# The New Shaded Relief Representation by Combining Multiple Light Sources with Clustering Aspect

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It is known that shaded relief representation using a Digital Elevation Model (DEM) shows fine terrain representation of a map with high-visibility.However, standard shaded relief with a single light source has difficulty to describe terrain in detail because of its dependency on an illumination and values for the z-factor emphasis.
This study attempts to establish the new method of shaded relief representation which depicts both large and small terrain features in addition to produce a trial image as a valid background map. The method devises observation for illumination and shadow density.
The first step of the study focuses the illumination effects with multiple light sources on a shaded relief. A few illuminations set each lights and shadows to whole area. Although this method defuses to be direction-dependence to some extent, it is a very limited success to describe small terrain features.
The second step is an extraction of shadow deficiency followed by an examination of shading interpolation. The shaded relief combines some illuminations from every horizontal positions with their perpendicular shadow. The shadow changes dynamically by the aspect clustering in the third and fourth quadrant.
As a result, the new relief shading representation implements to improve a previous standard. The method depict detail terrain features with fine vertical exaggeration. It also creates a natural color-shaded relief, applicable as a background image of any maps.

Keywords: DEM, Shaded Relief, Light Sources, Shade Density, Clustering Aspect

 

# The trial to the detailed geographical feature expression technique, and the geology, the disaster prevention, cultural history and resource investigation by IN-YOU-ZU.

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There are various modes of expression using acquisition and data of the geographical feature data based on a laser survey, and I am used for fine geographical feature analysis etc.
There are a shade figure, an amount figure of inclinations, etc. By this research, I was able to conduct fine geographical feature investigation of Wakayama Prefecture using the technique of the IN-YOU-ZU figure of AERO ASAHI CORPORATION incorporated company, and was able to compare about the contribution to geology, disaster prevention, history culture, and resource investigation as compared with the actual field. IN-YOU-ZU is one of methods to express the three-dimentional topographic features.The topographic features are onstituted by various ups and downs whose textures are complex in even small area.therefore, it becomes possible to emphasize the relief using a polarity and a magnitude of the wave and then easy to analyze and a complex topographic feature.

Keywords: The IN-YOU-ZU, Laser survey, Fine geographical feature analysis

 

# Detection of natural events and disasters from known historical records

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There have been many studies on natural events and hazard occurred in historic times. Catalogs in various research fields, such as earthquake, volcano eruption, weather and astronomy, are compiled and published. In these catalogues, an article about events in different field is often cited from the same historical literature. For example, an earthquake and flood are extracted from different part of the literature. Diary-style literatures tend to record events range over wide filed. Each catalog has its own editorial policy that constrained by target event, interests and limitation of page space. Articles about events in different field are not usually collected in catalogs. A known article in one research field can be unknown article in the other field. It is possible that a lot events are left as unknown.
Enormous data on historical events and disasters can be used via online database. The data includes geographic information such as places where an event occurred or observed and where the records are owned. The impacts of an event usually recorded in a certain geographic area. It is possible to find a new article to detect unknown events or to increase data on known events based on geographic information of known articles and records. Mapping and geographic information system is useful to arrange and search the information related to known historical records.
A good example of searching known records is a mud rain event that is observed in February, 1882 across a wide area of Japan's main island. Records and articles in several newspapers that written at At Osaka, Kyoto, Mie, Gifu, Aichi, Nagano, Tokyo, Chiba, Ibaraki Prefectures and so on, are transcribed to characterize the mud rain event. The records mostly described that something like ash, sand or mud fallen and accumulated. One article described that the night is like the one without moon. Although there was a rumor that the mud rain is caused by a volcano eruption, volcano eruption is not officially reported in the period. The point of observation seems to migrate from west to east in three days. The mud rain estimated to be brought by (1) ash fall from a volcano eruption, (2) Asian dust, or (3) local dust storm.

Keywords: historical record, February 1882, volcano eruption, Asian dust

 

# Ground View from Underground Space using 360 image

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Underground Space is more and more complicated. Underground space is un-visible from ground space, so if you're there, you have to rely on sign system, maps, or digital devices. However, display technology is developing, for example, projection mapping and digital signage. We can use these devices, instead of conventional tools. Then, I suggest method of ground-space-expression by making 360 merge photo image.
There are some Ground-space-expression method, for example, ground map for cell or floor in underground space, and side view for internal surface. Reduction or default image is available. We can choose expression methods and display space.
Next, considering underground space user, expression scene is considerable. There are 2 expression scenes, stand and sequence scene. Stand scene means that people see fixed landscape, but sequence scene, people are walking and seeing sequence landscape. We can choose 2 expression method, expression a space or expression along isle or underground space entirely. Here I show stand scene that is more imageable, because information is collected. I made merged 360 image, and considered ground-space-expression method.
Research target is Shibuya station, where is recently redeveloped. Target underground space is blow-by space of platform of Tokyo Metro Fukutoshin Line and Tokyu Toyoko Line, which is the deepest space in Shibuya. The depth of the platform is average 30m[1], this blow-by space is under of Meiji Street, and is just infront of Shibuya Hikarie, a big shopping building, referring to Yahoo Map. Then, projecting ground-space view on the cell of the blow-by space is considered. The skyway from Shibuya Hikarie is just above of Blow-by space, I displaced view point a little bit southern side. Then, expressing surround buildings, including the skyway and Shibuya station, and the top of Shibuya Hikarie, super wide view photo is desirable. But even if you have fish-eye camera, as there are many barrier for taking low angle photo, you wouldn't be able to take photo those building. And you can make 360 image by your own camera, but you can't enter center of roadway on your foot, Meiji street, only you can do is taking photo from curb side, then one side building is expressed big, the other side is small. Carside 360 view is needed, so I used Google Street View.
Eight parts capture of Google Street View 360 degree, horizontally close, from the same point, were taken. These parts are merged to an oblong image by image processing software. Next, I converted the image as rectangular coordinate to polar coordinate. The image became like daunt, but height was so reduced. Then, spherical correction was applied, the height was larger.
But the top of Shibuya Hikarie was lacked, so I repeated this method more high angle, and merged the image to the previous image. The 360 image was completed.
The 360 image itself has no space-image-ability. So I merged the completed image to the photo of the blow-by space. Shibuya Hikarie is role as a landmark and surround buildings make positional relationship clear, but there are some barrier. Especially, buses near Shibuya station are expressed too large. The too large buses make positional relationship complicated. Size balance have to be considered.
To aware space image for the user of underground space, detail of ground space is unnecessary, only high-image-ability expression is needed. We don't have to dwell on the real, we have to consider image-ability at the center, unnecessary detail have to be considered. We have to consider method of deleting noise and large balance.

 

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Keywords: Visualization, Sign System, Landscape, Underground Space, City Guide

 

図1　地上表現画像

Fig.1 Ground expression at Shibuya Station

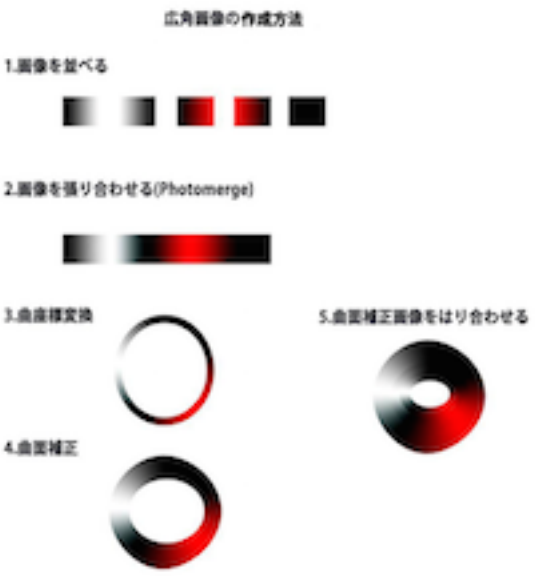


図2　画像作成手順

Fig.2 The order of processing

図3　実空間画像との合成

Fig.3 Merging to Real Space Image

 

# A Simulation Method for Visual Attention in Reading Illustrated Maps

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We present a novel approach of developing a visual attention movement analysis tool for illustrated maps by converting the common rules of visual attention movement defined in natural language into a mathematical model, which is an algorithm to extract a trajectory as a visual movement from multistory dynamic potential fields representing the distribution of visual attention within a single illustrated map. Our algorithm begins by composing a potential field as a combination of Gaussian kernels corresponding with graphic elements on a illustrated map. Because the symbolic attributes of these graphic elements and the relations between them generally lead the users to determine the order of reading graphic elements, the graphic elements compose multiple hierarchical networks and are classified into several layers, such as labels, mountains, and rivers, based on the knowledge of cartography so that these attributes and relations affect the dynamic change of potential fields. The algorithm then allows us to extract a visual attention movement on the illustrated map as the trajectory with area on the composed fields of a point moving along the valley of the potential fields. Finally, the feasibility of our approach is demonstrated by the comparison between the visual attention movements extracted by our implemented prototype system and those extracted by real users using an eye-tracker.

Keywords: Visual Attention, Map Reading, Simulation

 

# Rapid Prototyping of Map Collaging on Smartphones

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*Analogue mobile mapping* enable location-based services (LBS) on analogue map images on smartphones. It combines advantages of analogue maps and mobile mapping. However, it is inconvenient to make content for analogue mobile mapping, which make it difficult for rapid prototyping.
Rapid prototyping of analogue mobile mapping content is important to incent ordinary users to contribute content. This paper proposes a method of rapid prototyping of map collaging on smartphones.
*Map collaging* collages multiple analogue map images to provide LBS with rich topics of information. We divide map collaging content into three hierarchies: raw data, single geocoded map, and map collages.
*Raw data* is the data without explicit geo-information. Three kinds of raw data are used for map collaging: image, text, and audio. Raw data can be input with smartphone or imported from computer files.
A *single geocoded map* provides LBS with one analogue map image. Main blocks of functions of single geocoded map are: map browsing, positioning and directing, POI browsing, and dairy making.
Map browsing enables panning and zooming of an analogue map image. Map image browsing function needs a map image. Users can add map image by taking photo, pick from album, or import from raw images, and clip map image to remove margin parts. Users can also set the maximum and minimum scales of the map image.
Map images should be geocoded to enable positioning and directing. We apply polyline-based geocoding to ensure positioning accuracy. To make geocoding easy and fast, we integrate the editor part and browser part of the application to enable real time and progressive geocoding. Users can geocode progressively from parts to parts of the map image when they are travelling. Users can observe the positioning results of their current places and footprints immediately to adjust and revise geocoding. A trajectory managing and simulating function is added. Users can review their footprints, and can simulate virtual moving trajectory to test and revise geocoding.
POIs need to be registered to be viewed and searched. Positions of POI can be registered on map image or on base map. POIs registered on map image can be presented even if the map images are not yet geocoded. One kind of POI, e.g. public toilets, can be registered at many positions. When POIs are registered, their icons will be presented on the map image. Users can tap the icon to preview the POI or view details of the POI. If the map image is geocoded, a preview of a POI can be automatically shown when the user is near the POI.
Users can take photos, record audios and input texts to make travelling dairies. Icons dairy contents will be displayed on map images. Also, users' moving trajectories are recorded, and users can view and play their historical trajectories.
*Map collages* groups multiple maps to provide services with richer content and wider covering area. Two main functions of map collages are map collaging and map switching.
Single geocoded single maps will be collaged together, with consistent scale, direction and position relations among each other. Users can manage the map list of map collages by adding new maps from geocoded map list, remove maps from map collages, and rearrange orders of maps in map collages. The maps in map collages will be automatically collaged according to users' locations.
Triggers are used to automatically switch main map among maps in map collages. A trigger is a polyline or a polygon with each side linked to different geocoded maps. When user goes across the

 

border of a trigger, the main map of map collages will be changed accordingly.
Hierarchies of map collaging content enable ordinary uses to make simple content. It also enables cooperation of material-collectors and map geocoding experts to make high quality content.

Keywords: Rapid Prototyping, Map Collaging, Map Geocoding, Spatial Trigger, Location-based Service

 

# On the Buffer Zone around the Conservation Area

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To conserve heritages, a buffer zone has an important role. The buffer zone of the World Heritage is mentioned in the guidance of the world heritage treaty. In the description of the buffer zone, it has been transcribed several times, ‘a buffer zone is an area surrounding the nominated property which has complementary legal and/or customary restrictions placed on its use and development to give an added layer of protection to the property’.
However, we perceive various scenery, such as small space or large space. The buffer zone for the variety shaped heritage cannot necessarily set appropriately. It may be an example showing the problem of the buffer zone plainly. Off course we do not deny the present technique performed by these empirical technique, but if there are grounds for buffer zone setting more, we think that we have big influence for a future plan.
The purpose of this study is to construct the analyzing system to set appropriate buffer zone, particularly for the mountains where a buffer zone is set uniformly.
Specifically, we measure physical quantity based on not only the topography but also the vegetation. We carry out the laser survey and compare its result with the model analysis.
There are the studies that captured value of the forest for conservation from a macro viewpoint. In this study, we arrest the forest from the micro viewpoint. In particular, we analyze a close view capturing the state of the tree. We finally analyze the result in conjunction with a distant view. Based on a method to quantify value of the forest that we arrived as a conclusion, we will be able to suggest a method to set a new buffer zone.
In our previous studies, we modeled the vegetation that was distributed a lot over the conservation area, to quantify the view from the route, as a transmissible distance of gaze from the viewpoint, the “Transparency”. We performed the image analysis, and analyze the relations of both. In image analysis by the photographs, the ratio of the sky area in the photos was calculated. The direction photographing a camera is a horizontal direction for a prayer way. The eyes incidence angle set it in zero degree. The forty samples were analyzed. As a result, the adequate correlation is not appeared.
We carried out laser surveying in five places in the case study area. They were investigated at a place of the topography unlike different vegetation. The angle measurement is 6 second horizontally, 6 second vertically. The resolution (density of scan) is, as a spot size, 6 millimeters or less (1-40m), about 16mm (100m), and 1mm (the smallest point, distance: 20m). We analyzed of the largest visitation area, the ‘plantations of Japanese cedar and hinoki’.
As a result, we were able to get the useful knowledge on the occasion of the setting of the buffer zone. In this investigation, we conduct a similar investigation into much other vegetation. In addition, we have extracted the data of the illumination and the noise in case study area. We are going to obtain data of the setting the buffer zone, in reference to hearing and olfactory analysis. JSPS KAKENHI Grant Number 24603030 supported this work.

Keywords: buffer zone, conservation area, laser survey

 

*On the Bicycle Network in Osaka City*

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*In recent years, in the Osaka City has been an increase in bicycle users every year.For reasons such as the improvement of the bicycle of performance, economic and health thinking, bicycle Tsukinisuto to be used in commuting has increased.In recent years, the people to be used in a holiday to enjoy the cycling has increased.However, it includes issues such as an increase in the growth and abandoned bicycle accidents.The development of the bicycle network in the country and local governments have been made gradually.Domestic bicycle network are vulnerable compared with foreign countries.In the future, I will consider the necessary challenges to development in to try to match the route selection characteristics and the travel environment.In the current urban space, cycling roads are only one part, the bicycle are not developed enough driving environment.In addition, it is difficult to pass bacause there is the illegal parking in the cycling roads.Therefore, I identify the need for the maintenance points.I focus on the characteristics of the road structure and route selection.As a results, I clarify the problems of the road network.In addition, it is an object to obtain basic data necessary for cycling roads maintenance.It performs a clarify of the traveling environment by using data such as the road gradient or bicycle accident, to extract a place that has a problem.Also, I will clarify the route selected by the survey in bicycle rental.And, I will conprehend the actual situation of the traveling environment in that we try to fit a variety of factors.In this study, I understood the characteristic of the road incline of Osaka city, and I figured that a steep road existed only in around Uemachi plateau. I clarified accident distribution using the data of the bicycle accident to clarify safety of the bicycle run environment. I clarified a characteristic of the course choice by superimposing the course of the rent-a-bicycle user on a map. Maintenance of the way for exclusive use of the bicycle of Osaka city is not enough. Thus, it is necessary for us to think about measures including road maintenance technique.*

Keywords: Bicycle, Route Selection, Network

 

# Analysis on the Image of the Street Elements

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In recent years, People request in Japan has changed from Quantity sufficiency to Qualitative sufficiency. Thus, it has been a growing interest in the landscape. Landscape Act was enacted in 2004. Landscape is a regulation that targets the subjective beauty. Therefore regulation is difficult and many of the regulations that require the opinions of experts. In particular, restrictions on the form design are difficult to provide clear limitations. Similarly, it is popular that identify psychological image spaces by psychological experiments or comprehend spaces by quantification. Psychological experiments are not suitable for landscape regulations to require the objective criteria. It is necessary for us to identify the space from the objectively obtainable information from the background is need.
In this study, the authors comprehend quantitatively the shape information of streetscape, and we aims at visualizing. The shape information is that the shape group which is combination of discrete shapes and has a value such as characters and pictures.
Thus far, designers consider the shape information such as beautiful and attractive with feeling. Quantification of the shape information have been attempted, by the golden ratio. There is a possibility that “Complexity” is main cause of similarity and beauty among others. Therefore, we obtain clue to identify the landscape structure by quantifying the shape information “Complexity” of the street landscape. The authors extract of the shape information, and it analyzes the complexity by fractal dimension analysis. By the analysis, we would see the clues to be objectively manipulate the form design of the city that have been constructed subjectively.
The authors focused on the shape information of the streetscape and quantitatively grasp the shape information from objectively information that can be easy to obtain information. The authors showed the possibility of to grasp characteristics of the streetscape by the analysis of the complexity in appearances. The authors grasped the shape information of streetscape by extracting the complexity of the spaces.
The authors show the shape information showing a possibility of a clue that constitutes the shape information of streetscape by visualizing the shape information. In the future, it is necessary to examine the relationship of structure of the shape information and psychologically image.

Keywords: urban space, street scape, urban image

 