Japan Geoscience Union Meeting 2013
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Extraction and modeling of seasonal variation factor in green landscape

Yoichi Ono[1*], Shin Yoshikawa[2], Kazunari Tanaka[2]

[1]Graduate school of Engineering,Osaka Institute of Technology, [2]Faculty of Engineering, Osaka Institute of Technology

Landscape simulations have been becoming popular to the public by evolution of geospatial information technology. Moreover, in the scheme of the beautiful country creation policy decided in 2003, it is one of the themes that the three-dimensional landscape simulation by using GIS is carried out for landscape comparison and analysis. Which are comparatively shorter than the period of landscape transition, have been considered as variation factors in landscape engineering. However, the effect of variation factors on landscape is not so clear. In this research, a green landscape showing a delicate change with a change of the time is intended as the object. The green changes its aspect such as flowering and leaves' coloring. They extract the green changing delicately such an aspect, and express the green landscape of every season by using CAD/CG after grasping the positional data.

At first, the city of Kyoto is selected as a case study area because the seasonal scenes there become tourist attractions. Next, the authors analyze in a large region in order to set the objective area and the viewpoint field. Finally, they grasp the vegetation changing in a scene landscape as a fundamental form of landscape. And they express changes in the green in every season visually by using CAD/CG.

They understand the status of vegetation around Kyoto in order to select the concrete study area. The existing vegetation map provided by the Biodiversity Center of Japan shows the Japanese maple and Japanese zelkova grow in groups in Arashiyama-Sagano district. Therefore, Arashiyama-Sagano district was selected as the study area, and the case study scenes and their viewpoints were selected by using the photo community website, too. As a result, two scenes were selected as the case study scenes. One is the scene which looks at the Togetsu Bridge against the background of Mt. Arashi, and another is the scene which looks at Mt. Arashi as a scenic backdrop from the Tenryu Temple.

In order to find the important tree in scenes, the visible-invisible analyses were conducted from two selected viewpoints. These analyses used DSM which made from DEM and LIDAR data. Because the ratio which the Japanese maple-zelkova community is seen in from two viewpoints is high, the vegetation distribution of the Japanese maple-zelkova community is understood in great detail.

The tree height is different approximately 10m between the Japanese maple and the Japanese zelkova. Therefore, the authors think that paying their attention to the surface of the Japanese maple-zelkova community can catch the distribution of the Japanese maple, which is in the layer of the near tall tree. Then, they has grasped the trees position located in the layer of the near tall tree by using contour lines made only from the first pulse of LIDAR data. Also the vegetation distribution of Arashiyama-Sagano district is expressed on TIN generated by every tree class and community. It is necessary to inspect whether a position of the Japanese maple which they extracted is right. So, the authors utilized the photogrammetry to verify the position of the Japanese maple. They combined the photo image taken on the spot with CG image rendered from 3D model. As a result, it could be confirmed that the Japanese maple leaves in the photo image had turned red at the same position as in 3D model made from LIDAR data.

Then, we utilize the geospatial information and estimate the position of the wild cherry trees. According to geometric characteristics and growth conditions of the wild cherry trees, they made 3D models for the wild cherry trees at the appropriate positions. And also they verified the positions of the wild cherry trees by the photogrammetry as well as the Japanese maple.

Finally, they made the entire 3D models by using CAD/CG to carry out the landscape simulation every season. As a result, utilizing LIDAR data and photo images specified the tree positions, and every seasonal scene could be modeled.

Keywords: green landscape, variation factor, vegetation

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Transition of Osaka in the right bank area of the old Yodo River

Takahiro Nishimoto[1*], Shin Yoshikawa[2], Kazunari Tanaka[2]

[1]Graduate School of Engineering,Osaka Institute of Technology, [2]Faculty of Engineering,Osaka Institute of Technology

The modern Japan had been planned quantitative improvement by rapid urbanization through a revival development in the post-war and the high economic growth. Therefore, characteristic culture and historical landscapes had been lost with urban development in the metropolitan area in Japan. However, in recent years after the quantitative development settled down in the city, the activity given attention to the city history such as a sightseeing policy and the history education has been carried out for the purpose of substantial and activation in city. Thus the interest in history is increasing in modern Japan. On the other hand, the utilization of GIS becomes more familiar to the public, because geospatial information technology has spread rapidly in recent years which are in the period of maturity as an information society. Especially, the utilization GIS is effective for the historical research, because it can process long-term and enormous information like transition analysis.

Osaka was prosperous as the Aqua Metropolis in Edo period, and has become the city crowded with public transport and high-rise buildings in Kansai area at present. Although Osaka was one of the three capitals with Edo and Kyoto in the Edo period, the study of urban transition in Osaka is not enough. In this study, the authors are trying to grasp the urban transition focusing on the old Yodo River in Osaka based on the collected historical materials by using GIS. And they are going to recognize again the existence of characteristic urban space around the old Yodo River which disappeared in the urban transition, and to aim at creating it again as historic value becoming attractive of Osaka.

It becomes necessary to arrange the long-term change efficiently in the study of urban transition. Therefore the authors decided to use the topographical map for six terms in this study every approximately 20 years from the middle of Meiji when the urbanization began. The expanded process of urbanization was expressed by extracting the streets around the old Yodo River from this topographical map. As a result, in the right bank area of the old Yodo River, the authors grasped urbanization progressed around the Osaka Station established in 1874 and along that river, and urban development is almost over in the early Showa period. While the urbanization was expanding, the new Yodo River was dug with repairing the Nakatsu River located in a northern part of Osaka City, and new canals could be found in the south of Osaka Station.

At the same time, the reconstruction of buildings in the built-up area was repeated in addition to the expansion of the urbanization by the long-term urban development. Then, the authors extracted the key buildings which were deciphered from a topographical map to catch changes in the built-up area, and they tried to grasp the land usage pattern. As a result, approximately 40 buildings were extracted at the Taisho period, and the most of them were historical buildings and factories. And the authors found that those extracted sites had been mostly changed into parks and residential quarters. Moreover, they tried to find the beginning time of urbanization and the changing time of land usage pattern. Buildings began to increase in the late Meiji period, and the land usage pattern started to change in the early Showa period.

Also, the authors try to compare the present cityscape with the old photo, because the change of the land usage pattern in the built-up area affects the landscape.

At the present stage of this study, the authors clarified the partial urban transition in the right bank area of the old Yodo River after the late Meiji period. In the near future, they are going to grasp the changes in each district in both sides of the old Yodo River in consideration of bridges which are the keys of cityscape and traffic in Osaka, and to simulate the cityscape in transition based on 3D urban model by using GIS and CAD/CG in integration.

Keywords: urban transition, the old Yodo River, urbanization

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Analysis of regional conditions of cultivation abandonment by grid square statistics using GIS

Takehiro Morimoto[1*]

[1]Faculty of Life and Env. Sci., University of Tsukuba

The author composed grid square statistics using GIS to reveal the distribution of cultivation abandonment more precisely than ready-made regional statistics. The statistics is also suitable for analyses in combination with other ready-made social and environmental grid-square statistics. The agricultural grid square statistics was composed by allocating the value of the rural community statistics of Agricultural Census of Japan into the standard grid cell of Japan. Using the statistics he examined the spatial pattern of cultivation abandonment and the relationship between the abandonment and physical conditions, population, and agricultural production rural environment in Kanto Area, central Japan. The author examined the distribution of cultivation abandonment, agricultural production, population and topographic condition.

The result showed a slightly strong positive correlation between slope angle and ratio of cultivation abandonment. In steep slope areas worse situation for cultivating, decline in the production of special crops, decayed economic condition, and decrease in population resulted in high ratio of abandonment. In plain areas weak positive relationship between population density and abandonment was observed. Urbanizing impact on farmers' attitude might increase the abandonment in high-density areas.

Keywords: cultivation abandonment, grid square statistics, rural environment, GIS, cultivated land

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Changes in the Distribution of Deer and Black Bears in Nagano Prefecture and Regulating Factors

Misao Hashimoto[1*]

[1]Graduate Student, University of Tsukuba, JSPS Research Fellow

It is remarkable that wild animals make frequent appearances in villages and cause damages to crops, wood plantations and humans in recent years. The agricultural damage caused by the wild animal in Japan in the 2010 year amounts to about 23,900 million yen, where 70 percent are due to deer, wild boar, and monkeys (MAFF 2010). Also, bears cause not only damage to crops and wood plantations but also to humans.

In Europe and America wildlife management which manages the number of individual wild animals and their habitats has progressed to maintain hunting sustainably. Wildlife management has three elements, namely population management, habitat management, and consequence management. Wildlife management in Japan introduced the concepts of the European and American wildlife management. Also it is performed based on the wildlife aid-services plan of all prefectures according to the provisions of a country. It generally implements countermeasures to prevent wild animals from entering farmland or villages using expulsion or safety barriers. But currently no measures for the management of the environment are taken, such as maintenance of the environment of farmland and villages, and the environmental improvement of the wild animal's habitats. In order to evaluate the habitats of wild animals it is necessary to consider the relationship between changes in the habitat distribution and environmental changes on a long term time scale.

This is why this study intends to analyze the changes in the distribution of Deer and Black Bears in Nagano Prefecture and its regulating factors.

Chiba (1964) reveals that the depth of snow and an evergreen broadleaf forest are important environmental factors of habitats for deer and wild boar. In accordance with this result, this study also assumes that depth of snow and an evergreen broadleaf forest are impacting the habitats of deer and black bears. I used 5km grid data of the habitats of deer and black bears and a vegetation map on a scale of 1:50,000 for 1978 and 2003, obtained from the Biodiversity Center at the Ministry of the Environment. In addition, categories of vegetation are distributed by the degree of natural vegetation. I created GIS data of the snow depth in 1978 and 2002 from data by the Nagano local meteorological observatory.

The method of analysis was to overlay and create a cross table of the vegetation data and the snow depth data corresponding to each period on the basis of the habitats of deer and black bears for two years (1978 and 2003).

As a result, the habitats of deer and black bears in 2003 are larger than they were in 1978. Traditionally, the deer are said to restrict their habitation to places where the snow is more than knee-deep. But, in fact, the habitat region was expanded also to the area of 1 m or more depth of snow. This showed that it could not necessarily be said that the habitation region is prescribed by only the depth of snow. Furthermore, compared to the bears the deer inhabited more areas near artificial plantation and secondary woodland. This is influenced by the feeding habits of the deer. Moreover, the habitats of deer and black bears expanded more towards residential districts and crop lands. In response to the influence of an energy revolution and the import overseas material, the felling of firewood and building lumber has decreased. Since man stopped cutting down the forest,it has been expanded that the environment which a wild animal can inhabit.

This is why the changes of the habitats of deer and black bears are affected by the changing environment. Therefore, deer and black bears make frequent appearances in villages, and the damage caused by wild animals to agricultural land, wood plantations and humans has increased in recent years.

Reference

Chiba, T. 1964. Geographic distribution of wild boards and deer in the japanese islands and their areal and quantitative fluctuations. Geographical Review of Japan Ser.A, 37, 575-592.

Keywords: Japanese Deer, Asiatic black bear, Habitat, Factor, Nagano Prefecture

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Analysis of changes in shoreline locations along the Shizuoka and Shimizu coast since the Meiji period

Hiroki Mori[1*], Takashi Oguchi[2]

[1]EPS, The University of Tokyo, [2]CSIS, The University of Tokyo

Many researchers have analyzed changes in shoreline locations due to coastal erosion in relation to human activities, using topographic maps and aerial photographs. In such studies using topographic maps, errors due to paper sheet expansion and contraction were problematic. In studies using aerial photographs, errors due to the central projection and inclination of the axis of the camera can be reduced by geometric correction using GIS. This study aims to analyze temporal and spatial changes in shoreline locations since the Meiji period, using geometrically corrected topographic maps and aerial photographs, as well as a high-resolution digital elevation model (DEM). We selected the Shizuoka and Shimizu coast in Shizuoka Prefecture as the study area. It is known that the extraction of a large amount of gravel from the bed of the Abe River in the 1950s and 1960s reduced sediment discharge, causing coastal erosion. Later breakwaters were built along the coast to reduce erosion, which also affected shoreline locations. Therefore, this area is suitable for studying human-induced shoreline changes.

We scanned topographic maps and aerial photographs and corrected them geometrically, using the base map information distributed by the Geospatial Information Authority of Japan (GSI). Then vector data of shorelines were obtained by tracing lines shown in the corrected images of the topographic maps and aerial photographs. We also obtained shoreline data from the DEM which corresponds to the high-tide level. We set 13 baselines almost parallel to the shoreline, and survey lines perpendicular to the baseline at an interval of 25 m. Then the distance between the baseline and the shoreline along a survey line was measured to quantify changes in shoreline locations. The results were presented in maps and graphs to visually and quantitatively understand shoreline changes.

The detected changes of the shoreline locations and their controlling factors can be summarized as follows. Until 1953, when the influence of human activities was small, significant forwarding migration of shorelines had occurred particularly at the tip Miho Peninsula, and at the outlet of the Abe River. In these areas, sediment deposition had been very active. On the other hand, shorelines in other areas changed intricately and the balance between erosion and deposition had not always be constant even before the influence of human activities became strong. From 1953 to 1976, significant coastal erosion occurred at the outlet of the Abe River and south of the Udo Hills, caused by the extraction of a large amount of gravel from the bed of the Abe River. On the other hand, around the Miho Peninsula, the situation was very similar to that before 1953, in that shorelines changed intricately. This is because the influence of gravel extraction in the Abe River had not reached there until 1976. From 1976 to 2009, shorelines have moved forward at the outlet of the Abe River and south of the Udo Hills, because the supply of sediment from the Abe River has recovered gradually. However, shorelines moved back in some parts of the other areas, because the effect of increased sediment supply from the Abe River had not reached these areas. In addition, shorelines changed to form tongues or saws due to artificial construction. In summary, this study using various data sources and GIS allowed us to discuss details of shoreline changes related to both natural processes and human activities.

Keywords: GIS, coastal erosion, changes in shoreline locations, topographic maps, aerial photographs, human activities

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Analysis of Upper Pleistocene to Holocene sequences in the Osaka intra-arc basin using a borehole database and GIS

Yuka Ito[1*], Takashi Oguchi[1]

[1]The university of Tokyo

Development of Upper Pleistocene and Holocene depositional sequences in the Osaka intra-arc basin was reconstructed based on the analysis of subsurface geology and topography using ca. 32000 borehole data and GIS. The database for information of ground (DIG) constructed by the Geo-database Information Committee in Kansai was analyzed. The result allowed us to discuss the formation of river/marine terraces during the regression from MIS 5 to MIS 2 and the distribution of incised-valleys of the Yodo, Ina, and Muko Rivers. Ravinement surfaces formed by wave and tidal erosion during the transgression from MIS 2 to MIS 1 were widely identified in Osaka Bay and the step in the surfaces could be correlated with the rapid sea level rise event at 7.6 ka.

Keywords: terrace, borehole database, Upper Pleistocene to Holocene, ravinement surface, rapid-rise event

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Geomorphological Factors Affecting Speleothem Distribution in the Abukuma Cave, Japan: A 3-D Laser Scanning Approach

Tomomi Takayama[1*], Yuichi S. Hayakawa[2], Takashi Oguchi[2]

[1]Grad. Sch. Frontier. Sci., The University of Tokyo, [2]CSIS, The University of Tokyo

A terrestrial 3D laser scanner (TLS) is useful to obtain high resolution data of landforms. Recently TLS surveys have often been conducted to measure and analyze landforms particularly in Europe and North America, but have been relatively limited in Japan. This study aims to measure detailed topography of a limestone cave including speleothems using a TLS and analyze the relationship between speleothem distribution and morphological characteristics of surrounding ceilings. The study site is the Abukuma Cave in Tamura City, Fukushima Prefecture in central-northern Japan. We use a TLS of TOPCON Co. (GLS-1500) to obtain 3D point cloud data in a 29-m high space called Takine-goten. Analyses of the edited 3D point cloud, including a point dataset of stalactites and a 5-cm resolution DEM, were performed to assess the effects of slope and curvature of the ceiling surface on the distribution of stalactites. As a general trend, stalactites tend to occur at places with intermediate slopes, high standard deviations of slope and high absolute values of curvature. As a local analysis, the Takine-goten was divided into three areas in an outlet to inlet direction. Different characteristics of stalactite distribution and forms are found in each area. Stalactites are frequently found near the outlet where abundant water sprays out from the bedrock, despite low standard deviations of slope and low absolute values of curvature. Some stalactites in the innermost area are found in places with low standard deviations of slope and high absolute values of curvature, indicating that stalactites tend to occur in places where slope changes within a small area.

Keywords: Terrestrial 3D laser scanner, Speleothem, Geomorphological factors, Abukuma cave, Stalactite