Bringing dark data to light: a case study of historic vegetation data for modern ecological analysis

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Research efforts that synthesize historical and contemporary ecological data with GIS and spatial modeling approaches improve our understanding of the complex response of species, communities, and landscapes to changing biophysical conditions through time and in space. Historical ecological data are particularly important in this respect. Detailed records of past agricultural, ecological, and climate conditions exist in several forms, including paper archives, historic imagery, biological specimens, and digital data. Unfortunately, these materials are often hidden, many are disorganized or degraded, and some exist as "dark archives" that are currently invisible to researchers. There are remaining technical barriers that limit the synthesis of historic and contemporary data. Recent technological improvements derived from work in digitization, spatial database design, and web visualization can make multiple diverse datasets more readily available for integration and synthesis. This talk presents one case study of a historical archive of vegetation data (the Wieslander Vegetation Type Mapping project in California) and highlights the importance of rescuing, digitizing and sharing historical datasets through cloud-based application programming interfaces (APIs). The digitization and sharing of the data via the web has broadened the scope and scale of the types of analysis performed: the data have now been used to understand legacies of land use change, to examine changes to chaparral and forest communities around the state and to predict community structure and shifts under a changing climate.

Keywords: GIS, historical data, API, Climate change

Geospatial assessment of ecosystem services in Southeast Asian cities

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Ecosystem services refer to the benefits that ecosystems (e.g. cropland, forest, etc.) generate for and provide to people. Such benefits can be tangible (goods, e.g. food from cropland) or intangible (services, e.g. air quality regulation by forest), large or small and direct or indirect. Although cities largely rely from the ecosystems outside of their respective boundaries, they also benefit from their own urban ecosystems. The assessment of the spatial distribution of ecosystem services within cities can help in the understanding of the human-environment interactions. Furthermore, a spatial analysis of landscape pattern and how ecosystem services are distributed along urban-rural gradients might also help in the context of sustainable landscape and urban planning. In this study, we explore the landscape patterns of some major Southeast Asian cities and examine how their various ecosystem services are distributed along their respective urban-rural gradients.

Keywords: ecosystem services, spatial analysis , urban-rural gradient , Southeast Asian cities

Spatial accuracy assessment of soft classification land cover map
Spatial accuracy assessment of soft classification land cover map

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Reliable land use/cover information contributes to assess terrestrial environments. Land use/cover map is fundamental data for broad ranges of studies such as future earth, digital earth, and interdisciplinary researches including geography and environmental studies. Showing accuracy of a land use/cover map is essential to tell how the map is reliable. Accuracy assessment is often implemented by using R-squared, root mean squared error (RMSE), mean absolute error (MAE) for soft classification approach, while user's, producer's, and overall accuracies for hard classification approach. However, as such traditional measures are global indicators which tell the overall evaluation of map, they do not show any local information: where the classified land covers are accurate. For hard classification, previous studies successfully developed the accuracy surface of user, producer, and overall by applying a geographically weighted (GW) logistic regression, while as yet there is no application of them for soft classifications. Thus, the aim of this study is to demonstrate the way of estimating spatially explicit accuracy surfaces of soft classification land cover map. R-squared, RMSE, and MAE are estimated spatially on the classification map by applying the GW approach. Proportional impervious surface rate map in Jakarta metropolitan areas is used as a case study and accuracy surfaces of this are estimated from GW-Rsquared, GW-RMSE, and GW-MAE using independent proportional validation data. The proposed techniques are applicable for other case studies easily, and help understandings of accuracy of a soft classification map locally.

キーワード：Soft classification land cover map、Geographically weighted model、Accuracy assessment
Keywords: Soft classification land cover map, Geographically weighted model, Accuracy assessment

Geoinformation Sharing System for East and Southeast Asia

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Geographic Information System (GIS) is the most efficient tool for storing, managing, processing and sharing geographically referenced information. However, the cost of procuring and maintaining proprietary GIS software is very prohibitive, especially for some countries in east and southeast Asia. Furthermore, conventional GIS is not very efficient for sharing geoscience information from multiple countries. This paper presents a GIS-based spatial information sharing system for the region, using the internet as the platform and Free and Open Source Software (FOSS) and Open Geospatial Consortium (OGC) standards as the backbone for geoscience information management, processing and sharing. In this system, the GIS software and database are setup in a central server. Spatial information processing and sharing are implemented though the formulation of web services Web Map Service (WMS) and Web Processing Service (WPS) in the server. Clients process, render and share geoscience data by sending request to these web services. OpenLayers JavaScript library is mainly used for the rendition of spatial contents online. The developed system also includes an important component to control data access privileges for each user. Data owners could decide the users' data access privileges which are view (read), write (edit) and download, and all possible combinations of the three. Users' group could also be created to classify users with the same data access privileges. The URL of the geoinformation sharing system is http://ccop-gsi.org/MyPortalCreator/new_main/index.html .

Keywords: WebGIS, GIS, FOSS, OGC Geoinformation Sharing

A Framework for Generating Opt-in Data Donation Map Apps Based on ManpoKit
A Framework for Generating Opt-in Data Donation Map Apps Based on ManpoKit

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User-generated data has become a very important resource in spatial information services and researches for many aspects, such as enriching the contents, enhancing the service qualities, improving the human interfaces and so on. The methods of collecting user-generated data can be various in current commercial services. Most of the data are collected automatically without users' conscious based on the users' agreements. For example, history data of users' visits, text input for searching, users' positions, log data of users' operations, and so on, are often gathered in the backend. This kind of methods can collect large amounts of data, but the data may have limited types and pertinence. Users can also create and contribute data actively, for example the volunteered geographic information (VGI) is applied in online map services. However, this way often sets high requirements for users' knowledge and skills. On the other hand, traditional ways of data collection, such as online or offline questionnaires, are still widely used.
In this research, we want to explore a new approach of user data collection, which can include the following features:
(1) Higher pertinence of the required data, which means the types of data to collect and the generating methods are designed specifically according to the purposes.
(2) Opt-in based data donation, which means the users can choose and upload the data to contribute of their own will, and can also cancel the donation at any time.
(3) Lower operation burden for the users, which means users are guided to input or record the required data with ease.
The particular objects of user data to collect in this research are foreign-tourist-oriented maps, which are large-scale illustrated maps for certain sightseeing areas, and are usually printed on free leaflets provided free of charge in tourist information centers, stations and so on. The collected data will be used to improve the map designs and tourist information services. For this purpose, the users' behaviors and feedbacks are the main targets, such as:
(a) The users' moving trajectories as records of the places they have visited,
(b) Important operations when the users browse the maps,
(c) Comments on certain points or parts of the maps,
(d) Impressions of the visited places that the users are interested in.
As such data are usually difficult to obtain from the users of paper-based maps, we propose a framework for the quick development of mobile map apps that can browse such tourist maps in smartphones. With the location sensors and interactivity of the devices, the apps provide functions for viewing the maps and attached multimedia content interactively with the user's position and moving trajectory. The users can also add their own content as personal memorials or comments to the maps and places, which may include text, photos and audios, at any place of the maps with their current location.
This framework is based on a development library named ManpoKit, which is a result of our previous research on Human-Centered Mobile Mapping. ManpoKit can import analog maps and related multimedia content to mobile environments by attaching georeferences to them. With the mapping functions of

ManpoKit, developers can implement map apps easily, and create customized layers upon the map interface to realize more user interactions, such as appending users' own contents.
Prototype apps are developed for undergoing experimental projects, in order to test the feasibility of the proposed framework. One of them is a joint project with a city tourism association for improving their official tourist maps. The map app for this project is already on service. Another one tries to get users' feedback of some hand-drawn walking tour maps created by students. The intermediate results of the developments and experiments will be presented in the conference.

キーワード：data donation、tourist map、ManpoKit、mobile mapping
Keywords: data donation, tourist map, ManpoKit, mobile mapping

The democratization of planetary-scale geospatial analysis through cloud computing and massive parallelization

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The advent of cloud computing platforms puts the capacity for performing planetary-scale geospatial analyses into the hands of anyone with access to a web browser. Cloud-based geospatial analysis platforms potentially combine several services: access to data, programming interfaces for analyzing the data, and mechanisms for sharing the analyses and publishing results. This talk will describe examples of cloud-enabled geospatial analysis solutions, and provide examples of the types of analyses these systems support. Planetary-scale examples include the global monitoring of forest loss and gain, global surface water availability, and analyses of the global fishing fleet. On a more local scale, multiple sources of data can be combined and deep stacks of temporal imagery analyzed to estimate crop yield, malaria outbreak risk, and measure evapotranspiration. Each of the examples described will demonstrate how open access to large amounts of remotely sensed data can be analyzed without the need to download source data or manage large installations of servers.

Keywords: cloud-computing

The use of GIS and spatial statistics to study the spatial distribution of strokes in Rhone-Alpes (France) to target health care location priorities

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Stroke is a disease with a major impact on societies, particularly in developed countries. Thus, it is essential to understand this public health issue, especially in its spatial distribution and its possible relations with the surrounding areas. Consequently, a GIS (Geographic Information System) is really useful to make a spatial and statistical analysis of this phenomenon. The results are based on the AVC69 2007 study in Rhone-Alpes, on a cohort of about 1,000 patients. Rhone-Alpes is a region in south-eastern France which covers nearly 44,000 km². The city of Lyon, main town of Rhône-Alpes, is the second city in France after Paris.

In the presented study, GIS is a tool for the analysis of spatial distribution. Indeed, it has allowed studying the spatial distribution of stroke, particularly to identify the presence of clusters. Thus, after data processing, 900 patients were selected for analysis. The distribution of stroke has been studied from the stroke density per 1,000 inhabitants across the town (fig. 1). To characterize this distribution, calculating Moran's index was performed. This index indicates that the distribution of stroke is clustered (Moran's I = 0.16 ; z-score = 27.5 and p-value < 0.001). In addition, the LISA (Local Indicator of Spatial Association - Anselin, 1995) method is applied to explore the spatial patterns of stroke in different clusters (Marijon et al., 2013 ; Sasson et al., 2012). LISA method allows in particular identifying the High High-type clusters (HH), bringing together towns with high stroke rates surrounded by towns with similar characteristics. It also identifies the High Low-type clusters (HL) that are towns having lots of strokes surrounded by cities with few of them, thus being isolated. In addition, the Hot Spot Analysis Getis-Ord Gi* statistic is applied to identify spatial clusters of statistically significant areas with high strokes rate (Ord and Getis, 1995). The Getis-Ord Gi* statistic indicates whether high or low values of strokes are likely to cluster, and confirms the results obtained with the LISA method (fig. 1). The clusters (HH) are mainly distributed along the eastern part of the Rhône-Alpes (fig. 1). These results are used by the health and social services to target health care location priorities and focus on these precise cities. The HH and HL clusters are mainly rural. This factor might start explaining this distribution. However, additional socioeconomic and environmental factors (Mechtouff et al., 2012) are also considered to understand this dissemination, using a PCA with varimax rotation whose results will be mapped by using a GIS.

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Keywords: stroke, GIS, cluster, Moran's index, local indicator of spatial association (LISA), Getis-Ord Gi* statistic
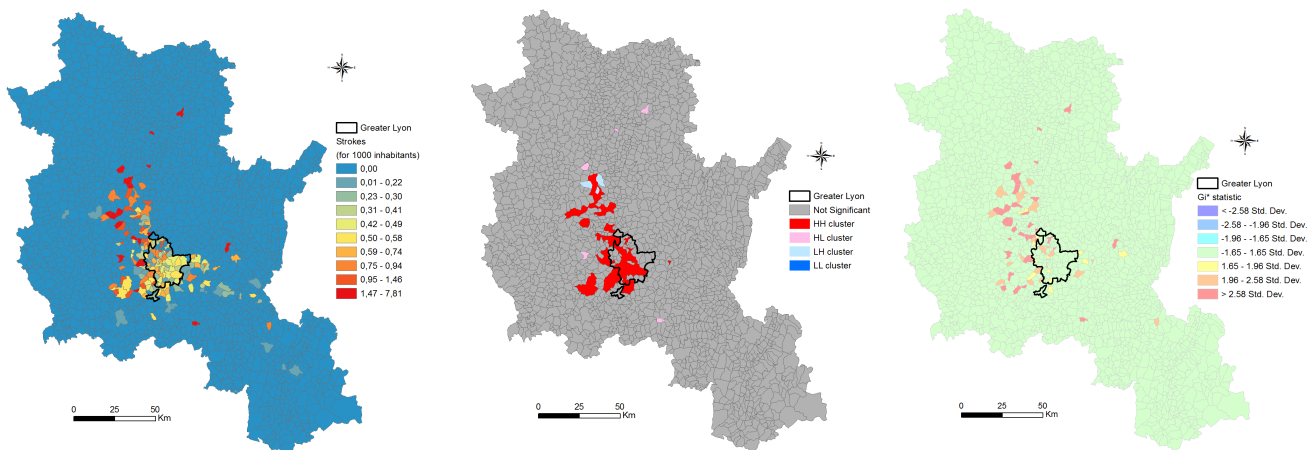
Spatiotemporal Analysis of Tsunami Vertical Evacuation: A Case Study of the Shizuoka Metropolitan Area

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The city of Shizuoka directly faces the Nankai Trough, which is expected to give a major tsunamigenic earthquake every 100 to 200 years. A tsunami generated by such an earthquake could have major implications to the lives of the city's residents, even from the very first moments of the tsunami when they will need to escape. As such, there is a need to study the potential for a vertical evacuation in the city in order to provide multiple options for safe refuge in such an event.

This study has the main objective of finding vertical evacuation sites among the currently existing buildings in the city, by examining how these buildings become inundated under variable tsunami scenarios, and how the city's population moves throughout them in different times of the day leaving increased or decreased volume available for evacuation. A wide range of Geographic Information System (GIS) datasets, as well as demographical and people flow movement data were used in order to (a) calculate the inundation ratio of buildings in Shizuoka City, (b) calculate the volume loss of buildings due to tsunamis based on the inundation ratio, (c) estimate the building population of the buildings in Shizuoka over 24 hours of the day and (d) introduce criteria per tsunami scenario in order to estimate how many people can be accepted in each building for evacuation based on the variable population.

The approach of this research has indicated that for four different tsunami scenarios (5m, 10m, 20m, and 34m run-up) there are 3204 potential vertical evacuation sites for the 34m scenario, 10,426 potential vertical evacuation sites for the 20m scenario, 2,046 potential vertical evacuation sites for 10m scenario, and 1643 potential vertical evacuation sites for the 5m scenario.

The analysis of the people movement over 24 hours has shown that there are discreet population distribution patterns depending on the time of the day. In the daytime, people are concentrated in the CBD for work and the other areas of the city are less populated, while in the nighttime the majority of the population is at home and distributed at the whole extent of the city. Finally, there are morning, noon and evening transit hours where great parts of the population are in transit, and outside buildings, at different locations in the city based on their transportation method. Concerning the capacity to accept people for vertical evacuation, the temporal population estimation and volume loss calculation indicate that on all four scenarios, the maximum total capacity to accept evacuees is achieved at 10am in the morning, with the 5m scenario sites allowing for 608,948 people to be accepted in the vertical evacuation sites, the 10 meter scenario allowing for 1,746,543 people to be accepted, the 20m scenario allowing for 5,764,030 people to be accepted, and the 34m scenario allowing for 1,865,315 people to be accepted. These numbers indicate that a majority of the city's population can be evacuated in potential evacuation sites that meet this study's criteria, within the tsunami flood zone of each scenario, greatly reducing the need for movement outside the tsunami flood. The approach further reveals, that this can be achieved by utilizing only existing buildings in the city without the need for additional construction.

The approach used in this research combines methods from different fields of Geography and GIS into a new approach that can be used in different locations that meet the data requirements, producing results that can be used by interested parties such as disaster planners, emergency managers and other Geographers in order to produce enhanced and optimized vertical evacuation plans.

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Keywords: Vertical evacuation, Shizuoka, Tsunami, Building population estimation, GIS

陸前高田市における震災前後で比較したコンビニエンスストアの立地の変化による住民への影響
Influence on Residents Emerged from Location Changes of Convenience Stores, through
Comparison of Pre and Post Earthquake Disaster in Rikuzentakata City

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本論文は、2011年3月11日に発生した東北地方太平洋沖地震に伴う津波被害を受けた岩手県陸前高田市における、コンビニエンスストアの立地の変化による影響を分析するものである。住民意識およびアクセシビリティの観点から、２つの調査手法によって震災前と現在の状態を比較した。アクセシビリティとは交通の便の良さの度合いを意味し、本論文ではGISの到達圏解析によって求めた、その地点から最寄りのコンビニエンスストアまでの道路距離の度合いを指す。
住民意識調査では、陸前高田市内の周辺環境の異なる７区域の住民を対象としてアンケートを実施した。2015年9〜10月に各戸へアンケートを配布したのち、郵送で回収した。配布数1,012に対し、有効回答数は382だった。調査内容として、自宅から最寄りのコンビニエンスストアまでどの程度遠く感じるかなどを設定した。アクセシビリティの解析は市内全域を対象とし、ArcGISのNetwork Analystを用いて、震災前と現在について各店舗から一定の道路距離による到達圏を求めた。
住民意識調査では、震災前の最寄りコンビニエンスストアについて、「遠いと感じる」が42.6%、「やや遠いと感じる」が22.3%、「あまり遠いと感じない」が19.9%、「遠いと感じない」が15.1%となった。一方現在の状態については、「遠いと感じる」から順に、16.9%、14.5%、26.9%、41.7%という結果となった。震災後、回答者が最寄り店舗を近いと感じるよう変化していることが分かる。また、アンケートの対象区域ごとに結果を比較すると、震災後ほとんどの区域で「遠いと感じる」の回答率が減り「遠いと感じない」の回答率が増える傾向にあったが、被災によって失われた中心市街地に接していた津波の到達点付近の区域では、逆の傾向がみられた。
空間分析では、コンビニエンスストアに対するアクセシビリティは、震災前には主に中心市街地のあった平野部で高かったのに対し、現在はその外縁部のより広範な範囲においてアクセシビリティが高いことが分かった。これは震災前に平野部に集中していた店舗が失われ、建築制限が行われていない場所に分散的に新たな店舗が建てられたことが原因である。
最後にアンケートを行った区域の空間分析の結果を、住民意識の結果と比較した。対象区域の大半では、震災後のアクセシビリティが上昇している。また津波の到達点付近の区域のアクセシビリティの変化は場所によって異なり、明らかなアクセシビリティの上昇は見られない。以上から、住民意識の「遠いと感じる」の回答率が減る傾向の区域と、空間分析でアクセシビリティの上昇がみられる場所は一致していることが分かる。異なる2つの調査手法が明らかにした施設の立地の変化による住民への影響は、概ね一致するといえる。
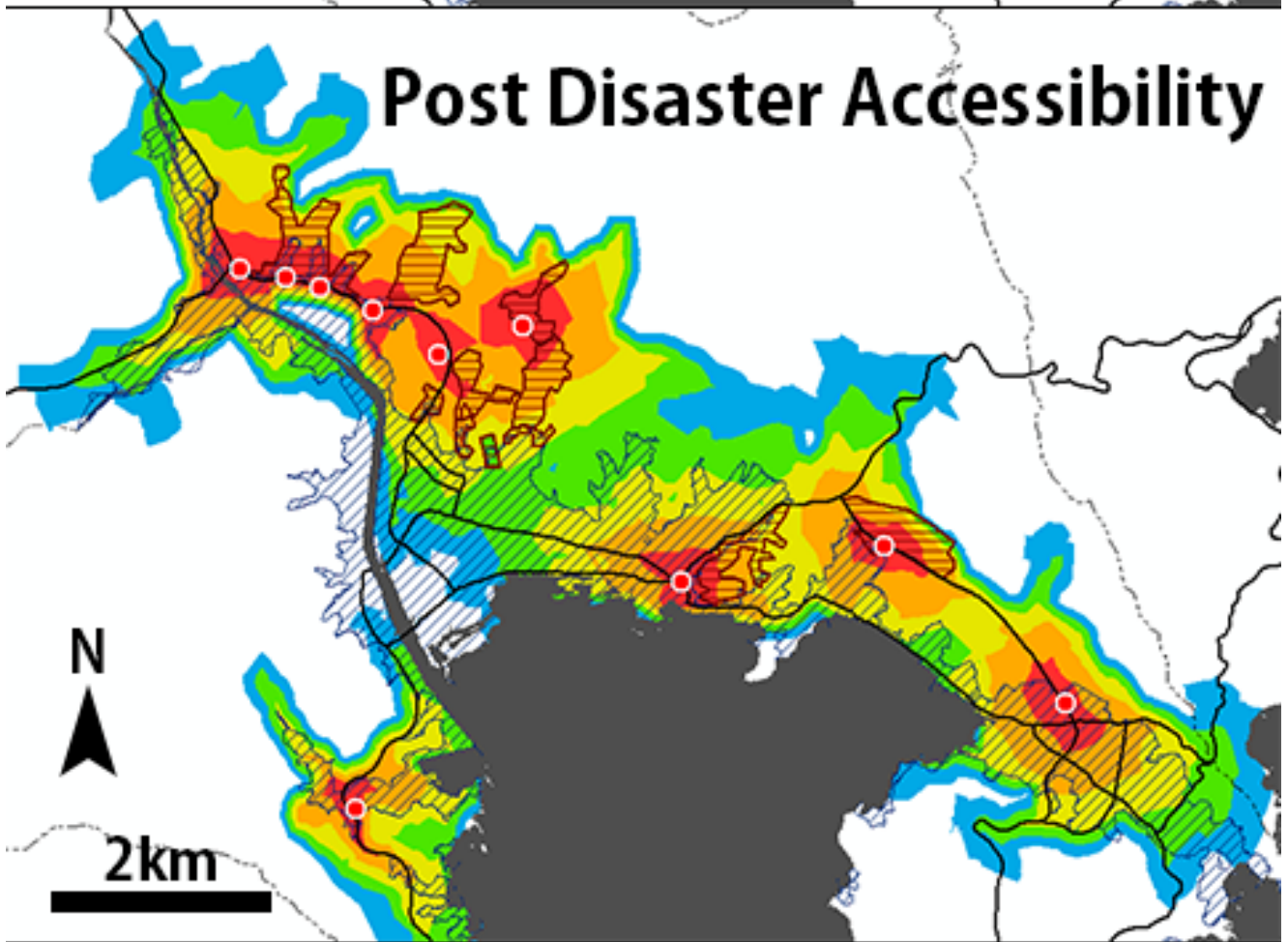
キーワード：東日本大震災、陸前高田、アクセシビリティ、GIS、ネットワーク分析
Keywords: Tohoku Regional Pacific Coast Earthquake, Rikuzentakata, Accessibility, GIS, Network
          Analyst

Pre Disaster Accessibility

N

2km
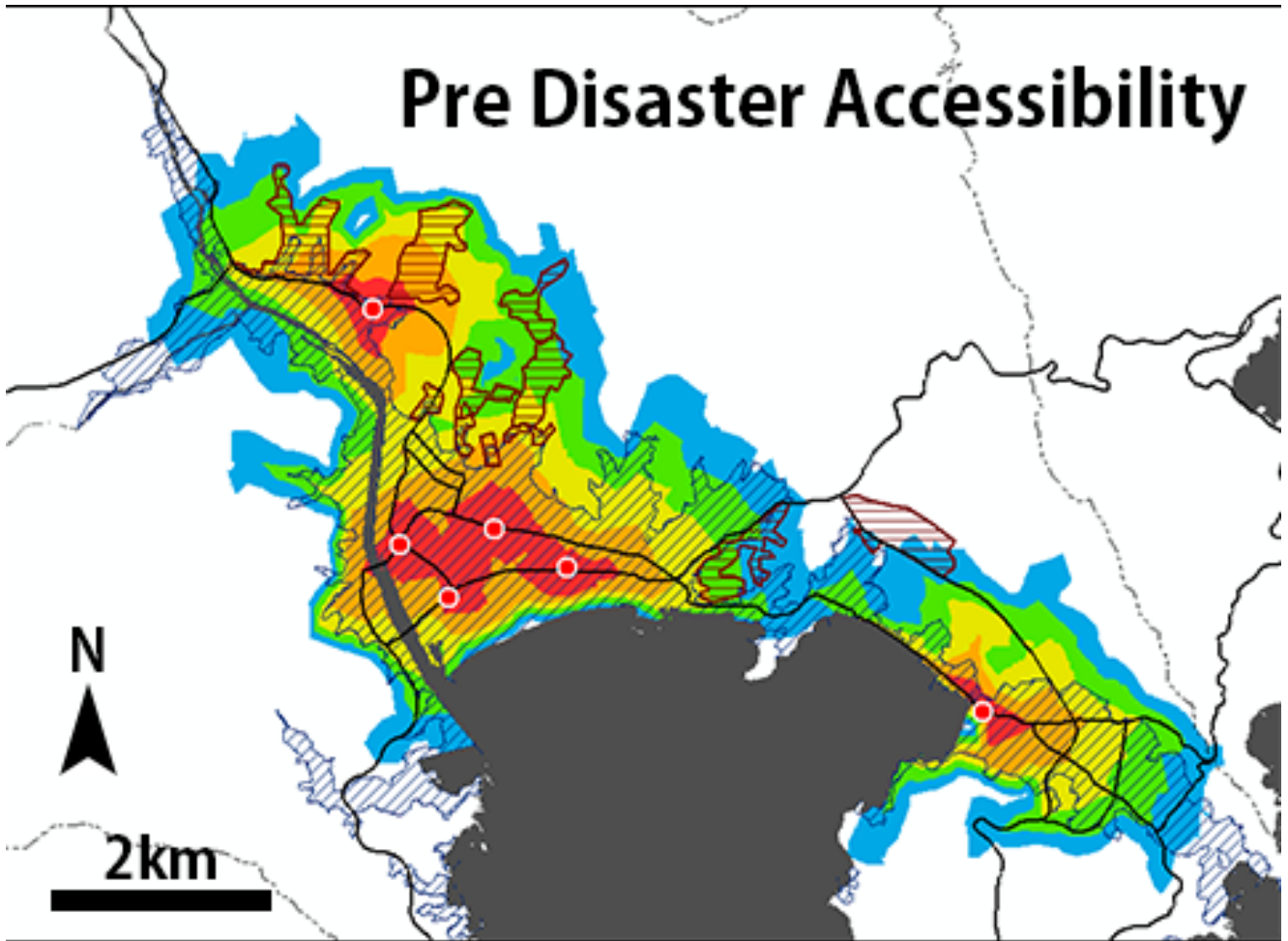
Post Disaster Accessibility

N

2km

Legends

City limits

GIS based decision support system for Sri Lankan agriculture sector

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The agriculture plays a dominant role in the economy of Sri Lanka while it contributes nearly 17.9 % to the Gross National Products (GNP) or Gross Domestic Product (GDP). Moreover, agriculture sector of Sri Lanka has generated more than one-third of the labour force and provides a livelihood for more than 800,000 farm families. Several government and non-government organizations involves with various sectors of agricultural related activities including management, research, and policy planning in the country. However, there is a gap in between these organization to integrated agricultural related data in order to provide a frame for better decision making practices. In this context, the development of a computer based tool is very important. The main objective of the study is to develop a user friendly GIS based decision support tool for the benefit of agricultural sector of Sri Lanka. Specifically, this will help both GIS users and non-GIS users who involves in agricultural related decision making process. Basically, this tool facilitates the user to find several agriculture related information, like suitable crop, suitable place, suitable time for farming and harvesting in Sri Lanka.

Keywords: NADSS, Decision making, spatial information

GIS based decision support system for Sri Lankan agriculture sector

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The agriculture plays a dominant role in the economy of Sri Lanka while it contributes nearly 17.9 % to the Gross National Products (GNP) or Gross Domestic Product (GDP). Moreover, agriculture sector of Sri Lanka has generated more than one-third of the labour force and provides a livelihood for more than 800,000 farm families. Several government and non-government organizations involves with various sectors of agricultural related activities including management, research, and policy planning in the country. However, there is a gap in between these organization to integrated agricultural related data in order to provide a frame for better decision making practices. In this context, the development of a computer based tool is very important. The main objective of the study is to develop a user friendly GIS based decision support tool for the benefit of agricultural sector of Sri Lanka. Specifically, this will help both GIS users and non-GIS users who involves in agricultural related decision making process. Basically, this tool facilitates the user to find several agriculture related information, like suitable crop, suitable place, suitable time for farming and harvesting in Sri Lanka.

Key words- NADSS, Decision making, spatial information

Spatiotemporal pattern of urban process in Colombo metropolitan area, Sri Lanka

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Identifying and evaluating urban land use changes (ULCs) and its driving forces supports to the
decision-making in urban planning and resource management. The study analyzes the ULCs in Colombo
metropolitan area (CMA), and detects the geospatial dimension of its urbanization pattern as the
main objective. The study site is the largest and only metropolitan area of the Sri Lanka, which
contains mosaic of complex urban land use types. The methodology of study includes three major
components. The fist is the remote sensing based land use/cover mapping and defining urban land
uses (ULUs) based on neighborhood characteristics. The second is examining the ULCs using the land
intensity analysis. The third is characterizing the spatial dimension of urban development through
infill, extension, and leapfrog development pattern indicators. Main two scenarios are defined to
achieve the main objective of the study: the rapid urban expansion period (1992-2001) and drastic
urban expansion period (2001-2014). These two scenarios are defined depending on the country's
political backgrounds and urban planning policies. Specifically, it is used Landsat TM/ETM+ data
and employs hybrid mapping techniques (pixel/object-based) in producing the LUC maps. Further, the
variety of GIS-based operations is used in order to detect the geospatial dimension of urbanization
patterns. Finally, the ULC pattern, and the major driving factors in particular are discussed.

Keywords: Colombo metropolitan area, Hybrid mapping, Neighborhood, Urban land use change

Monitoring the urban growth pattern and intensity of Lusaka City, Zambia

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Many cities in Sub Saharan Africa have experienced rapid urban growth. Uncontrolled and unplanned population growth caused by rural urban migration has been the main driving force of urban growth in these cities. Consequently, the form of urban growth of SSA cities is usually characterized by emergence of informal settlements which are located close to urban growth centers such the Central Business District and other industrial and commercial areas. This has transformed many SSA cities into complex urban environments with different Urban Land Forms (ULF) (Residential, Industrial, Commercial etc.). Therefore, spatial temporal monitoring of the urban growth pattern is inevitable for the local planning authorities and decision makers to address urban growth problems and for better future urban planning, management and development.

This study examined the urban growth pattern and growth intensity of deferent ULFs in Lusaka, the capital City of Zambia. First the city landscape was classified into two urban classes (Built up and Non Built Up) from Landsat TM and ETM+ images using Remote sensing and GIS techniques for three time periods, 1990, 2000 and 2010. Then six ULFs from the built up class were characterized for all the three time periods: (1) Unplanned High Density Residential (UHDR) (2) Unplanned Low Density Area (ULDR) (3) Planned High Density Residential (PHDR) (4) Planned Low Density Residential (PLDR) (5) Commercial and Industrial Areas (CIA) and (6) Public Institutions and Areas (PIA).

The study also adopted the Burgess Concentric Zone Model to characterize the urban growth pattern. Four Zones were identified: (1) CBD Core, (2) CBD Fringe, (3) Transition Zone and (4) Peri-Urban Zone. The magnitude and intensity of each ULF was then analyzed within the entire administrate boundary of the city and the four zones from 1990 to 2010. Pearson's Correlation method was also used to analyze the correlation between different ULFs

The results show that the urban land changed from 49.2 km^2 in 1990 to 84.4 km^2 in 2000 and 158.8 km^2 in 2010. This translated into an Urban Growth Intensity (UGI) of 8.4% for 1990-2000 and 17.9 % for 2000 –2010 with annual intensities of 0.84 and 1.79 respectively. It was observed that urban growth has been dominated by the UHDR followed by PHDR and CIA. All the UGIs for all the ULFs were very high with annual change intensities ranging from 3.4 to 4.6% for 1990-2000 and 3.6 to7.7 % for 2000-2010. In terms of Zones, the UHDR contributed significantly urban land increase except for the CBD which was dominated by commercial and industrial areas. The correlation analysis results showed that there is high correlation between UHDR and PHDR as well a CIA.

The paper revealed problems in city planning as shown by high dominance of UHDR areas. Therefore, the information from this paper can be used by local city planners for better future planning.

Keywords: Urban Growth Pattern, Urban Land Forms, Intensity, Lusaka City

High scale landscape mapping for mountain of Khamar-Daban (near Lake Baikal, Russia)

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Classification of homogeneous geosystems (landscapes) and its reflection on the map could be a base for effective organization of economic activity. Landscape patterns and landscape units can be used in the assessment of ecosystem service supply. Geosystem defined as uniform territory, with regular and typical repetition of some interrelated combinations of geological structures, landforms, surface and groundwater, microclimates, soil types, phytocoenoses and zoocoenoses. The aim of research is analysis and mapping of the landscape diversity of the key area (125.3 km2) of the Khamar –Daban mountain range which actively used for mountain tourism. This mountain range distinguished by the uniqueness of vegetation related to climate features: significant moisturizing, high snow cover and other. We used the following data: fieldwork (73 test areas), Digital elevation model (SRTM), and remote sensing (Landsat 8). Fieldworks were conducted in summer seasons 2010 and 2015 years where collected data about wood and grass species and their projective cover, soil characteristics. Software Quantum GIS (Qgis) 2.10 was used to create the landscape map. At the first step the area was divided on the base of SRTM data on categories of landform: surface of drainage divide, river and stream valleys for their definition were added to the vector layer to the information of the natural drainage system of the territory which was made on the basis of the topographic map 1: 50000 scale, several classes of slopes according their steepness (min steepness value 0, max steepness value 40.05), exposure (8 different categories have been allocated for different, exposure: north, northeast, east, southeast, south, southwest , west , northwest. Then these patterns divided on the base of Landsat 8 image (2014 year) in band combination 753 (picture 1). This combination allow to get high color contrasts: healthy vegetation appears as bright green, the soil - mauve. This information was very useful for the vegetation studying and for the analyzing of health condition of forest communities. Results of fieldworks and the geoinformation analysis were used to form the classification of the landscapes which became the map legend. In classification 38 types of geosystem defined. On the map 654 homogeneous geosystem patterns digitized. Map accuracy was tested under field conditions.

Keywords: landscape mapping, geosystem classification, Khamar-Daban mountain range

- landscapes
- srtm isoline
- rives
- lake Baikal

landsat 8_654i
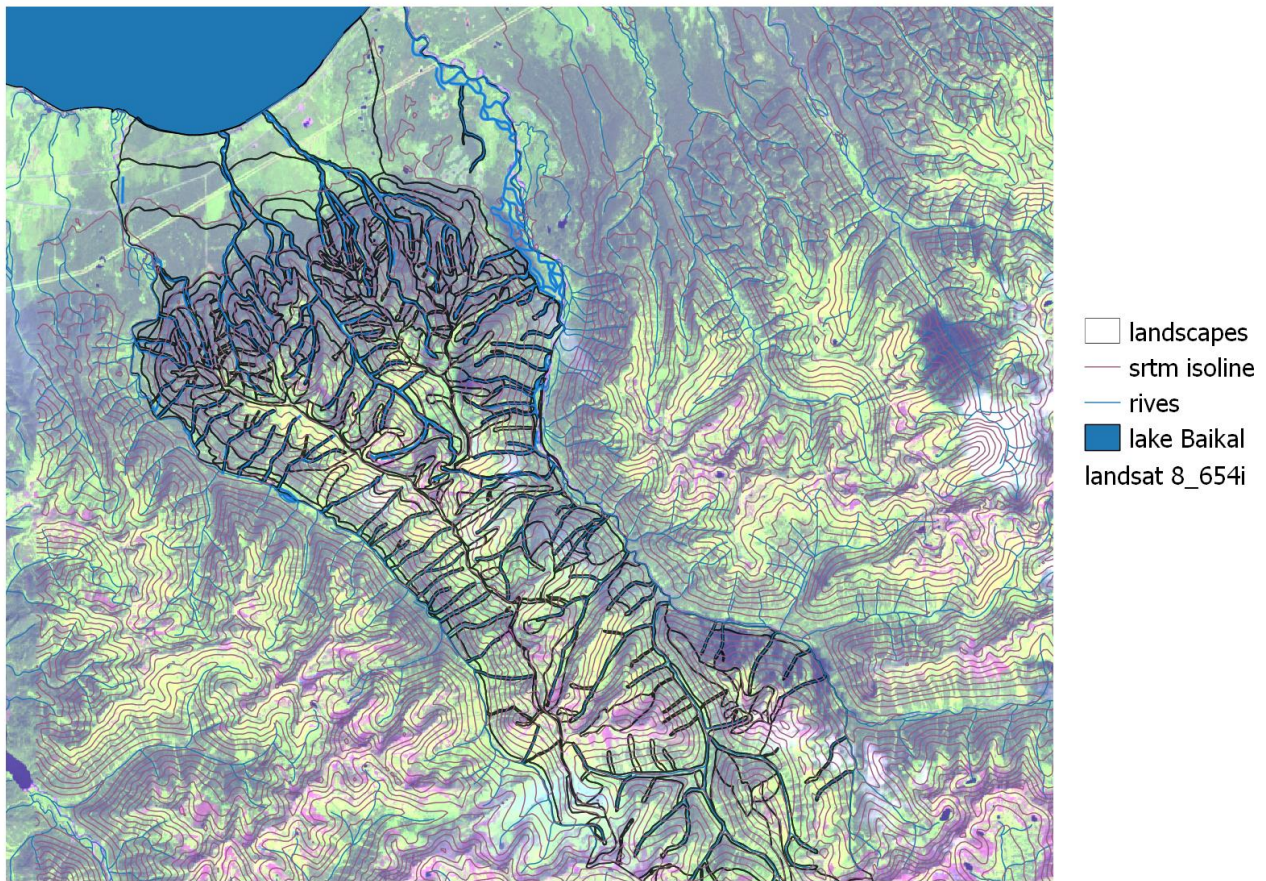
Evaluation of Erosion Rates on a Global Scale

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Understanding the mechanisms and controlling factors of erosion rates is of great importance as it is a vital component of both geochemical and sediment mass balance studies, and a deep understanding of these processes will enable us to develop accurate landscape evolution models. During the past decades scientists have been studying and measuring erosion rates using different methods. Some examples use sediment yield, measure the rates of active surface processes, and estimate exhumation rates through fission tracks, denudation rates using cosmogenic isotopes and even erosion rates through mass land wasting. A major objective of these studies is to try and discover what the controlling factors of erosion rates are.
Although erosion rates and sediment yield on a global scale have been studied in relation to topographic conditions, due to lack of available data in the past, the analysis was relatively basic. Thanks to abundant newly obtained erosion rates data, combined with new high resolution DEM data, a more complete and comprehensive analysis can be made, and correlation of erosion rates with factors such as basin morphometry, climate or tectonic plate boundaries is possible.
This study is based on previously obtained and published erosion rate data and sediment yield measurements published by the U.S. Geological Survey. It uses the ASTR GDEM, a 30-m DEM, and ArcGIS in order to analyze the relationship between basin morphometry and erosion rates. In addition, tectonic plate data published by Nordpil based on Bird (2003), and the WorldClim, global climate data based on Hijmans et al. (2005), are used in order to examine any correlation between erosion rates and tectonic plate boundaries, and erosion rates and climate.
Preliminary results show that: 1) Erosion rates are positively correlated to basin relief and mean slope; 2) they are also positively correlated to the precipitation amount and range; and 3) they are negatively correlated to distance to tectonic plate boundary.

Keywords: Erosion Rates , Sediment Yield, Basin Morphometry, GIS

台湾のマスムーブメントでの先行降雨期間の推定
Estimation of the antecedent rainfall period for mass movements in Taiwan

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Antecedent rainfall plays an important role in rainfall-induced mass movements. However, it is difficult to define the period of antecedent rainfall for mass movement assessment. To solve this problem, this study provides a simple approach that combines calibrated antecedent rainfall (CAR) and 24-hour rainfall for 283 mass movements that occurred in Taiwan during 2006–2013. The 24-hour rainfall at the time of each mass movement was compared with the total cumulative rainfall from various days before the event. The lowest value of the correlation coefficient occurred for the total cumulative rainfall from 15 to 20 days before a mass movements day. The 24-hour rainfall was compared with the cumulative CAR values for various days of antecedent rainfall. The effect of cumulative CAR on mass movements increased from 22.0% to 39.7% when the considered days increased from three to 30 days. However, the increase became gentle after 15–18 days. In addition, the critical antecedent rainfall conditions occurred within 18 days before mass movements for all cases. These results suggest that the antecedent rainfall of 15–18 days is useful for mass movement assessment in Taiwan. This study also established a critical antecedent rainfall threshold for mass movements in Taiwan useful for early-warnings: $I = 28.7D^{-1.24}$, where I is critical mean rainfall intensity during the antecedent rainfall period (up to 18 days) (mm/day) and D is the length of the antecedent rainfall period. According to the relationship between 24-hour rainfall and the critical antecedent rainfall conditions, low antecedent rainfall intensity continued for a long time leads to a gradual increase in soil moisture so that a small amount of 24-hour rainfall can trigger mass movements. On the other hand, high antecedent rainfall intensity for a short time is not enough to increase soil moisture, and a large amount of 24-hour rainfall is needed to flush surface materials and cause mass movements.

Statistical analysis on topography of mountain watersheds with frequent debris flows using multi-temporal high-resolution DEMs

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Ohya Landslide, located along the uppermost reach of the Abe River, is a gigantic landslide generated in the early 18th century. It has been producing abundant clastic sediments, which may increase the risk of sediment disasters in the Abe River basin. Quantitative estimation of sediment supply from the landslide is important for effective sediment control. The landslide can also be regarded as a natural laboratory of rapid geomorphic change; therefore, investigating the landslide and the surrounding area is of geomorphological importance. The objective of this study is to examine topographic changes and the relationship between the topography and the frequency of debris flows and sediment transportation in the area. For quantitative analyses, high-resolution digital elevation models (DEMs) for eight periods from 2005 to 2013 were used, and the areas of generated debris flows were extracted. A parameter *DF* was defined as the debris flow frequency in each raster cell, and it was used for statistical analyses. The results revealed the important characteristic of the watersheds with frequent debris flows: they have V-shaped valleys with enhanced erosion, and both longitudinal and transversal inclinations of watersheds are sufficiently high. The DEMs were also used for differentiation to obtain erosion and deposition amounts and rates. The result shows that the average erosion rate of the landslide for the eight years is 23.7 mm/yr, which is significantly high even for Japanese mountains known for very rapid erosion rates.

キーワード：大谷崩、地形、航空レーザー測量、高解像度DEM、土石流
Keywords: Ohya landslide, geomorphology, airborne LiDAR, high-resolution DEM, debris flow

東京墨田区における自然災害被害の時空間分析
Spatio-temporal analysis of disaster risk in Sumida ward, Tokyo

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The understanding of disaster risk in a spatiotemporal perspective helps to mitigate the potential damages of disasters effectively. In this study, the Data Envelopment Analysis (DEA) technique and people flow data are integrated to develop a disaster risk assessment to understand the disaster risks in both spatial and temporal manner. In doing so, Sumida ward, located in the northern part of Tokyo bay is selected as the case study. Geographically, Sumida ward is situated in an alluvial lowland area and there are many places below the mean sea level with high population density and several urban features. Most of the man-made features of this area are made out of wood faces and having a higher potential for extreme damages. Generally, the damage by disaster is strongly related to the population density of the area. But the population density of the area is varying with the people movement within a day. Thus, the present study assesses the disaster risk levels with the different time periods of the day based on people flow and its spatial pattern through the developed assessment.

キーワード：災害、災害リスク評価、墨田区
Keywords: Disaster, Disaster risk assessment, Sumida ward

Relationship between Urban Traffic Accidents and Urban Structures from Spatial Perspective

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Urban Traffic Accidents have been and continuing to be a major contributor of human and economic costs to requiring concerted multi-disciplinary efforts for sustainable effective prevention. Traffic accidents rank in the top ten causes of the global burden of disease and injury, and will probably be in third place by 2020, when measured in disability-adjusted life years lost (WHO, 2013). Urban structure and urban activities in a city or metropolitan area, make a significant involvement in generating interactions and accidents. Investigation of traffic accidents and urban structures such as road networks, land use patterns, public facilities, etc. from spatial perspective is important for future urban planning processes The urban interactions and activities can happen between districts or within a district, on different roads and different time and space. The study area of this study is Tehran city which include 22 districts. Tehran is the largest city in Iran and also its capital. Its population is close to 12 million during day time and over 8.5 million people at night. The analysis in this study is based on data obtained from the Police Department of the Islamic Republic of Iran, Tehran. The main database contains information about all police-reported urban traffic accidents that occurred in 2011 in Tehran. Tehran has experienced a rapid growth of urban population. With the expansion of the city boundaries, even though there is an occurrence of urban transportation and large usage of cars for daily urban trips and large number of accidents, make the Tehran accident problem more serious. The Tehran spatial structure has a high density structure combined with a several central pattern. The lack of strong and unique essence, as easily as the spatial distribution of employment, are mostly associated with the build-up density and accidents but less dangerous accidents. The current spatial structure of Tehran, which is a high density city unaccompanied by influential Central Business District (CBD) creates several limitations, so that we can see the distribution of the accidents whole of the city. A rapid and continued rise in living accommodations and land costs is expected in cities with transportation improvements and rapid economic and population growth. Humans, nations, regions and the world would be seriously limited in development without transportation, which is a central element for physical and economic growth. Urban growth occurred as physical and functional changes took place, due to the transition of the rural landscape to urban forms, which has been studied by various researchers (Thapa and Murayama, 2010). These changes as well influence the urban density, which would be the increase of the growth rate in several dimensions. Transportation network systems, urban construction and urban traffic accidents are interdependent each other. Urbanization is taking place at a rapid pace in Tehran, and this expanding city is changing the urban structure. Land use is one of the most important pillars in creating urban areas, and thus, creating transportation and road patterns have a direct impact on urban traffic accidents. The combination of high population and growth of land use causes the increase of daily trips that produce urban traffic accidents in the city. Agreeing to this varying communication between land use and the road network, which is causing traffic accidents, also calls for an agreement on how the land use is associated with urban traffic accidents. An explanation of the connection between the several land uses and occurrence of urban traffic accidents in Tehran's metropolitan area indicates that land use generates different kinds of causes, which are brought about by various actions. It is necessary therefore to have an understanding structure of urban and accidents for improving safety on the roads which will be done with GIS as GIS is a comprehensive management tool for traffic

safety.

Keywords: Urban Traffic Accidents, Urban Structure, Spatial Analysis

Modeling Urban Land Use / Cover Changes Based on Machine Learning Techniques: A Case study of Shanghai, China

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Urban growth is one of the most important topics in urban studies. A city is considered as a complex system. It consists of numerous interactive sub-systems and is affected by various factors including governmental land policies, population growth, transportation infrastructure and market behavior. To understand the driving forces of the urban form and structural changes, the satellite-based estimation is considered as the appropriate methods to monitor these dynamic changes in a long term.
Based on previous studies, classified Landsat satellite images are used to monitor the temporal changes of land use and land cover (LULC) for the study area. Furthermore, modeling and simulation are believed to be powerful tools to explore the mechanisms of urban evolution and to support the planning in growth management. In this study, authors use the social and geographical factors to model and simulate the urban growth in Shanghai. Finally, an attempt is made to utilize two machine learning models (the deep convolutional network and multi-layer perceptron neural network) to predict the future changes in the land use / cover, and compare the performance of two models.

Keywords: LULC, Machine learning, Shanghai, Urban growth modeling

Urban Growth Modeling Using Neural Network Simulation: A Case Study of Dongguan City, China

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Dongguan is an important industrial city, located in the Pearl River Delta, South China. Recently, Dongguan city experienced a rapid urban growth with the locational advantage by transforming from traditional agricultural region to modern manufacturing metropolis. The urban transformation became usual change in China under the background of urbanization which belongs to one trend of globalization in the 21st century. This paper tries to analyze urban growth simulation based on remotely sensed data of previous years and the related physical and socio-economic factors and predict future urban growth in 2024. The study examines and compares the land use/cover (LUC) changes over time based on produced maps of 2004, 2009, and 2014. The results showed that water and forest area decreased since the past years. In contrast, the urban land increased from 2004 to 2014, and this increasing trend will continue to the future years through the urbanization process. Having understood the spatiotemporal trends of urban growth, the study simulated the urban growth of Dongguan city for 2024 using neural network simulation technique. The Kappa transition was calculated for the simulated map of 2014, and the value was approximately 0.5. Further, the figure of merit (FoM) of simulated map of 2014 map was 8.86%, which can be accepted in the simulation and used in the prediction process. Based on the consideration of water body and forest, the newly growth area is located in the west, northeast, and southeast regions of Dongguan city. The finding can help us to understand which areas are going to be considered into the future urban planning and policy by the local government.

Keywords: Neural Network Simulation, Dongguan City, Urban Growth

Evaluating Walkability through Neighborhood Environment: A Case Study in Tokyo Metropolitan Area

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Walkability is an index to evaluate how friendly the built environment is towards the presence of people's walking behavior. Neighborhoods with high walkability can promote local residents' daily walking behavior and the evidence has shown that regular walking behavior is benefit to personal health. As a result, evaluating walkability is a public health priority since it provides information of how to build a walkable neighborhood to promote local people's walking activity. Daily walking behavior can be separated into two categories: utilitarian walking and recreational walking. Among them, utilitarian walking is a mobile method to reach a place for further behavior and it is highly affected by the built environment and availability of different destinations. On the other hand, recreational walking refers to walking for health, pleasure and entertainment. It is highly affected by aesthetics and safety. In this study, the main purpose is to evaluate utilitarian walkability in Tokyo Metropolitan Area (TMA) and prove that good utilitarian walkability of neighborhoods promotes the daily walking behavior.
For evaluation of utilitarian walkability, five factors (residential density, road accessibility, land use diversity, bus stops density, and railway station accessibility) are selected and GIS methods are adopted for collecting and analyzing the data. For accomplishing Multi-criteria Evaluation (MCE), Analytic Hierarchy Process (AHP) analysis is employed to determine the weights of each factor. Subsequently, the final walkability map is established by raster calculation of all the factors based on assigned weights. With the utilitarian walkability map of TMA, the spatial patterns of utilitarian walkability are detected and summarized. Further, two neighborhoods with different utilitarian walkability are selected for the detailed analysis and comparison. The key points of this step are the separation of walking behavior happened within and without the neighborhood, together with the combination of social-economical attributes of residents and physical attributes of the neighborhood environment. With the findings from this study, characteristics of utilitarian walkability in TMA can be better understood. Advices on building a more walkable neighborhood can be concluded.

Keywords: neighborhood environment, people flow, Tokyo Metropolitan Area, utilitarian walking, walkability

クラウドGISとスマートフォンを用いた地理空間データ収集の利点と意義
Geospatial data gathering using cloud GIS and smartphones: its advantages and significance

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The authors examined the advantages and significance of the use of cloud GIS and smartphones to collect geospatial data in a fieldwork.
For this purpose, the authors conducted an experimental study in which the distribution of bicycles parked in a whole university campus was investigated.
The authors implemented a web-GIS map on ArcGIS Online, a cloud-GIS service by ESRI, to map the location of bicycles. Thirty students surveyed the distribution of bicycles in their assigned areas using smartphones on-line. They could record the data about bicycles onto the web-GIS map using ESRI's Collector for ArcGIS, an application for data collection, installed on their smartphones. The authors had a questionnaire on the students' experience after the investigation.
Results of this study showed that the use of cloud GIS and smartphones in a fieldwork made simple, quick and cooperative investigation possible, triggered interests in using GIS, and stimulate spatial thinking. The authors argued that advanced use of them should be developed to enhance its advantages and significance.

キーワード：クラウドGIS、スマートフォン、フィールド調査、地理空間情報、地理教育
Keywords: cloud GIS, smartphone, fieldwork, geospatial data, geography education

日本地球惑星科学連合2016年大会

Bicycles parked in the University of Tsukuba, Feb. 8, 2016
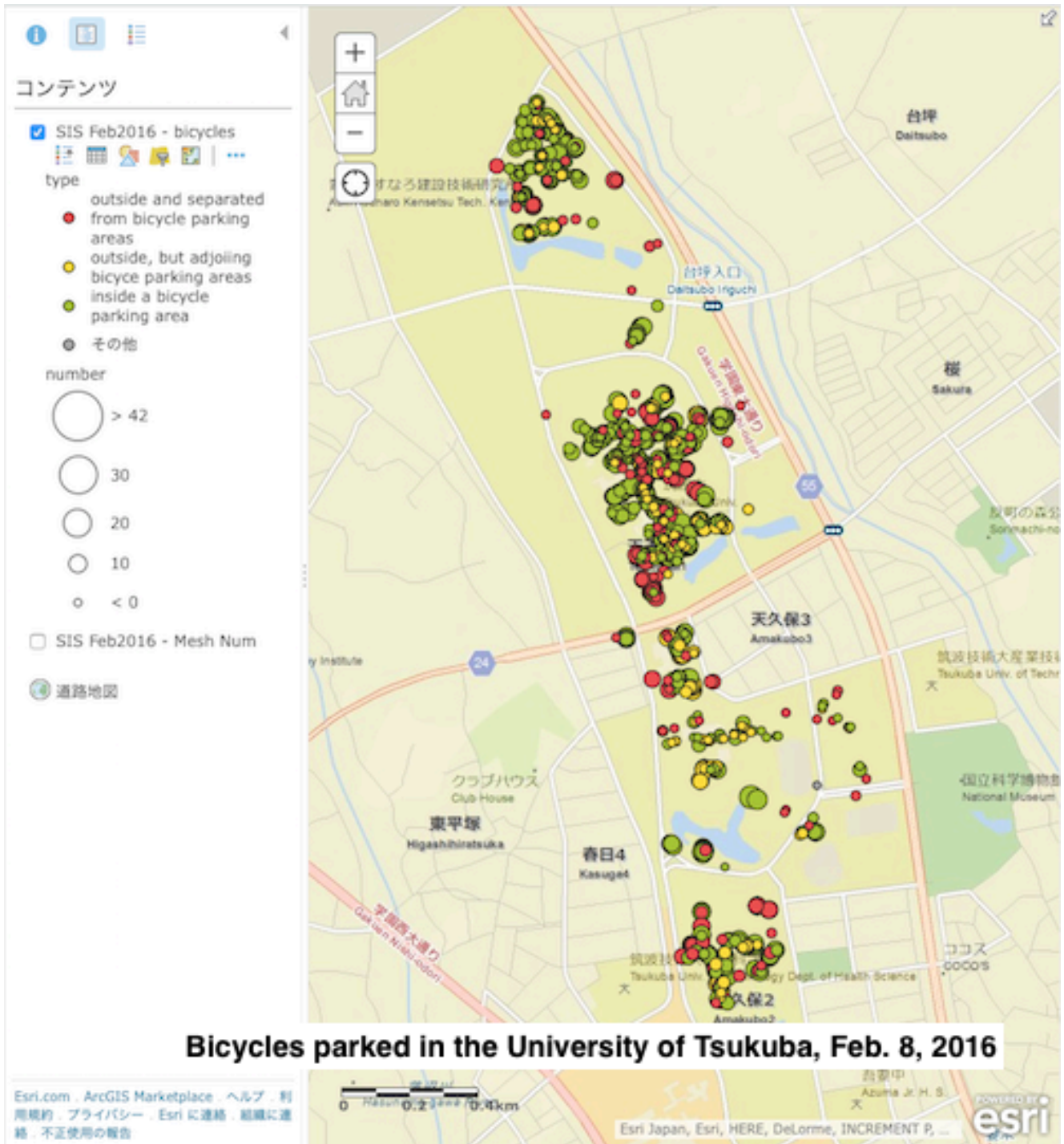
オープンソースソフトウェアや国際標準ウェブサービスを利用したタイの空間情報共有のための新たなWebGISシステム

New WebGIS system for geospatial data sharing of Thailand using open source software server and web service standard

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Authors made a new challenge for sharing on the mineral and geological information of Thailand. Although some efforts existed to share either standardized data format such as GML /EarthResourceML or client applications to gain access on heterogeneous data that stored in different formats from diverse sources, the usability of the access was limited due to lack of suitable data semantic encoded. The authors proposed a new method of geospatial data sharing of Thailand that are compliant to the standard format and access protocols of Web Map Service (WMS) and Web Feature Service (WFS) to overcome these problems. Our Web-Based GIS architecture is designed based on OGC service standard such as WMS, WFS and Open Source Software server. It approaches to the geological and mineral information sharing, formulation techniques of WebGIS configuration. The new method can be applied to other fields of geosciences for implementation of web-based system because there are applicable and functioning tool for server software. It has an advantage on cost efficiency in either the development or system maintenance as well.

キーワード：OGC ウェブサービス、ウェブ フィーチャ サービス、ジオサーバー、タイ、鉱物資源
Keywords: OGC web service, Web Feature Service, GeoServer, Thailand, mineral resources

GIS実習のためのオープンアクセス・オンライン教材の提供
Providing open-access online materials for GIS exercises

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Since around 2000, GIS researchers in Japan have collaborated to provide materials for GIS lecture classes usable in university education. The outcome incudes a GIS core curriculum, a GIS "body of knowledge" explaining the details of the curriculum, a series of PowerPoint presentations, and a GIS textbook. However, they have not yet provided materials for GIS exercises using GIS software. Therefore, we launched a new project to provide such materials which will be available online and accessible by anybody. This paper introduces the project and materials provided so far.

キーワード：地理情報システム、実習教材、オープンアクセス
Keywords: GIS, Materials for exercises, Open access