# Mass movement analysis using digital image system

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Recently, variable digital image system based on GIS, has been getting popular and progressed much. The expression and analyses of mass movement phenomena, such as landslides and volcanic eruptions , have been also done using the digital image systems accompanied by spreading of LP data etc. In this presentation, I introduce case studies of analyses of the geomorphic phenomena in Hokkaido using such digital technology.

Keywords: GIS, digital image system, mass movement, landslide, volcanic eruption
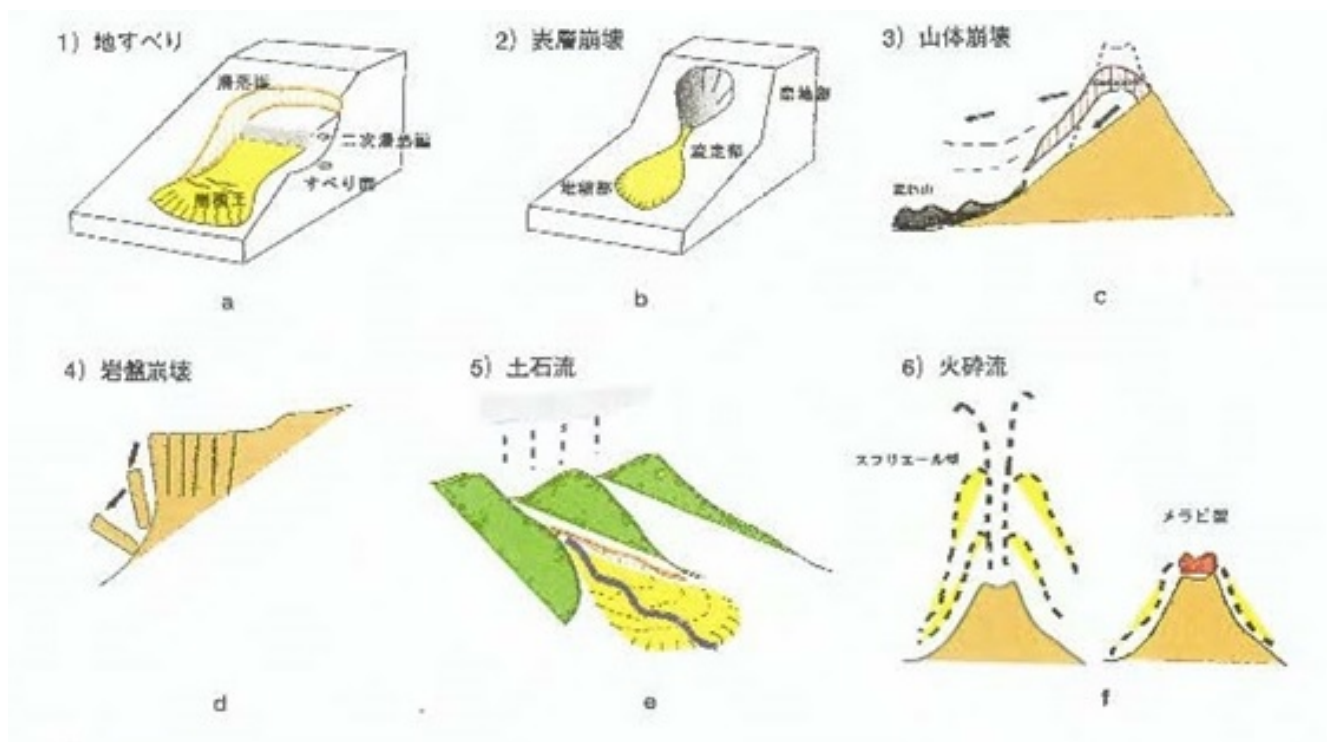
Acquisition of aerial photographs using drone and computing high resolution ortho mosaic imagery for utilizing as Land use/Land cover image classification

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Landuse/Landcover mapping utilizing remote sensing data such as satellite imageries, is a promised method used in various fields such as for land use planning's or environmental analysis, to understand the current status at the region of interest. Recent technology of satellite imageries can observe the land environment in finer spatial resolution with higher revisiting time, showing its high versatility. However, effects of cloud covers are unavoidable issues when observations are made from space, and availability of optical data is occasionally seen with lacking number of scenes for the analysis, which can even extend to months of no data. This often occurs in the tropic regions, where frequent cloud covers makes impossible to seek the land features. Unmanned Aerial Vehicle (UAV: hereafter called drones), which showed large attention in the past year with rapid development of the technology, led to increment of opportunities in the utilization of the drones as for a tool in observing and collecting data in a remote sensing way, for various environmental analysis. Due to its potential -for observing wider areas in less time consumption- it has provided the users and made it possible to collect the ground information simpler and easier. Because it flies at lower altitude then the clouds, observations of the land can even be accomplished without considering its interference.

This work focus on Indonesia as a case study where less frequent optical data can be collected due to the restriction from the clouds. The drone was utilized and multiple aerial photo where collected through the survey and processed with the Structure from Motion (SfM) technique to develop an ultra-high resolution ortho mosaicked imagery. The produced ortho mosaicked imagery was separated into a three byte binary image each representing the RGB bands, then a conventional approach was taken for image classification to obtain a categorical map of the area. The Multilayer Perceptron neural network classification was performed and segmentation classification was further performed to produce a smoother map-like classification result. The method has shown well in developing the map by using the generated image approximate 5 cm resolution which no other satellite imageries provides. Even with this short limited time of observation, it has maximized the performance for obtaining in-depth detail spatial information of the region, and using its output can lead to sound decisions for land use planning's or environmental reclamation of the areas.

Keywords: Drone, Structure from Motion, Land use, Classification, Remote Sensing, Landscape

An analysis of geographical compression effect of PM2.5 by R and GIS applications

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The PM2.5 is a group of suspended particulate matter in the air which aerodynamic radius is about 2.5 micrometers or less. The analysis of the dynamic nature of the distribution of PM2.5 are important information for the consideration on the human health. To use for the purpose, relative high-resolution estimations (about 3 km), and basis on the limited obserbatories numbers, the estimations have been performing by using the time-series analysis and the Kriging method. In this study, a geographic compression effect, one of the dynamic nature of the PM2.5, were attempt to reveal by using the high-resolution estimation of the PM2.5 with R and GIS.

The target area of this study is located at the south part of the Okayama prefecture, Japan. It has a about 40 km length from east to west and about 30 km length from north to south. Observed concentration data of the PM2.5 about the region were obtained from the Okayama prefectural website of the environmental data. The DEM data were acquired from the open data which were distributed by the Japanese government-affiliated research institute. The kriging analysis were performed using the R (R core team, 2016) and its geospatial libraries such as maptools (Bivand and Lewin-Koh, 2014), rgdal (Bivand, Keitt and Rowlingson, 2014) and gstat (Pebesma, 2014). The geographical representations were performed using the QGIS (QGIS Development Team, 2017) and the Google earth (Google, 2016). The rgdal and QGIS are developed under the Open Source Geospatial Foundation and constitute the part of the FOSS4G software.

At first, a geographical subdomain that was expected to occur the geographic compression effect was selected from the research area by the series of the hight-resolution PM2.5 estimations. Then, the compression parameters such as the attack time, ratio and the release time were calculated from the estimations. The slope gradients of the subdomain were calculated by the GIS using with the DEM data. Finally, the correlation of the compression parameters and the slope gradients were analysed by the R. As the result, the degree of a geographical compression showed a relation to the amount of the slope gradients of the subdomain. The consideration of the relationship between the geographical compression and the local meteorology, especially the direction of the wind will be required further analysis.

Keywords: PM2.5, Kriging, Geostatistics, R, GIS, FOSS4G

Representation of geospatial information for situation awareness in disaster response - Cases of 2016 Kumamoto earthquake

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The National Research Institute for Earth Science and Disaster Resilience (NIED) carried out information support by collecting and sharing geospatial information in response to the 2016 Kumamoto earthquake. In this presentation, I will describe how it expressed useful information on WebGIS and helped in dealing with disasters.

Keywords: WebGIS, situation awareness, Geospatial information, 2016 Kumamoto earthquake
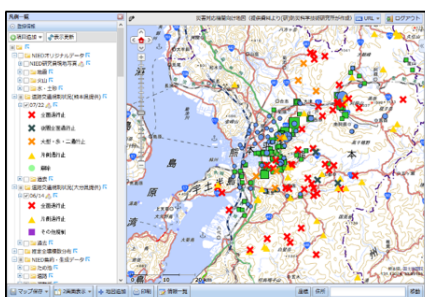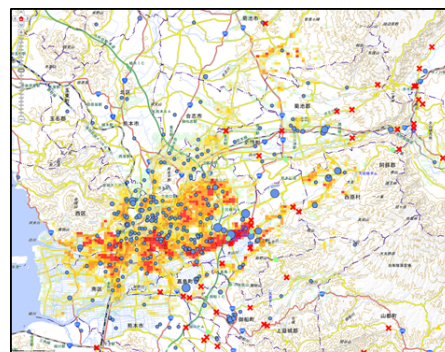
図1　災害対応機関向けに提供した地図

図2　災害情報の凡例

図3　避難所＋推定全壊棟数分布＋道路を重ね合わせた図

The Distortion of the City in the Perceptual Space of Children

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Our country has made the cities that established an important point for the childcare support as declining birthrate measures. However, there are few places where children play in city space. The current city planning does not become the child-based measures. Thus, it is necessary to plan a city after having grasped the relationship between a children and the town.
In this study, the authors analyze a relationship between the cognitive space of the children and reality space. In previous studies, the authors analyzed the element that gave a distortion on a map by grasping a difference of the cognitive space and reality space as a distortion. As a result, the authors found the distortion of the cognitive space on distance, orientation and angle.
A purpose of this study is to grasp spaces and factors that children feel attractive by analyzing relationship between the cognitive space of the children and reality space. The authors grasp a distortion of the cognitive space from a psychology side and physical aspect. In the research method, the authors perform the questionaries' survey to confirm the cognitive space of the children, in three elementary schools. The relationship between the shape of town and reality space are analyzed by Geographic Information System. The authors measure the distance between the elements in the cities as the network distance. The difference of the perceptual height is also find by the statistical analysis.

Keywords: cognitive space, cognitive map, child

The Relationship Between The Borderland and The Action of Pedestrian

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In this study, the authors are going to investigate the action of pedestrian focused on the urban public space. In the urban public space, the various needs, such as the advancement of amenities and facilitation of pedestrian movement and so on, have been required. On the other hands, there are many clear border such as the outer wall and fence in the public space by separate of functionality. So, it is necessary that we create the buffer space in the present urban area. Therefore, the authors are going to analize the borderland focused on the urban public space. In the traditional Japanese town, we find a boundary space, such as a veranda, called "Engawa", to be put beautiful flowers. We find also a ambiguous space, such as a sidewalk to be put beautiful flowers. Many people should prefer ambiguous spaces. To make such ambiguous spaces as a borderland has a good influence on the city.
There are components such as a sidewalk, pillars, colors and trees for example. The characteristic varies regarding the space component for each target area. Therefore, in consideration of various space elements, it is necessary to choose the target area.Thus, the authors chose the a former settlement of Kobe-shi, Hyogo and examined the characteristics of this area.
In this study, the authors will clarify the existence of the domain that it is hard to catch in the city space. And it is intended to find a clue to bring it up as a town with the unities. Therefore, in the space where it is thought that some domains exist, the author will clarify the domain that it is had to arrest by clarifying the relationship between the pedestrian behavior and the space component. The method of research the author used is an analysis on action of pedestrian. We analize the relationship between the action of pedestrian and the space component by GIS and CAD.

Keywords: urban public space, borderland, pedestrian behavior

Understanding of Festival Space Based on "Danjiri" Festival

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The festival is a valuable event historically that has been inherited and conducted for a long time by the cooperation of local residents. In the historical transition, some festivals changed their forms. On the other hand, any festivals have not changed their forms up to the present. For many people, the festival is an opportunity to enjoy urban space changed to the stage of "hare" form "ke" as the daily life. In this study, the authors define the festival space in where various elements related to the festival can be seen, and analyze the festival space expanding to urban space.

Keywords: Festival space, Historical transition, Geo spatial information technology

Landscape Analysis of Skyline

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In recent years, the urban redevelopment has been advanced in each city. To update the land-use and the urban functions, high-rise buildings have been accumulated in cities. The city of Osaka has so many high-rise building in the inner city. They have formed the urban mountain ranges. On the other hand, the city of Osaka is surrounded by the ranges of real mountains. Both of them are making the skylines in and around the city. So, the authors are going to analyze the two types of skyline.

Keywords: skyline, landscape analysis, mountain range, building group

Analysis of Green Landscape Based on Spatial Data

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Our country is abundant in nature and the beautiful landscape has been formed through the ages. The green environment forming a beautiful landscape becomes the important landscape resource and the tourist resource in modern society. On the other hand, smart device is becoming increasingly popular. As a result, the users of social media have increased rapidly and enormous spatial data group has appeared in modern society.

In this study, the authors are going to investigate green landscape focused on the tourist spot. The green environment has become more important as a kind of landscape resource and tourist resource. The data contributed to social media is realistic data, because it is generated by human behavior. People visiting tourist spots have been contributed photographs to the photo community website. So, it is intended to understand the green landscape that people enjoy on a tourist spot.

First of all, the authors decide the area of the Nara-Park as a case study. And they built the database of the area and used Flicker and Panoramio as photo community websites for data collection. It is possible to extract attribute information including location information from the photo contributed on social media. These two photograph community websites are different in characteristics. The authors think that the most of users of Flickr are foreigners and the most of users of Panoramio are Japanese by understanding the photography positions obtained from each photograph community website and the route listed in a sightseeing magazine. And they understood the green environment in the small area by the spatial data acquired from the PentaDigiCAM. They grasped the good viewpoint field where the tourists visited by using the two kinds of data. In addition, they investigate the tourist route actually used by acquiring positional information and time information. Finally, they analyze the continuous green landscape actually viewed by the visible-invisible analysis from the tourist route.

In future, the authors are going to grasp the good viewpoint fields and tourist routes for the green landscape in a whole Nara-Park by expanding the case study area.

Keywords: Green landscape, Tourist area, Social media

The Image Elements for the Route Selection in Urban Space

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In recent years the compact city is an important concept of urban planning. To encourage using the public transportation, the consolidation of urban functions to walk is important. In the contemporary cities, the structure of the metropolitan area is complicated. The pedestrians could not move easily. If factors to be not confused are found and locate landmark to proper position, it will help city planning in new era. The purpose of this study is to appear the characteristics of the walking paths and the landmarks used by pedestrian. There is a difference between the characteristics of new visitors and high frequency visitors. Therefore, we analyzed the two separately. First of all, the authors investigated the walking route and the landmarks used of new visitors. From this result, the position relation, visibility and so on were analyzed. As a result, the characteristics of landmarks used of new visitors were discussed. Next, we investigated the walking route and the landmarks used by high frequency visitors. Analyzing the characteristics of the landmarks of in high frequency visitors, the location, the size and the property were clear. In this study, we revealed the characteristics of space grasp to focus on difference between new visitors and high frequency visitors. Results of discussing about the characteristics of each visitor, we propose the landmarks to play an effective role on route search for new visitors. Furthermore, we propose the landmark's position to be placed from result of high frequency visitors.

Keywords: route choice, landmark, geo spatial information technology

A Study on the Cognition of the Seaside Space ˜ Based on the Sea Breeze and the Wave ˜

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In recent years,waterfront of coastal cities have been developed .The planning include coast area has been demanded the creation of a comfortable seaside environment . In the study , the authers analyzed the parameters to evaluate the invisible environment.Themethod to describe the different positions of the coast for visually challenged person, for deaf and for other handicapped person were analyzed.The characteristics based on the wind; seabreeze direction in coastal cities, as the sence of touch and smell were analyzed. The characteristic based on the wave, as the sense of the auditory and visual senses were analyzed. The wind direction ware cleard by the fluid analysis program. The visible and invisible area were analyzed using Open Saouse Geo Information System.Thsound were analyzed besed previous our studies. The seaside space and the coastline were expressedused theGeo Information System. It is appear that there are the types of the coasts based different sense. The differences in sensibilities are also in the conbinations of sensibilities.

Keywords: Sea Side Speace, Visualization, Geo Spetial Information Technology

Consideration about a topographic expression by comparison on various Geopark maps

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The authors collected many maps of each Geoparks and considered the effect of topographic expression of these maps.
The authors is trying the questioning about a map expression of the Geopark maps targeted for the participant and the interpreter to Geotours in The North Ibaraki Geopark. The authors will have a plan to ask the person concerned of Geopark maps in the Kanto area neighborhood for concentration of opinions and information about the backgrounds that they chose the topographic expression in particular. In this presentation, the authors report the result which considered the indispensable item in a topographic expression of Geopark maps.

Keywords: Geopark, map, topography expression

Development and publishing of the high speed rendering web site for slope gradation map and shaded map

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We developed and published the high speed rendering web site for slope gradation map and shaded map of the various part of Japan. In this website, PNG elevation tile based on elevation tile of of the Geospatial Information Authority of Japan tile is used. We chose the simplest method using three points to calculate solpe.

Keywords: slope, elevation, PNG elevation tile, geology, smart tile

Geospatial analysis of moving routes of bicycles using probe data

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Various policies have been recently taken to promote the use of bicycles as urban traffic in many cities around the world. However, for implementing such bicycle use promotion policy, building a bicycle road network concerning the improvement of the bicycling environment should be carefully assessed. The OD (origin to destination) data have often been utilized in many study cases on the traffic performance of the bicycle. However, since actual cyclists may take various routes, not only the shortest one but a longer route where the cyclists feel comfortable. In this research, therefore, network analysis on the actual bike movement trajectory is analyzed using the probe data (Strava Metro) which summarizes the movement of cyclists for each road segment, whose tracks are recorded by GNSS receivers. We then try to provide objective information which can be the basis of the discussion for building optimal bicycle roads encouraging the comfortable use of bicycles in cities.

Along with the probe data of bicycles, topographic environments and land use data were collected for five cities including Melbourne (Australia), New York (USA), Austin (USA), Chicago (USA), and Paris (France). Spatial analysis was performed using these data. Regarding the bicycle trajectory, the three points, including commuting use, weekend use, and use ratio on weekdays and weekends, were focused to be compared with the urban structure. Characteristic features of bicycle use for each city, as well as common features among the cities, were clarified: for instance, in Melbourne, commuting users tend to pass curved roads near parks more frequently rather than straight roads. Also, the use of roads in suburban areas is more frequent in weekends. Like this, it is observed that the frequent use of bicycles is found in or near parks, or characteristic topographical environments such as rivers and ridges, suggesting that the bicycle use strongly depends on the urban environments. Classification of bicycling networks is possible for different existing urban structures. It was also shown that the use ratio of bicycles in the central and peripheral areas is different for each city. These findings can be used for promoting future bicycle policies, including the construction of a wide-area bicycle network that incorporates existing urban structures, and optimal routes and connection distances.

Keywords: Bicycle, Probe data, GNSS, Spatial analysis

Spatial diffusion of emerging and re-emerging infectious disease: A case study of Influenza type A/H1N1pdm09 in Japan, 2009-2010

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Influenza is the most widely distributed viral zoonotic disease on the Earth. In Japan, a seasonal Influenza epidemic occurs around November to March every year. Among the three types of viruses A, B, and C, Influenza type A may cause a pandemic because of a new type of virus.

This study, examines the spatial diffusion process of Pandemic Influenza A/H1N1pdm09 in Japan. Whereas in various studies examined the pandemic from various fields, few ones considered the detailed diffusion process in Japan from spatial aspects. In particular, mapping its spatial distribution at different spatial scales is required to analyze the diffusion process and its regional differences in detail. In this study, we made multiscale analysis of the diffusion process by mapping at global scale, national scale, and local scale with GIS.

We used infectious disease surveillance data of pandemic season in 2009 to 2010. At the global and national scales, we used patient data from the National Institute of Infectious Diseases (NIID) of Japan, and at the local scale, we used the data from outbreaks at school facilities. The study area at the local scale is Wakayama prefecture, located in the southern part of the Kinki district. This area has regional characteristics of the northern region included in the Keihanshin metropolitan area, and southern region of depopulation area in mountainous lands of Kii Peninsula.

The global and national scale maps revealed that patient arrived taking two routes, mainly in the United States and Southeast Asian countries in May 2009. One is the route from Kansai International Airport, and the other is the Kanto region and Tohoku region from Narita Airport. The spatial diffusion within Japan is supposed to take path according to inter-regional ties.

The peak of the epidemic in Wakayama Prefecture is November 2009; there are it took six months to reach this peak in Wakayama Prefecture from the first confirmation in the Kinki district. An increase in outbreaks began in September 2009. From the distribution of closed facilities, it became clear that it gradually diffused from the northern part included in the metropolitan area to the south part of the prefecture.

These results provide not only emerging and re-emerging influenza but also basic information on daily epidemic prevention.

Keywords: Spatial diffusion, Influenza type A/H1N1pdm09, Japan, Geographical Information System (GIS)