Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT29-P01 Room:Convention Hall Time:May 22 17:15-18:30

Analysis Method for Arrangement of Signage by Pedestrian Readability and Visibility

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1.Background

The signage system is important for pedestrian's movement within a railway station. However, the lack of proper signage system makes passengers difficult to reach their destinations. Therefore, it is essential to study the effectiveness of the signage information at the railway station in order to design user friendly signage system.

2. The purpose and the method of study

The study focuses on the continuity of the signage and clarifies the analysis method of its assessment in term of applicability in the real space and identifies the issues.

The study applied Computer Aided Design (CAD) modeling. Over the base information of the plan of railway station, locations, heights, area of existing signage are layered. Then, in order to recognize the correlations of existing signage, definitions of signage Readability and Visibility will be determined taking into account the peculiarity of human site.

3.Study Area

The study picked up the Hanshin Railway Sannomiya Station and its vicinity for the target area. This area is in the hub for major railway stations such as Japan Railways (JR), Hankyu, Port Liner, and Kobe City subway. Moreover, the area is close to the commercial districts that continuity of the signage should be significant.

4. Definition of Readability Area and Visibility Area

The study defined the Readability and Visibility as follows. Readability is whether or not the contents of a signage are recognized and understandable.

Visibility is whether or not people recognize the signage. It does not need to read the contents but to understand the figures and colors on the signage. The idea of visibility always connotes the readability.

The authors think that correlation of readability and visibility area is essential for guiding pedestrians. Because the pedestrians who can read the letters express information that they need on sign, they would look for next visible sign of the same type.

5. Methodology

The study applied readability and visibility area to the modeled signage from the in Hanshin railway station taking into account the characteristics of human vision. The modeled signage installed six lights in every corner and center of the signage and elevated the floor level to 1,500 mm to match with the human viewpoint. The study defined the visibility area where reflection of lights was seen on the floor.

In order to confirm the accuracy of the analysis method, the study utilized GIS for the Visible-invisible Analysis for the 30 cm grid Digital Surface Model (DSM) data. Only the allowable margin of error was indicated.

6. Results of Analysis

The study focused on the signage which contains the guidance to the "Port Liner." The Port Liner station is the elevated one that guidance from the basement station needs to be easy for pedestrians to understand their whereabouts. The study found out the statuesque of the signage as mostly fragmented. Only the readability of the individual signage area is secured around the exit of the Hanshin station for pedestrians but lacks the continuity to the Port Liner station. Also, there is other signage located near the exit of Hanshin station and visibility areas are piled up each other that it may be guide for pedestrians.

7.Conclusion

The study analyzed the correlations of signage in the urban railway stations for the convenience of pedestrians.

The findings are; 1) the effect of the signage is not enough when these were stand alone, and 2) considering the readability and visibility of signage, continuity of the signage (visibility of the next signage to guide the routes to the destination) is significant.

The study will consider proper locations of signage in focusing on a pedestrian's eye movements.

Keywords: sign, guidance, readability, visibility, pedestrian

HTT29-P02 Room:Convention Hall Time:May 22 17:15-18:30

Introduce of Smart Tiles System Architecutre for Seamless Geological Map of Japan and contribute the new website

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The Geological Survey of Japan (GSJ), AIST started creating the 1:200,000 seamless digital geological map of Japan in 2001, and contribute it on a website from 2002. The map is based on the 1:200,000 geological quadrangle maps that have been published by GSJ since the 1950s. The geology of the maps was updated by checking the latest geological data and adjusted the stratigraphic and structural discordance among the original maps using Geographic Information System (GIS) softwa re. We devised a system architecture, SmartTile System Architecture, to use this digital geological map through the Internet comfortably, and built a website by using it. Pyramid tiles, PHP, and SVG (Scalable Vector Graphics) are mainly used for implementing SmartTile System Architecture in seamless digital geological map of Japan. We started updating our website with the SmartTile System Architecture in October 2011, and since then, website visits have increased dramatically.

Keywords: SmartTile, Seamless geological map, Google map, Tablet PC, Smartphoe, SVG

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Estimated distribution of SPM in the sky above the Seto Inland Sea

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Created an estimated distribution map of Suspended Particulate Matter (SPM) of the monthly variation in the sky above the Seto Inland Sea. By using Kriging method that one of the spatial interpolated method, the Earth Scientific information at the uninvestigated area was estimated and derived from the original sampling data, and was able to create the estimated distribution map. This estimated data is called the Best Linear Unbiased Predictor (BLUP). This value change by the variogram model, so, need to choose the most suitable model. This process was run using the some libraries into the R-Language (Ihaka and Gentlemen, 1996).

In this report, create the estimated distribution using the SPM data of every month of 2009 year by the Ordinary Kriging (OK) method, consider that the seasonal change and the relation between SPM and terrain.

Keywords: Kriging, BLUP, R-Language

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Spatial analysis for distributions of vegetation and soil thickness in a mountainous region using LIDAR data

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1. INTRODUCTION

In this research, we discuss a method to clarify a regional distribution of soil thickness which is an important factor of collapse in order to improve the accuracy of slope failure prediction. First, with a geographic information system (GIS), we have developed a method to extract information of vegetation such as tree heights and tree densities in mountainous regions using the 10m digital elevation model (10m-DEM) of the Geographical Survey Institute of Japan and airborne laser surveying data (xyz-points data; LIDAR data) collected by Fukuoka Prefecture in 2003. Next, a distribution of soil thickness has been simulated using the process-based model (Dietrich et al., 1995) in order to examine a relationship between the vegetation information and soil thickness.

The study region that is 20 km^2 is located at Umi in Fukuoka Prefecture of southwestern Japan. The geology consists of Mesozoic granitic rocks which are the Sawara granite and Itoshima granodiorite. In this region, more than a few hundred slope failures were caused by the torrential rain disaster in 2003. The subsequent geological survey has showed that the past debris flow events have been confirmed in some outcrops (Kyushu Branch of the Society of Engineering Geology, 2004). The mountainous region where disturbance to vegetation due to landslides often occurs like this region might show a correlation between vegetation and soil thickness (Kuroki et al, 2011).

2. METHODS

2.1 Extraction for information of vegetation using LIDAR data

The airborne laser survey can measure the height of ground surface and features with high precision by a pulsed laser light irradiated from the air. But the high precision DEM due to LIDAR cannot be expected owing to a lot of trees in the region. Thus, the basic geomorphic values have been calculated using the 10m-DEM, and the LIDAR data have been used for extraction of information about vegetation. At first, the LIDAR point data are modified in order to move each gradient vector of a 10m-grid into the horizontal plane, or to remove variations in height due to geomorphic relief. The next, simply assuming that variations in elevation after the modification depend on density and height of the vegetation on each grid, the vegetation coverage ratios (VCR) can be calculated as follows,

VCR = (average elevation - minimum elevation) / (maximum elevation - minimum elevation).

2.2 Simulation of soil thickness

Distribution of soil thickness has been calculated by the finite difference method using the process-based model. In this model, the movement of soil depends on geomorphic relief as defined by -Kdz (K: diffusion coefficient, dz: slope). The simulation of soil development has been carried out using the parameter of Dietrich et al. (1995) and the 10m-DEM as an initial elevation with 100 year time steps until 6000 years.

3. RESULTS AND DISCUSSIONS

The distribution of VCR has a tendency to increase in forest area. However, a linear correlation is not observed between the VCR and the normalized difference vegetation index (NDVI) derived from a LANDSAT image of 2001. It means that VCR and NDVI show different information of vegetation. The calculation of soil thickness shows relatively high values in the catchments which are identified as the runoff erosion threshold in the modeling of hillslope processes (Tucker & Brass, 1998). The variation of the soil thickness increases with the increase of the VCR, and reaches a maximum at around 0.7 in VCR. These results imply that the vegetation analysis using LIDAR data has a possibility to detect a soil distribution or slope failure inventories.

Kyushu Branch of Japan Soc. Eng. Geol. (2004): GET Kyushu, 25, 14-40
Kuroki et al. (2011): Proc. of Japan Soc. Eng. Geol. Annual Meeting 2011, CD
Dietrich et al. (1995): Hydrological process, 383-400
Tucker & Bras (1998): Water resources research, 34(10), 2751-2764

Keywords: GIS, LIDAR, landslide, vegetation, soil thickness

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Classification and formation environment of glacial valleys inferred from morphometric analyses

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Glacial valleys are a type of glacial landforms, and some researchers investigated the form of transverse sections of glacial valleys. The objectives of this research are: 1) analyze and compare the forms of glacial valleys using up-to-date elevation data; and 2) classify glacial valleys based on forms of transverse sections. The study areas are the Swiss Alps, the Himalayan Range, Yosemite, the New Zealand Southern Alps and Patagonia which contain typical glacial valleys of the world. Four to six valleys were selected from each area. Transverse and vertical longitudinal sections were obtained from DEMs, and the aspect/form ratio (*FR*) of each transverse section and slope of each small segment of the section were calculated. From frequency distributions of slope, statical moments including kurtosis, skewness, and standard deviation were computed. Forms of glacial valleys were evaluated using these three parameters and *FR*.

For all glacial valleys, *FR* converged into about 0.28 with increase in valley size. The value may correspond to the balance of vertical and lateral glacial erosion as well as a threshold slope angle for slope failure after the melting of glaciers.

Correlations between any two of the four parameters were investigated. Based on the correlations and actual forms of the transverse sections, the sections were classified into four types; 1) U-shaped, 2) V-shaped, 3) plain, and 4) others. Then the characteristics of glacial values were compared based on the classification, and the correlation between the area of each transverse section and the equilibrium line altitude was investigated. Comparisons among the glacial valleys in the five regions revealed that the most common valley-form type is U-shaped in New Zealand, V-shaped in the Himalayas, and plain in Yosemite and the Swiss Alps. In New Zealand, highly abundant snowfall let glaciers create typical U-shaped valleys. In the Himalayas both V-shaped and U-shaped valleys are abundant with high *FR* values, indicating that both active glacial erosion and mass movements after glacial melting contributed to valley formation. The high proportion of the plain type may reflect limited snowfall and a low uplift rate in Yosemite, and glacial re-advances in the Swiss Alps. Average *FR* of valleys in Patagonia is small because of active lateral erosion by ice sheets. Consequently, the form of glacial valleys are controlled by the mode and intensity of erosion, regional climate and tectonics.

In each region, *FR* tends to change according to elevation, and *FR* reaches the maximum in an intermediate elevation in areas around Mt. Cook in New Zealand and in the Swiss Alps. The elevation approximately corresponds to the equilibrium line altitude at the Last Glacial Maximum, suggesting a possibility of estimating the past equilibrium line from *FR*.

Keywords: glacial valley, transverse section, DEM, formation environment

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Effects of Source Area Properties on Alluvial Fan Morphology

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Studies of alluvial fans and their source basins are important to discuss not only flood and sediment hazards but also earth-scientific issues including sediment transport from mountains to plains. In geomorphological research, relationships between a morphometric property of alluvial fans and that of source basins have often been analyzed. However, there have been limited studies on the comparison of the relationships for various regions in the world, and geomorphological analyses including the characteristics of major streams in source areas along with alluvial fans and sources basins as a whole. Therefore, this study analyzes the effects of basin characteristics on fan morphology in areas with different types of natural environment. Additionally, this study deals with three geomorphological components: basins as sediment production area, trunk streams as sediment transport area, and fans as sediment depositional area. The study areas are Japan, the American Southwest, the Southern Philippines, Southwest of Turkey and East Coast of the Gulf of Alaska. Geographical Information Systems (GIS) are used to analyze digital elevation models (DEMs) and digital geological maps. Then fan area (A_b), mean fan slope (S_f), basin area (A_b), mean basin slope (S_b), mainstream length (L_s), mean mainstream slope (S_s), dominant lithology and bedrock age are obtained, and their characteristics and mutual relationships are analyzed.

The results indicate that fan area and fan slope depend on basin area, and fan slope depends on basin mean slope. This may reflect the difference in sediment production including sediment grain size and the ratio of transported sediment to water. Furthermore, regions with higher precipitation tend to have larger fan area and gentler fan slope for the same basin size. This indicates that higher precipitation leads to frequent flooding on a fan and subsequent sediment transport toward the distal area of the fan. In Japan, the same tendency is found in basins larger than 200 km^2. It is also revealed that fan slope tends to be smaller than trunk-stream slope if basin area is larger than a certain threshold value. The threshold tends to be greater in regions with smaller precipitation, reflecting sediment transport on a fan and resultant decrease in fan slope. By contrast, dominant geology of source basins hardly affects fan morphology. In summary, morphometric properties and climate conditions exert strong influences on fan morphology because they affect sediment supply, transport, re-transport and water runoff.

Keywords: Alluvial fan, Drainage basin, Morphometric property, GIS