accuracy of tagged trees is subject to certain positioning errors that might not be able to represent exactly the location of an individual tree. End users are able to record basic tree data, including species name, diameter and height, after tagging a tree with a QR code.

The system also provides a tool to report post-event activities such as tree watering and pruning. In conclusion, engaging citizens in tree inventory using digital mobile technology could offer an alternative way to support



Figure 12 Map view of tree planting in Negeri Sembilan.



Figure 13 Tree planting of mangrove trees by volunteers from ON Semiconductor and students.

in providing supplementary data toward a comprehensive database for monitoring the sustainability of urban green space and forest in Malaysia.

Acknowledgement

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Opportunities for female land surveyors in emerging economies

We can learn and accomplish a great deal when female land intermediaries work hand-in-hand with chartered surveyors



Emem Isang
Women In Surveying
(WIS), Nigeria



Anne Girardin
Cadasta, USA



Madaleine Weber
Cadasta, USA

Land administration is generally the responsibility of governments. But in emerging economies, the lack of financial and human resources prevent many governments from building and maintaining comprehensive land registries and cadastral systems. Typically, only the wealthiest people have the means to navigate a cumbersome and expensive government bureaucracy in order to acquire legal titles and secure their land tenure. The most vulnerable people often rely on commonly unrecorded informal and/or customary practices and these land management practices most acutely affect women. In many societies, even if women inherit land from their fathers, and even if they have the financial capacity to register their land, women are not recognized by men as landowners. Furthermore, women often lack knowledge about their rights, face male-dominated land agencies, and even in instances where women can register their property in their name, the process is often hijacked by male relatives. However, research has established that secure land rights increase productivity by as much as 50 percent, doubles the rate of high-school graduation, and increases environmental conservation.

This impact is even more pronounced when women gain secure rights to land.

The lack of female intermediaries to facilitate the formalization of tenure for female landowners actually creates an opportunity for women land professionals in emerging economies that might be more trusted by female headed households than their male counterparts. At the moment, there are no clear global figures regarding the number of female surveyors or cartographers and their proportion in regards to men, but it is certainly still a profession that is highly dominated by men. In certain areas of the world, it is a necessity to involve women in the land documentation process to enter homes, if accurate and unbiased data is to be collected. Women are also essential in certain conflict resolution projects related to women and inheritance, so why not involve them in the entire registration process? Women can talk to other women more easily and are often seen as having more empathy. And when it comes to using the tools and applying a process, women are also more detail oriented and thus accurate than men.

Women surveying and mapping professionals will facilitate the empowerment of women in the global economy. By starting with a pragmatic approach in training them to the use of the newest mobile technologies that allow them to collect land information and build local cadastral systems faster and at a fraction of a cost compared to traditional survey methods, it will help bridge the gap between women landowners deprived from land rights recognition and women full actors of economic development by having access to secured tenure. And by having

It would probably take all the land surveyors in the world 200 to 300 years to map the world's undocumented land. Given the overwhelming shortage and demand for land professionals worldwide, there is a clear need for a more pragmatic approach to involving and training women in the land documentation process



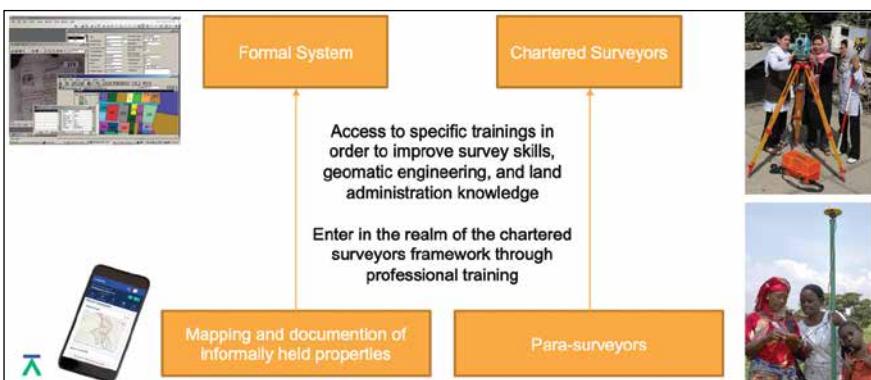
Two community members learning how to become para-surveyors using a smartphone and an external GNSS antenna to increase the positional accuracy in Luberizi, South Kivu, Democratic Republic of Congo



Anne Girardin teaching two land survey and geomatic students from Kabul Polytechnic University in Afghanistan how to use a total station

often lack knowledge about their rights, face male-dominated land agencies, and even in instances where women can register their property in their name, the process is often hijacked by male relatives. However, research has established that secure land rights increase productivity by as much as 50 percent, doubles the rate of high-school graduation, and increases environmental conservation. This impact is even more pronounced when women gain secure rights to land.

Over the past two decades, the development of remote sensing, the Global Network Satellites System (GNSS), and mobile technologies have changed the landscape of land documentation. Donor agencies have taken notice by developing simple digital tools to document land rights from bottom-up in an effort to reduce the time and cost of traditional documentation methods. Some of these tools include the UN-Habitat Social Tenure Domain Model (STDM), the United Nations Food and Agriculture Organization (FAO) Open Tenure, the USAID Mobile Application to Secure Tenure (MAST), and the Cadasta Platform funded by the Omidyar Network and UK Department for International Development (DFID). These new tools utilize land intermediaries such as para-surveyors to identify properties and collect land-related data and GIS technicians to help manage the collected data and review for overlapping claims and conflicts over land. Together, these intermediaries work to produce and manage information required for land formalization. Women, however, are still largely barred from accessing these intermediary professions, despite the fact that in certain areas of the world, women's involvement is required in order to enter homes or to solve conflicts related to women's land rights and inheritance.



The need for female intermediaries in emerging economies presents an opportunity for women to become land professionals for both the formal and informal systems

these newly qualified women surveyors join land professional organizations, they will have access to higher competences and eventually get job opportunities in the construction industry, urban and rural planning, or even conservation. Involving women in the land and surveying profession is essential, especially if we want to have women participate as full actors in the process of economic development.

financial and human resources prevents many governments from building and maintaining comprehensive land registries and cadastral systems. Typically, only the wealthiest people have the means to navigate a cumbersome and expensive government bureaucracy in order to acquire legal titles and secure their land tenure. The most vulnerable people often rely on commonly unrecorded informal and/or customary practices and these land management practices most acutely affect women. In many societies, even if women inherit land from their fathers, and even if they have the financial capacity to register their land, women are not recognized by men as landowners. Furthermore, women

At the moment, there are no clear global figures regarding the number of female surveyors and cartographers and their proportion to men, but it is certainly still a profession that is largely male dominate. The lack of female male professionals is also a result of the difficulties that women face accessing secure land rights. In certain parts of the world, involving women in the land documentation process is required to enter homes, if accurate and unbiased data

Introduction

Land administration is generally the responsibility of governments. But in emerging economies, the lack of

is to be collected. Women are also essential in certain conflict resolution projects related to women and inheritance as they are seen as having more empathy and being able to talk to other women more easily. And when it comes to using the tools and applying a process, women are also known to be more detail oriented and accurate

Becoming a land professional through the formal system

Understanding the education requirements and barriers that women must overcome to become land professionals

Formal land administrations are formed by professionals (both public and private) that are typically trained in universities or dedicated schools such as the Ecole du Cadastre (Cadastral Schools) in many francophone countries. It typically takes two years to become a technician, five years to become an engineer, and seven years to become a chartered surveyor. All land professionals are trained in both the technical (topography, geodesy, GIS, etc.) and the legal (civil law, judicial law, administrative law, etc.) aspects of the profession. As such, it takes significant time and resources to become a qualified, experienced land professional through the formal system.

Because land surveyors were needed in the development of transportation networks and construction buildings, the land profession has historically been seen as a man's job. The heavy equipment and the often difficult weather conditions are often used as justifications to exclude women from the profession. Until now, very few women have become land professionals, and even when they do, they are often put in more administrative and legal roles. But with the development of new lightweight technologies that reduce field time, the traditional barriers facing women are diminishing.

Technological advancements aside, the gender gap in education still prevails

in emerging economies. Fewer females attend and finish high school than their male classmates and therefore have less of a chance to enter the profession, even if they wish to.

Lessons from Women In Surveying (WIS) Nigeria in Overcoming these Barriers

Founded in 1934, the Nigerian Institution of Surveyors is one of the oldest professional associations in Nigeria. In an attempt to support female surveyors, the Women in Surveying (WIS) Nigeria network was established in 2004 by Mrs. FK Omatsola, a female land surveyor. The network now has over 500 members and has inspired other WIS groups in Africa (WIS Ghana was established in 2012 by Mrs Angela Etuonovbe) as well as worldwide.

In Nigeria, women have been trailblazers in the field of surveying, both nationally and internationally. These trailblazers include Mrs. Olayinka, the first female surveyor general of Nigeria.

Women in Surveying Nigeria is committed to:

- Empowering and encouraging girl children through its project "catch them young",
- Upholding the ethical practice of surveying and mapping profession,
- Encouraging professional integrity of women,
- Economic empowerment of women and poverty alleviation,
- Sensitizing the general public on the need to engage the services of surveyors to prevent developmental errors, save time and money,
- Promoting the economic, social, political and professional growth and development in the society.

WIS is the only institution that caters exclusively to the needs and challenges of the female surveyors in Nigeria. It has become a beacon of hope to young Nigerian girls to prove to them that with hard work, nothing is impossible. It has helped to break down social barriers in a heavily male dominated work environment.

The "catch them young" program has helped to educate, empower, and train young girls giving them the much-needed tools (both mentally and educationally) to succeed as land professionals. As an example, Emem Isang, the first female surveyor general in Akwa Ibom, and national secretary of WIS Nigeria for four years, has been involved in mentorship and training programs in Akwa Ibom which has helped produce a new generation of over 50 brilliant female surveyors and counting.

Regardless of various challenges faced,—including a lack of funding, infrastructure, technology, equipment, education, and male acceptance, as well as deeply embedded cultural barriers—, WIS has been able to overcome and achieve great exploits in the surveying profession in Nigeria and the association has become a example of success.

But despite all these efforts, gender equality in the surveying world in Nigeria is not yet achieved.

Globalization of WIS

In looking at the success of WIS, the International Federation of Surveyors (FIG) and Winnie Shui, Chief Land Surveyor at Hong Kong Government (at the time part of the FIG Commission 1 and now president of Commission 1) made a presentation at the FIG Working Week in Bulgaria in 2015 promoting the network. Thus, FIG Working Group (Commission 1.2) Women In Surveying was created with one initial vector of actions: encourage women to become surveyors or join land professions in general. Since then, WIS groups are slowly being created in other parts of the world like in Australia and New Zealand.

A WIS meeting was held for the first time in 2018 during the FIG Congress in Istanbul, Turkey to discuss the way forward. Inline with the development of fit-for-purpose land administrations and recognizing that there was a need for female intermediaries to facilitate the formalization of tenure for female landowners in certain countries, a second vector of actions was laid down:

support women in emerging economies to secure their land and resource rights.

Following the movement, the Francophone Federation of Surveyors (FGF) initiated the creation of a francophone WIS network during the annual congress in Rabat in November 2018. In early 2019, the French female surveyors created WIS France which is supporting the creation of WIS associations in Benin and Senegal. More progress is expected by April 2019 at the FIG Working Week in Vietnam. This global network of female surveyors should help coordinate actions and reach the Gender Equality Sustainable Development Goal.

Becoming a land professional through the informal system

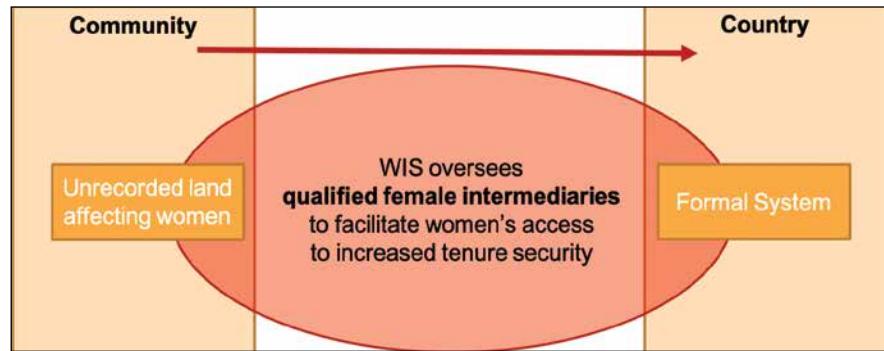
Clearing the way for female land intermediaries

It would probably take all the land surveyors in the world 200 to 300 years to map the world's undocumented land. Given the overwhelming shortage and demand for land professionals worldwide, there is a clear need for a more pragmatic approach to involving and training women in the land documentation process.

With the advent of easy-to-use mobile technologies, such as those offered by Cadasta, women can now more easily collect land information and build local cadastral systems faster and at a fraction of a cost compared to traditional survey methods. These new female land intermediaries will help bridge the gap between those women with land rights and those without. And by making it easier for women to enter the land profession, we will also open broader economic and job opportunities for these women and their families. Involving women in the land and surveying profession is essential, especially if we want to have women participate as full actors in the process of economic development.

Establishing WIS groups in emerging economies to provide a framework of intervention

Becoming a land professional through



the informal system will require some attention in order to make sure that these newly trained practitioners comply with the fit-for-purpose best-practices established by FIG and World Bank in 2015 in the Fit-For-Purpose Land Administration guide.

WIS groups are overseen by FIG Commission 1.2 to ensure coordination of actions and support between countries. Creating WIS groups in more countries would provide the needed framework to train new female practitioners and establish a means to bringing them into the profession at higher levels.

During the WIS meeting in 2018, male surveyors and land professionals were encouraged to join the movement in order to help develop the WIS concept and groups worldwide, especially in countries where women are currently absent from the land professions.

Chartered surveyors and newly trained female land intermediaries working hand-in-hand

Today, despite widespread acceptance of the Fit-For-Purpose land administration guidance, we continue to subscribe to the idea that land documentation needs to comply with the traditional surveying methodologies of the formal systems, requiring fixed boundary mapping and therefore increasing the cost and the time of registration. But the growing recognition of customary tenure and women land rights' using general boundary mapping requires us to think differently.

We can learn and accomplish a great deal when female land intermediaries work hand-in-hand with chartered surveyors. While the female land intermediaries can focus on the land rights recognition process, conflict resolution mechanisms, or the recognition of women's land and resource rights and compliance with the Social Tenure Domain Model (STDM), the chartered surveyors can ensure that systematic surveys and the mapping of general boundaries using low cost instruments reach a defined spatial accuracy and comply with international standards such as the Land Administration Domain Model (LADM).

This cooperative arrangement will promote the exchange of experience between the two systems to help address the gaps between laws and community norms.

Let us draw on the success of networks like WIS to support women in becoming land professionals through a practical approach. There is still much to be gained from involving women surveyors to push laws and policies forward to bring informally-held properties into the realm of the formal system.

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The paper was presented at FIG Working Week 2019 Hanoi, Vietnam, April 22–26, 2019. ▶

New versatility to chart production by S-100 data model

Teledyne CARIS has announced the release of its Hydrographic Production Database™ (HPD) 4.0. It is designed to support Hydrographic Offices around the world as they embrace the new S-100 Universal Hydrographic Data Model and explore its many possibilities. Its users will be able to augment their existing production environment to support both the S-101 and S-57 Electronic Navigational Chart (ENC) production from the same source database. Rich, customizable mappings allow for a full transition of data to the new data model to achieve ultimate versatility without redundancy. Also featured in version 4.0 is the ability to connect to the bathymetry compilation toolkit, CARIS Bathy DataBASE™ (BDB). teledyne.com

Free U.S. traffic count data

Caliper has announced the release of free USA traffic count data for Maptitude 2019 users. This latest map layer includes fields with total Annual Average Daily Traffic (AADT), semi-trailer daily traffic, single-unit truck and bus daily traffic, number of through lanes, and road classification. Annual average daily traffic is the total volume of vehicle traffic on a highway or road for a year divided by 365 days. AADT is a useful and simple measurement of how busy a road is. The downloaded layer can be added to any Maptitude 2019 map.

Esri releases book: GIS and the 2020 census

In preparation for the 2020 round of censuses comes a book providing statistical organizations with the most recent methodologies and technological tools to support all stages of the census. GIS and the 2020 Census supports the transformation of countries' censuses with the use of GIS software and related geospatial technologies to improve data collection, analysis, and dissemination and to enable agencies to build accurate, authoritative, actionable data.

Mapping is generally recognized as one of the most crucial activities of a census. As

Timothy Trainor, former chief geospatial scientist for the US Census Bureau, reminds readers in the foreword of this book, "A census provides the data that allows us to begin the determination of a cause-and-effect relationship to important questions posed by why." By this, Trainor is referring to the why of where.

GIS and the 2020 Census covers planning, enumeration and field data collection, and post-enumeration tasks: converting existing data, field operations, data processing and dissemination, developing geographic products, and much more. esri.com/esripressorders

Spatial database using GIS by Government of Oman

Government of Oman's, Ministry of Housing is planning to launch a system on land information services with the spatial database using GIS. Recently, a meeting to review the progress in the establishment of the system was held in the presence of Saif bin Amer al Shaqsi, Under-Secretary of the Ministry, representatives of the executing company and a number of officials in the ministry and its directorates.

Taher al Salami, Director of GIS Department at the Directorate General of Urban Planning and Surveying, said, "The system assigned by the ministry to a GIS company is based on the establishment of a central geographic database. The new system assists in the development of land information systems, registration of land and property, draw of survey and topographic maps, geospatial data formation, data migration and development of the geographic database. The system also provides options for daily switching as well as editing, updating, reporting, extracting and printing required notes and receipts collection services through web browser."

Nordic enterprises seek digital transformation from data center and cloud vendors

Enterprises in the Nordic countries are investing in digital transformation and looking for vendors to help them with their move to the cloud and adoption

of artificial intelligence for operations, according to a new report by Information Services Group (ISG) a leading global technology research and advisory firm.

The 2019 ISG Provider Lens™ Private/Hybrid Cloud — Data Center Services & Solutions Report for the Nordics finds many Nordic enterprises turning to IT outsourcing as a way to cut costs, expand their businesses globally and gain access to technology experts with niche skills.

In some cases, however, Nordic businesses are struggling to see quick returns on investment when they move to a cloud computing model, the report says. While cloud computing can eliminate or minimize hardware infrastructure, some enterprises need outside expertise to help them plan and capitalize their cloud investments. www.isg-one.com.

Ascend unveils Autonomous Dataflow Service

Ascend has introduced the world's first Autonomous Dataflow Service, allowing data engineering teams to quickly build, scale, and operate continuously optimized, Apache Spark-based pipelines. Users combine declarative configurations and automation to manage cloud infrastructure, optimize pipelines, and eliminate maintenance across the entire data lifecycle. Customers of all sizes and industries are using the Ascend Service to leapfrog their data architectures and build the data foundation to fuel their digital transformations.

Pipelines are an essential part of any modern data architecture. With ever-changing infrastructure technologies, larger data volumes, and a growing variety of data formats, today's pipeline development and operations require far too much coding and a disproportionate amount of time for maintenance and optimizations. Changes in the data itself, infrastructure updates, or logic tweaks often produce brittle and problematic pipelines. For many data engineering teams, this means combing through code and logs and constantly tuning parameters just to keep things running. www.ascend.io/get-started. ▶

Improve bridge inspections using robotics technology

Powerful robotics technology developed by researchers at the University of Waterloo makes critical bridge inspections cheaper and more reliable by automating the process. The new system combines autonomous robots, cameras and lidar – a remote sensing method using lasers — to systematically collect data for defect detection and analysis.

"We can do more than humans now do – and do it much better in every way," said Sriram Narasimhan, an engineering professor at Waterloo. "It is very inexpensive because you don't need as many inspectors relying on specialized equipment such as lifts and you get much higher quality information."

Narasimhan, a Canada Research Chair in Smart Infrastructure, said current practices create an inspection system that is subjective, less repeatable and often imprecise because it is based, at least in part, on educated guesswork. The automated system, by contrast, eliminates the subjectivity of human inspectors, and is both repeatable and reliable, with the ability to precisely measure the size of defects and reveal invisible, subsurface problems with infrared cameras. It is designed so that the results from one inspection can be overlaid on previous inspection results on a detailed map displaying dozens of key vulnerable areas of the subject bridge. <https://uwaterloo.ca>

AI for agriculture in Government of Canada-funded network

MDA has announced its partnership in a network team led by Alberta Innovates that was selected by the Government of Canada for a Strategic Innovation Fund (SIF) investment. The Canadian Agri-Food Automation and Intelligence Network (CAAIN) will bring technology and agri-food companies together with academic partners to create new solutions that improve competitiveness and drive growth in both the agriculture and technology sectors. Within the network, MDA will conduct a program of research

and technology development to advance enabling Artificial Intelligence (AI) technologies with applications in the agriculture sector. MDA will also advance core data collection and data management technologies that use multiple sensor types, including hyperspectral imaging. In cooperation with its network partners, MDA will field the core AI and data technologies in a series of information service demonstrations, including those targeted at applications related to precision farming and supply chain management. <https://mdacorporation.com>

Nowigence launches game-changing Artificial Intelligence platform

Nowigence has released Pluaris capable of extracting relevant content from various sources used in your day-to-day work and organizing, storing, and delivering tailored intelligence as per your preferences in ready-to-use formats.

Nowigence is an up and coming SaaS company that utilizes Natural Language Processing (NLP) and Machine Learning to automatically extract and synthesize sales intelligence from both unstructured and structured data.

OpenAI joins hands with Microsoft

Microsoft and OpenAI have partnered to further extend Microsoft Azure's capabilities in large-scale AI systems. Through this partnership, the companies will accelerate breakthroughs in AI and power OpenAI's efforts to create artificial general intelligence (AGI). The resulting enhancements to the Azure platform will also help developers build the next generation of AI applications.

The companies will focus on building a computational platform in Azure of unprecedented scale, which will train and run increasingly advanced AI models, include hardware technologies that build on Microsoft's supercomputing technology, and adhere to the two companies' shared principles on ethics and trust. This will create the foundation for advancements in AI to be implemented in a safe, secure and trustworthy way and is a critical

reason the companies chose to partner together. <https://news.microsoft.com>

Trimble launches cloud-based TMW.Suite

Trimble has announced that its TMW.Suite and TruckMate transportation management system (TMS) solutions are now available via a cloud-based subscription model. TMW.Suite and TruckMate are two of Trimble's flagship TMS solutions, which enable transportation and logistics providers to better manage their transportation operations and improve efficiencies throughout their organization.

Built on decades of experience, Trimble's TMW.Suite and TruckMate have been carefully bundled and backed by prescriptive implementation and training options. The cloud-based options provide an ideal solution for both asset and non-asset based companies of all sizes looking to implement a scalable TMS without the need for on-site servers or extensive IT oversight—saving money and improving outcomes. On-premise options will continue to be available as well.

51VR initiated China's first autonomous driving simulation bluebook

Under the guidance of industry experts, the bluebook unveils the current development of China's automated driving simulation and serves as a tool to OEMs, suppliers, startups, testing agencies, etc.

Lately, China's first self-driving simulation blue book "*Annual Research Report on Autonomous Vehicle Simulation in China (2019)*", initiated by 51VR, was released recently.

Compiled from the opinions of many industry experts, the Bluebook is the first comprehensive reference book on the development status of China's automated driving simulation test. It combines the cutting-edge research results of current academic institutions and leading Chinese companies and deals with all areas of automated driving simulation testing. The book includes the

significance of simulation test, method applications, technical solutions, the current status of software, virtual scene database, demonstration area testing mode, the introduction of simulation testing standards, challenges and trends.

The Bluebook provides an opportunity for communication and learning in the autonomous driving industry, and makes an introduction to 51Sim-One, which is China's first full-function automated driving simulator and testing platform. It integrates multi-sensors simulation, traffic flows and intelligent objects simulation, perception and decision simulation, and automated driving behavior training. Based on precise and real-time physics modeling, the simulation platform is widely used in R&D, testing and validation of autonomous driving products. It can quickly accumulate automated driving experiences for users, ensure product performance, safety and reliability, accelerate product development speed and reduce development cost. <http://www.51hitech.com>

Volkswagen, Ford move towards partnership in autonomous vehicles

Volkswagen and Ford could be headed for a possible partnership for the development of autonomous vehicles as reported by Bloomberg. According to the report, the deal could include an investment in Ford's autonomous side-project Argo AI, which the carmaker has been backing through investment deals.

MADD partnership with Velodyne LiDAR

Mothers Against Drunk Driving (MADD) has announced to partner for a second year with Silicon Valley-based Velodyne Lidar, Inc. The partnership continues a public education effort across the country on the safety benefits of autonomous vehicle technology.

Drunk driving is a violent and preventable crime that kills someone every 48 minutes in the United States. MADD's Campaign to Eliminate Drunk Driving

is working toward eradicating this crime through four key elements that include supporting high visibility law enforcement, ignition interlocks, support for advanced vehicle technology, and building public support. Velodyne's work with autonomous vehicle technology is a natural complement to MADD's support for future technologies.

<https://velodynelidar.com/>

Postmates selects Ouster LiDAR for autonomous delivery rover

Ouster, a leading provider of high-resolution LiDAR sensors used for autonomous vehicles, robotics, and mapping, announced that Postmates, selected the Ouster OS1 LiDAR sensor for use in its Serve autonomous delivery rover deploying first in Los Angeles. The LiDAR delivers an industry-leading combination of performance, lightweight, value and reliability that enables Serve to seamlessly and safely navigate sidewalks, detect pedestrians, and interact with the community. www.ouster.io ▶

LINERTEC

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Total Station

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Reflectorless
Total Station

LTH-02/05
Electronic
Theodolite

LGN-100N/T
Positioning
System



Linertec, your Benefit in Surveying and Construction

The Linertec Precision Instruments are designed and developed in Japan. They are the result of our long-established expertise in Surveying and Construction.



Galileo GNSS Service restored

Carlos des Dorides, executive director of the GSA made the following statement after restoration of GNSS services over the Galileo satellite constellation.

"As members of the GNSS community, you are all undoubtedly aware of the recent technical incident that resulted in the temporary interruption of Galileo navigation and timing services.

The technical incident originated by an equipment malfunction in the Galileo ground infrastructure, affecting the calculation of time and orbit predictions, which are used to compute the navigation message. The technical incident affected different elements of the ground facilities.

A team composed of GSA experts, industry, ESA and the Commission worked together 24/7 to address the incident, and Galileo Initial Services have now been restored. In particular, the dedication and work of our industrial partners has helped to achieve this result. Commercial users can already see signs of recovery of the Galileo navigation and timing services, although some fluctuations may be experienced until further notice.

The team is monitoring the quality of Galileo services to restore the Galileo timing and navigation services to their nominal levels. As soon as we gather all the technical elements and implement all necessary actions, we will provide more detailed information through our NAGU (Notice Advisory to Galileo Users) notifications to users.

All partners worked together to remedy the situation as soon as possible. We will set up an Independent Inquiry Board to identify the root causes of the incident. This will allow us to draw lessons for the management of a global operational system with several millions of users worldwide.

The Galileo system has grown stronger as a result of this experience, and we will continue to deliver Initial Services until full operational capability is declared. These challenging days have shown us

how much you, the GNSS user community and stakeholders, rely on Galileo and how much you trust the Galileo system to deliver the services to support growth, business and sustainability. Europe and the world need a strong civil global satellite navigation system today more than ever." <http://www.gsa.europa.eu>

Glonass protected against errors that hit Galileo

Russia's Glonass satellite navigation system is protected against technical issues that earlier knocked down its European rival, Galileo, a spokesperson for Russia's space corporation Roscosmos said recently.

"[The Glonass system] is certainly protected. In order to prevent such errors, rocket and space industry enterprises have a multiple-level checking systems for software. Besides, the ground-based control hub of the Glonass space system has automated control systems and reserve capacities," the source said.

"Flight trials [of Glonass spacecraft] envisage simulation of emergency situations, and operating instructions contain measures for tackling them," he added. <https://tass.com>

State Duma ratifies Russia-China agreement on national satellite system station

The Russian State Duma (lower chamber) has ratified an agreement between the Russian and the Chinese governments on cooperation in applying the GLONASS and the BeiDou global national satellite navigation systems, envisioning a mutual deployment of stations on their territories.

The agreement was signed in Beijing on November 7, 2018. According to the explanatory material, the agreement stipulates deployment of measurement station for the GLONASS and the BeiDou systems on the territories of China and Russia respectively to develop functional additional features of GLONASS and to create a global system of control and confirm the radio navigation zone characteristics of this system. <https://tass.com> 

Airbus brings a SMILE to ESA

Airbus has been selected by the European Space Agency to build the European component of the SMILE satellite (Solar wind Magnetosphere Ionosphere Link Explorer). SMILE will be the first joint satellite mission between the European Space Agency (ESA) and the Chinese Academy of Sciences (CAS), following on from the success of the Double Star / Tan Ce mission which flew between 2003 and 2008.

The objective of SMILE is to study and understand space weather. Specifically, it will look at the physics behind continuous interaction between particles in the solar wind and Earth's magnetosphere, the magnetic shield that protects the existence of life in our planet. The mission is now entering a four-year period of manufacturing, testing, and integration of the payload module and the platform. In launch configuration these two components will form a 3.15-m-high stack.

The spacecraft will have a mass of 2,200 kg and will travel in a highly elliptical orbit around the Earth. Its perigee will be at a distance of 5,000 km (from where it will download data to the Troll ground station in Antarctica and the CAS ground station in Sanya, China), while the apogee will be as far as 121,000 km (this is almost one third the distance to the Moon). At this vantage point the satellite will have a prolonged view of the Earth's northern polar regions, to enable the boundary of the Earth's magnetic field and the Northern Lights, or aurora borealis, to be imaged.

The payload module will be built at the Airbus site in Madrid, where the instruments will be integrated. The platform will be built in Shanghai. airbus.com

Airbus Defense and Space completed first step in construction of JUICE satellite

Airbus Defence and Space has completed the first step in the construction of the inner structure of the European Space Agency's (ESA) JUICE satellite. This is the beginning of its Earthly journey through different Airbus sites in Europe

(Lampoldshausen, Friedrichshafen and Toulouse) towards final integration.

Airbus is building the JUICE (JUpiter ICY moons Explorer) spacecraft for ESA, which will investigate the potential for Jupiter's icy moons Europa, Callisto and Ganymede to harbour habitable environments such as subsurface oceans. JUICE will also carry out observations of Jupiter, its atmosphere, magnetosphere, other satellites and rings. As prime contractor, Airbus is leading a consortium of more than 60 companies across Europe on the project.

nFrames SURE combines photogrammetry and Lidar

nFrames is a provider of photogrammetric software that uses intelligent algorithms that can automate the processing of constantly increasing data volumes at an ever-growing acquisition frequency. The software is used worldwide by private and public mapping organizations for the automated production of point clouds, digital surface models, true

orthophotos and meshes from imagery for cities and entire countries by extracting precise 3D information for every pixel. While the automatically produced true orthophotos are driving automation for applications in the 2D GIS domain, meshes are now driving GIS applications in the 3D beyond city modelling, visualization and web-streaming as they elegantly combine geometry as a closed surface in combination with high-resolution imagery.

China to launch constellation of remote sensing satellites by 2021

China is planning to launch a constellation of 192 remote sensing satellites by 2021. Artificial intelligence technology will process the images captured by the satellites, which will have sensors with multiple resolutions. This will allow poor quality images to be filtered out so that only useful data is beamed back to earth. Scientists working on the project are also attempting to enable the constellation to be self-piloting. www.ecns.cn

Synspective raises US \$100 million in funding

Synspective is a Japanese startup which provides satellite data solutions using small-sized SAR (Synthetic Aperture Radar) satellites. The company accumulated \$100 million USD in funding since its foundation in February 2018. Raising that amount in less than 17 months makes Synspective the world's fastest and Japan's second-highest funded space startup. The investment will help strengthen the company's SAR satellite development, manufacturing systems, and solutions development. Synspective provides one-stop solutions by satellite gathered geospatial data.

SAR satellites actively observe and acquire earth surface information by transmitting and receiving reflected microwaves. Compared to optical satellites, which depend on sunlight reflection, SAR can capture images of the ground surface in all-weather conditions and any time of the day or night. www.finsmes.com

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US Commerce department urged to revise commercial RS regulations

Satellite operators Maxar Technologies, Planet Labs, HawkEye 360, BlackSky Global and Spire Global have urged the U.S. Department of Commerce to revise its proposed commercial remote sensing regulations, which as drafted would put U.S. firms at a significant disadvantage in the global marketplace.

While U.S. satellite operators appreciate the Department's recognition of the risk to American leadership in space that comes from overly burdensome regulation, the proposed regulations would undermine U.S. competitiveness, impair U.S. innovation and deter investment in the U.S. commercial space industry. Commenters urged the Commerce Department to significantly revise the proposed regulations to take a more narrowly tailored approach to ensure the pressing need for continued U.S. leadership in commercial space is more appropriately balanced with other regulatory interests. www.satellitetoday.com

LeoLabs and New Zealand Space Agency unveil regulatory platform for low Earth orbit

LeoLabs, has announced the world's first dedicated regulatory platform for LEO: the Space Regulatory and Sustainability Platform, developed as a joint initiative between LeoLabs and the New Zealand Space Agency (NZSA). The NZSA is a leader in best practices and industry standards for promoting, regulating, and guiding the global new space community. The regulatory platform offers a ground-breaking set of capabilities to empower the New Zealand government to meet its stated mission of encouraging a sustainable space environment for future generations.

The Space Regulatory and Sustainability Platform provides cloud-based services based on LeoLabs' network of global sensors. Observations from this network are then processed via the LeoLabs mapping and SaaS platform which analyzes and delivers operational and compliance information to the New

Zealand regulatory and space agency. The platform monitors satellites launched from New Zealand. <https://leolabs.space/>

Glavkosmos signs contract with ISRO for training Indian astronauts

First Deputy Director General of Glavkosmos (part of Roscosmos State Corporation) Natalia Lokteva and Director of Human Space Flight Centre (HSFC) of Indian Space Research Organization (ISRO) Dr. S. Unnikrishnan Nair signed a contract for selection support, medical examination and space training of Indian astronauts.

Glavkosmos will render to HSFC services on consulting support of the selection of candidates for the Indian astronauts, providing a medical examination of the candidates for access to space flight related training programs and providing space flight related training for the Indian astronauts selected on the basis of the medical examination. www.firstpost.com

Chandrayaan-2 successfully Launched

India has its second moon mission Chandrayaan-2 from its most powerful rocket with a plan to land the rover on September 7 in the unexplored lunar south pole, exactly a week after the liftoff was aborted due to a technical snag.

Carrying a "billion dreams" in a giant leap for the country's ambitious low-cost space programme, the most complex and prestigious mission ever undertaken by the Indian Space Research Organisation (ISRO), if successful, will also make India the fourth country after Russia, the US and China to pull off a soft landing on the moon.

The Rs 978-crore unmanned mission also brought woman power to the fore as it was helmed by two woman scientists of the ISRO--Ritu Karidhal and M Vanitha, the Mission and Project directors respectively.

The ISRO is aiming for a soft landing of the lander in the South Pole region of the moon where no country has gone so far. www.news18.com ▶

Drone Companies snag \$7.5 Million Air Force contract to develop UTM

Two New York drone companies have flown into a cloud of sweet, sweet government dollars after receiving a \$7.75 million grant from the Air Force Research Lab.

UAS provider AX Enterprize of Yorkville, N.Y. and drone UTM company Thales USA will use the money to investigate state-of-the-art air traffic management (ATM) systems to gauge how civilian and military drone systems can safely coexist alongside manned aviation in the National Airspace System. The project will be completed at the Griffiss UAS Test Site in Rome, N.Y. through a partnership the two companies as well as collaboration with NUAIR, Scherzi Systems LLC and Syracuse University's Center for Advanced Systems and Engineering (CASE) and Autonomous Systems Policy Institute (ASPI).

Before multiple large or small UAS can fly in the same airspace as other aircraft, procedures need to be developed for drone pilots to safely detect and avoid other air traffic. The project will develop a policy approach and data exchange models – using high-definition air traffic surveillance and ground-based sense-avoid radar technology at Griffiss – to ensure that UAS and manned aircraft can operate within close proximity safely in the National Airspace System (NAS). [https://dronelife.com](http://dronelife.com)

VOXL from ModalAI contributes to Uber Eats drone delivery testing

Uber Eats successfully tested its first food delivery by drone recently, in a high-density urban area with the assistance of technology from San Diego-based startup ModalAI. As the drone carried its edible cargo, VOXL, a powerful yet light-weight computing platform with 4G cellular connectivity, helped keep it safely on the flight path, even when the drone was out of sight from the pilot-in-command.

VOXL is a computing and communication platform that utilizes the smartphone ecosystem to create a highly-integrated, machine vision-based, autonomous

navigation system for indoor, outdoor ground robots and drones. Unlike traditional GPS-based flight systems that can experience weak or lost satellite connections, VOXL keeps drones flying even when GPS is not available. www.modalai.com

Delair announces subscription program

Delair has announced Delair Takeoff, a cost-effective subscription program for accessing the company's high performance Delair UX11 family of UAVs and its delair.ai, cloud-based data management solution. Customers can pay a fixed monthly fee and have unlimited use of the long-range, fully equipped drone. A six-month minimum contract is required, and the plan is currently only available to customers in Europe. www.delair.aero

Drone-based aerial biocontrol now offered

UAV-IQ today announced that it is offering aerial biocontrol, a new integrated pest management (IPM) service that uses drones to release beneficial biological control agents bred by Koppert Biological Systems. Drone-based aerial biocontrol offers a new way for conventional and organic growers to combat pests, reduce the environmental impact of pesticide usage, and address a growing labor crunch. <https://www.uaviq.com>

SpotterRF receives patent for the first full dome counter drone radar

SpotterRF has been awarded a patent by the U.S. Patent office for the 3D-500 360° full-dome radar that was developed to detect drone attacks and is the latest in a line of counter-drone radars from SpotterRF. It is the first radar that creates a full-dome drone detection volume from 0 to 90 degrees in the vertical and 360 degrees in the horizontal with single radar that weighs 12 pounds. It measures latitude, longitude, and altitude of all aerial targets in a 1 km wide semi-hemisphere dome, even directly above the radar with no gaps in coverage. Rapid threat assessment is simple with the automatic AI-driven classification

and 3D tracking of CUAS combined with fully automated camera queuing on the target. Effective and cost-effective counter-drone systems, are necessary to tackle challenges faced by airports, special events, military, prisons, and critical infrastructure <https://spotterrf.com/>

Indian government brings more provisions to regulate drone operations

Indian Minister of State for Civil Aviation Hardeep Singh Puri has admitted in the Upper House of the Indian Parliament that drones can pose a security risk. The government will bring in more provisions to regulate their operation, especially in no-go areas.

Puri added, "The government is acutely conscious of the kind of security threats that drones can pose as they come in all shapes and sizes ranging from 250 grams to 250 kilograms. Therefore, we need to devise an ecosystem in overall system which is well regulated; and some of the steps that we are contemplating and which is work-in-progress is that we are trying to ensure that certain parts of the country are no-go areas or red zones."

The Minister also emphasised that drones need to be equipped with domestic made technology and those drones that do not have the permission won't be allowed to take-off <https://m.economictimes.com>

Maharashtra becomes the first state in India to launch drone-based spatial survey

The largest unmanned aerial vehicle (UAVs) survey of properties was launched in the district of Pune last week. This was the largest exercise in the country that used drones to map spatial information to give out property titles to both residential and other properties around 40,000 villages. Drones fitted with high-mounted cameras conducted the in two villages – Pimpri Sandas and Nnavi Sandas in Pune's Haveli taluka. To cover 25 more villages, authorities are planning to launch the project in Satara (Maan and Khatav talukas), Aurangabad (Aurangabad

taluka) and Pune (Purandar taluka).



The 3.73 billion rupee project has been launched by the settlement commissionerate and department of land records, department of rural development and Survey of India (SOI) and for the first time, such a spatial survey is being conducted over 39,000 villages in Maharashtra. www.dnaindia.com

JIW signs agreement with Aerodyne

Japan Infrastructure Waymark Co. Ltd (JIW), a wholly owned subsidiary of Nippon Telegraph and Telephone West (NTT), has signed an agreement with leading UAV service provider Aerodyne to collaborate on drone-based services for infrastructure management, both within Japan and on behalf of overseas Japanese companies. Aerodyne is a world-leading AI-driven drone solutions provider, with a presence in 25 countries around the world and growing. www.suasnews.com

AirBox drone delivery tests conducted successfully in Antigua

In a partnership with the UN Ops, Antigua Computer Technology (ACT), and the government of Antigua, Drone Delivery Systems successfully performed drone deliveries to a secure smart mailbox, called AirBox Home.

Additionally, Drone Delivery Systems performed a 2.1 mile beyond line of sight (BVLOS) flight, delivering one of the most innovative defibrillators in the world made by Heart Hero from Colorado. Co-founder of Drone Delivery Systems, Brandon Pargoe, stated that the "accomplishment of these tests were not planned overnight." Pargoe shared that the company collaborated not only with the government of Antigua, but also with many other partnering companies and authorities to make these tests a reality.

AirBox Technology is a patented product invented by Mr. Pargoe to provide remote secure delivery access points to anyone in the world. <https://airboxtechnologies.com>

Racelogic announces SatGen Galileo update

RACELOGIC Limited, experts in the field of GPS testing and data logging today announced the latest update to its' SatGen GNSS simulation software for PC which now incorporates Galileo RF simulation.

Designed to create a GNSS RF I&Q or IF data file based on a user-generated trajectory file, the updated software can now accurately simulate the European Galileo GNSS satellite constellation alongside existing GPS, GLONASS and BeiDou RF signal generation.

The full range of Galileo frequencies that SatGen can simulate are Galileo E1 B/C, E5a, E5b and E6 B/C (see table below for further information). Other changes to the software include various UI tweaks, performance optimisation and fixes.

Trimble Catalyst software

Trimble has announced its Trimble® Catalyst™ software-defined GNSS receiver for Android™ phones and tablets is now available with a usage-based service plan—Trimble Catalyst On Demand. It provides scalable access to RTK-quality GNSS positioning using an affordable pay-per-use hourly pricing model in addition to the current Catalyst monthly plans. The new service also enables automated domain-level email address access, which streamlines license allocation for organizations with a large number of users. Account owners purchase access to the service in the form of On Demand time bundles. By keeping the account balance topped up, Catalyst remains ready to use at a moment's notice, for any number of nominated users in the account. This flexibility eliminates the need to predict project requirements weeks or months in advance. <https://catalyst.trimble.com>

SiTime offers MEMS timing solutions for rugged GNSS

SiTime Corp. has released its Endura micro-electro-mechanical system (MEMS) timing solutions for aerospace and defense applications including precision GNSS, as

well as field and satellite communications, avionic and space. These products are engineered to provide high performance in harsh conditions-severe shock, vibration and extreme temperature—that are routinely experienced in these applications.

Tersus launches David Plus dual-antenna GNSS Receiver

China-based Tersus GNSS Inc. recently launched its new David Plus receiver, a dual-antenna GNSS receiver which offers centimeter-accurate positioning and heading. It is designed for intelligent transportation, construction, machine control, precision agriculture, and navigation applications. It supports RTK positioning mode or RTK positioning + heading mode. It supports 384 channels and is said to be easy to connect an external powerful radio for long range communication.

Hi-Target iRTK5 make cadastral surveying faster and easier

Survey and register the lands and real estate properties can help to resolve the land dispute, manage the total land usage and better development plan. This project went off in Aksu, Xinjiang - an important agricultural base. Accuracy of the cadastral survey is very vital and sensitive to the landowners and administration agencies as it provides the essential elements of the land maps, coordinates. It is required that accuracies of all the boundary marks, evaluated by root mean square error value, should be less than 5 cm according to the National Cadastral Survey Standards of China when the mapping scale is 1:500.

The new iRTK5 by Hi-Target, with a built-in IMU, can provide 2 cm accuracy within 30-degree tilt, while there is no need for calibration at all. Thus, by using the new iRTK5, surveyors can go and pick without leveling the pole every time surveying points, no matter it is in a plane region, or a complicated area where man cannot access directly, the real coordination can be measured swiftly. Since total station's accuracy can be good within 2 mm error, these coordinates can be recognized as real coordinates.

GSA selects Orolia for timing solution on its GNSS systems

Orolia has announced that its team has been awarded an up to 1.7 million Euro grant by the European Global Satellite Navigation Systems Agency (GSA) to develop a resilient time and frequency server to protect critical GNSS-reliant systems. The Galileo Authenticated Robust Timing System (GEARS) project will deliver accurate and highly robust Galileo-based time and frequency data for critical infrastructure. Critical infrastructure such as telecommunications, broadcast, data centers, transportation, energy generation/distribution, and finance rely on GNSS signals, and detailed studies have documented their vulnerability to threats from signal jamming or spoofing.

The GEARS program will fund the development of a timing system to validate GNSS signals and protect the Galileo system from GNSS threats, providing accurate and robust time in GNSS challenged environments. It will also provide a backup signal and timing reference if Galileo is unavailable. The GEARS initiative will also develop a new standard for GNSS timing system protection by defining minimum testing criteria to qualify robustness against threats.

Quectel launches dual-band GNSS module LC79D

Quectel Wireless Solutions has launched a compact dual-band GNSS module, the LC79D, that supports the L1 and L5 bands from navigation satellites to improve positioning accuracy.

Featuring concurrent multi-constellation GNSS receivers on dual GNSS bands, LC79D uses L1 and L5 bands for GPS, Galileo and QZSS satellites, L1 band for GLONASS and BeiDou satellites, and L5 band for IRNSS satellites.

Compared to GNSS modules that use the L1 band only, LC79D can generally increase the number of visible satellites, significantly improve positioning drifting when driving in rough urban canyons and enhance positioning accuracy.

Atmos UAV signs a reseller agreement with Sonar Nusantara in Indonesia

Atmos UAV, the Delft-based drone manufacturer that develops high-end VTOL fixed-wing drones for surveying and mapping, has appointed Sonar Nusantara as its official distributor in Indonesia. Sonar, with its headquarters in South Jakarta, offers solutions to a complete range of surveying needs through partnerships with global and well-known manufacturers in the geospatial industry. With this collaboration, Atmos UAV will meet the demand in the Southeast Asian region and provide local Marlyn operators with support and first-line maintenance. www.atmosuav.com

ADW-Software Launches MyCumulus 3.0

MyCumulus is a cloud-based service. A combination of an app, a website and a number of tools that allows any user to create its own forms, collect or update data on an Android device and view the data on the MyCumulus website. The data can be imported in Pythagoras CAD+GIS Software . It is a solution for any type of mobile data collection and updates. When developing MyCumulus 3.0, the focused primarily has been on surveying, road construction and utilities. It anticipates an evolution: new and cheap GNSS devices are on the market that, in combination with Android devices and MyCumulus, allow measurements directly in the cloud.

Free Disaster Response Program for government agencies by Vexcel Imaging

Vexcel Imaging, has announced the availability of the Vexcel Disaster Response Program for government agencies. This program provides government agencies with access to post-event aerial imagery within hours of a disaster at no cost or obligation. The imagery is provided as an Esri ArcGIS Image Service or through other open standards, making it very easy to add this data to a county or state's current GIS maps and software.

Since the GIC was founded, it has responded to more than 20 events including hurricanes, tropical storms, tornadoes, floods, hail storms and floods through its Gray Sky program. By leveraging Vexcel Imaging's aerial imagery software and hardware and the large community of Vexcel UltraCam equipped aircraft, GIC is able to collect and deliver imagery of very large impacted areas within hours of an event. www.vexcel-imaging.com.

Leica Geosystems introduces new generation of manual construction Total Stations

Leica Geosystems has announced the next generation of iCON manual total stations, the Leica iCON iCB50 and iCB70. The next gen total stations further propels the industry to move from traditional analogue layout methods to digitalised construction layout techniques. Now integrated with the well-established and construction-tailored field software Leica iCON build, the iCON iCB50 and iCB70 allow users to easily digitalise and embed BIM workflows in their construction processes. It allows construction professionals to layout complex structures, increase accuracy and minimise delays. leica-geosystems.com

RIEGL invests in new production facilities in US and Austria

RIEGL is investing heavily in the expansion of production and office space in its headquarter Horn, Austria as well as in the US.

The continued, worldwide demand for the high-performance sensors allows the company to grow and expand further. The new building will house the company's printed circuit board production and the software development team.

Single antenna receiver by Septentrio

Septentrio has announced that their GPS/INS receiver is now available with a single antenna option. This single antenna receiver brings the possibility of robust centimeter positioning and 3D attitude (heading, roll, pitch), while keeping weight and power consumption to a minimum. For

Septentrio customers this means simplified integration as well as increased operation time and productivity. septentrio.com

ACI accepts DroneShield as sole counterdrone member

DroneShield has announced that it has been accepted for membership in ACI (Airports Council International) Europe. ACI Europe represents over 500 airports in 45 European countries, including virtually every major European airport.

Based in Brussels, ACI Europe leads and serves the European airport industry and maintains strong links with other ACI regions throughout the world.

ACI Europe membership is comprised of airport operators of various sizes, along with national airport associations, educational establishments and world business partners. The members work together in an active association to ensure effective communication and negotiation with legislative, commercial, technical, environmental, passenger and other interests.

The association's members facilitate over 90% of commercial air traffic in Europe, accounting for 2.3 billion passengers, 21.2 million tonnes of freight and 25.7 million aircraft movements in 2018. www.droneshield.com

Monitoring the quality of GNSS-based timing

ADVA launched ADVA SatAware, the AI-powered analytics service for monitoring the quality of GNSS-based timing. The unique solution provides communication service providers (CSPs) and other operators of critical infrastructure with real-time insight into signal quality at their GNSS satellite receivers. The non-intrusive, cost-effective solution is specifically designed to meet the needs of major CSPs and enable the robust timing needed for 5G connectivity. It will also prove invaluable in a wide range of time-sensitive industries from utilities to financial networks. www.helpnetsecurity.com ▶

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Esri India User Conference
August 20, Hyderabad
August 22, Kolkata
August 28 - 29, Gurugram
www.esri.in/events/2019/uc

Hidden Geographies: Slovenia 2019

28-31 August
<http://hiddengeographies.geografija.si>

September 2019

GI4DM
3 - 6 September
Prague, Czech Republic
www.gi4dm2019.org

Interdrone

3 - 6 September
Las Vegas, USA
www.interdrone.com

57th Photogrammetric Week

9 - 13 September 2019
Stuttgart, Germany
<https://phowo.ifp.uni-stuttgart.de>

ION GNSS+2019

16 - 20 September
Miami, Florida, USA
www.ion.org

Intergeo 2019

17 - 19 September
Stuttgart, Germany
www.intergeo.de

ICOIRS 2019

17-20 September
Bandung, West Java, Indonesia
<https://icoirsmapin2019.org>

MRSS19 - Munich Remote

Sensing Symposium 2019

18 - 20 September
Munich, Germany
www.mrss.tum.de

PIA19 - Photogrammetric Image Analysis 2019

September 18 - 20
Munich, Germany
www.pia.tum.de

ISDE 11

24 - 27 September
Florence, Italy
digitalearth2019.eu

October 2019

The 8th FIG Land Administration Domain Model Workshop (LADM 2019)
4th International Conference on Smart Data and Smart Cities (SDSC2019)

Geomatics Geospatial Technology (GGT2019)

1 - 3 October
Kuala Lumpur, Malaysia,
<http://isoladm.org>
www.geoinfo.utm

40th Asian Conference on Remote Sensing (ACRS)
13 - 18 October
Deajuong City, Korea
www.acrs2019.org

Commercial UAV Expo Americas
28 - 30 October
Las Vegas, USA
www.expouav.com

ISGNSS 2019

29 October - 1 November
Jeju Island, South Korea
www.ipnt.or.kr/isgnss2019

November 2019

International Timing and Sync Forum 2019
4-7 November
Brighton, United Kingdom
<http://itsf2019.executiveindustryevents.com>

GEO Week 2019 and the GEO Ministerial Summit
4-9 November
Canberra, Australia
www.earthobservations.org

International Navigation Conference 2019
18 - 21 November
Edinburgh, Scotland
<https://rin.org.uk/events>

December 2019

Amsterdam Drone Week
4-6 December 2019
Amsterdam, The Netherlands
www.amsterdamdroneweek.com

March 2020

Munich Satellite Navigation Summit
16 - 18 March
Munich, Germany
www.munich-satellite-navigation-summit.org

May 2020

FIG Working Week 2020
10 - 14 May
Amsterdam, the Netherlands
www.fig.net

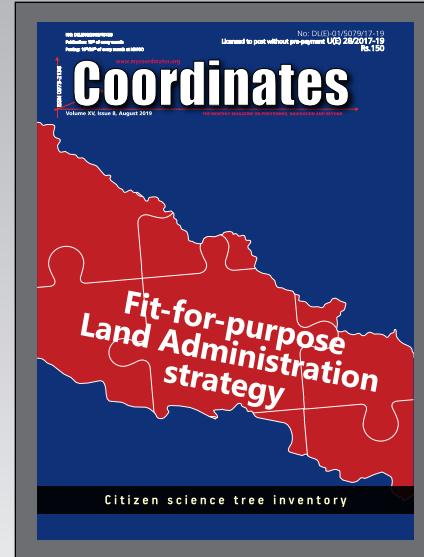
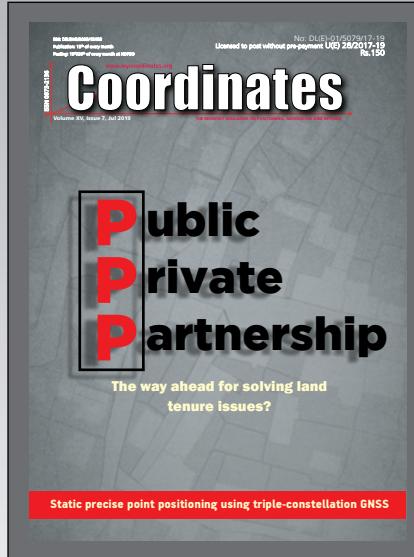
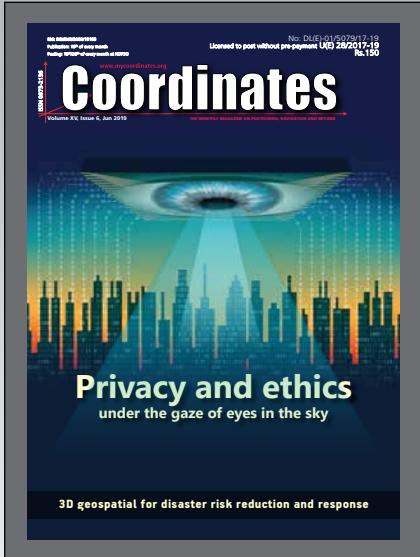
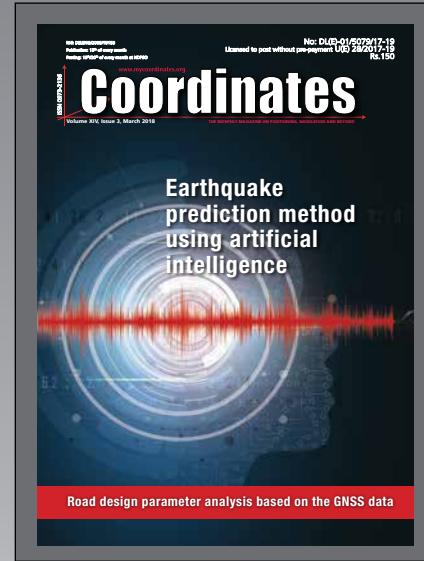
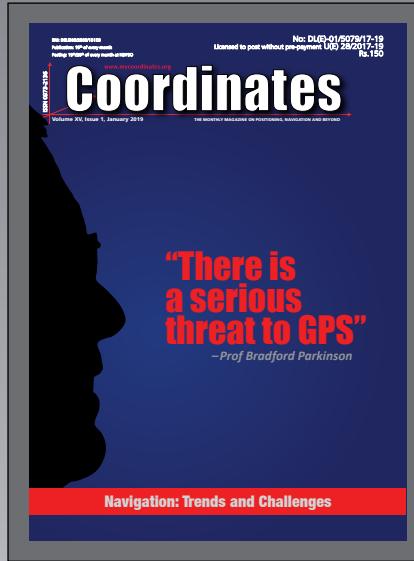
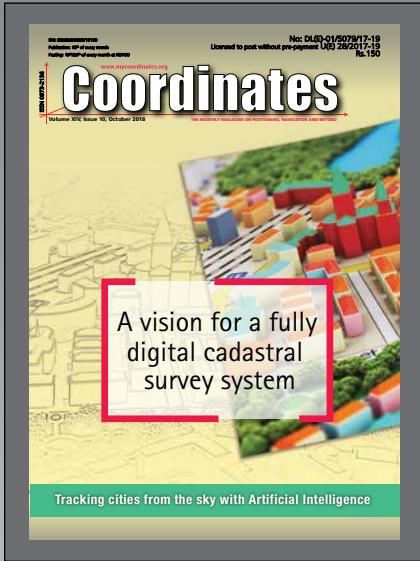
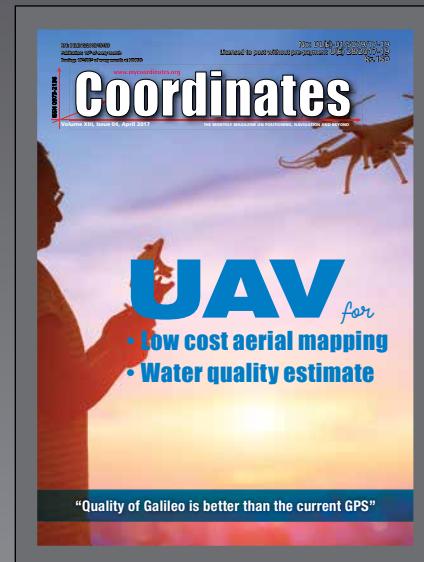
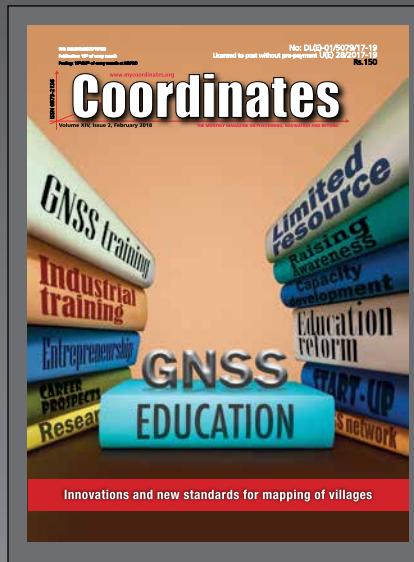
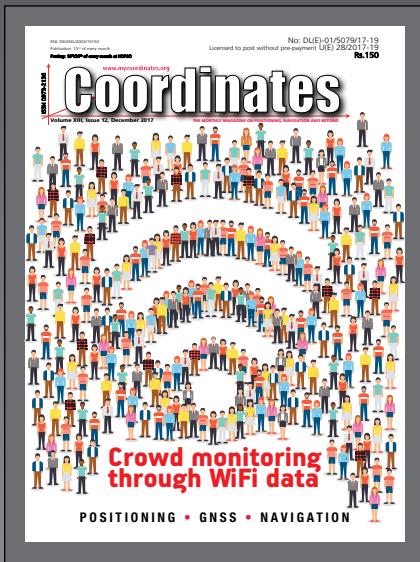
European Navigation Conference 2020
11-14 May
Dresden, Germany
www.dgon.de

GeoBusiness 2020

20 - 21 May
London, UK
www.geobusinessshow.com

June 2020

XIVth ISPRS Congress
14 - 20 June 2020
Nice, France
www.isprs2020-nice.com



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