Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

MTT37-P01 Room:Convention Hall Time:May 21 18:15-19:30

Location-based Learning with Diverse Maps Applying Gamification Strategies

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1. Location-based learning and gamification

Location-based Learning is a type of knowledge transfer enabled by sensors responding to the actions of a user at a specific location in space and time to create a situated learning experience. Its quick development is based on the global proliferation of location-aware devices like smartphones and LBS. The learning is in a highly mobile context, and its content is highly contextual and immediately relevant to user's physical location. As some products already appear, reports show that the global market is growing quickly.

In designing such kind of applications, gamification strategy is often applied. Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate actions, promote learning, and solve problems. It is the idea of thinking about an everyday experience like jogging or running and converting it into an activity that has elements of competition, cooperation, exploration and storytelling. So that an attractive system can be created, in which people want to invest brain share, time and energy. Stamp rally can be considered as a close example in daily life.

We insist that learning is not only in the progress of browsing content or "playing games", but also should be in creating content or "making games" by the users themselves.

2. Using diverse maps instead of commercial web mappings

Current location-based learning applications usually use commercial Web mappings as base map. Those maps are accurate, convenient and globally available, but they are designed for generic and multiple purposes, but without emphasis and diversities. On the other hand, there are rich resources of existing diverse maps in printed medias, such as illustrated maps in textbooks, guide books, magazines, pamphlets and so on. These maps are well designed for specific themes and are more attractive, therefore more suitable for knowledge acquisition. However, they are often distorted, as a result of exaggeration, simplification and decoration, which will bring difficulty for positioning.

Our proposed approach is called POI-based inter-georeference. We simply use points of interest (POI) as reference points. If we have got the coordinates of POIs both in the real world and in the map images, then we can locate our current position obtained from GPS to the map images by making a similarity transform with the nearest 2 POIs. Some analysis has been made on the error of the method. The results show that, the error become larger when the current position is far from the POIs or the line of POIs; and the error is acceptable when the current position is near the POIs or along the line of POIs.

3. Design of framework and development of experimental system "Manpo"

The approach above enables the design of structure of the framework. It uses multiple geo-referenced illustrated maps for particular areas, on which multiple POIs are located, and link to multimedia content. Location of user is considered to be the input to invoke content.

We have developed an experimental system on Apple Inc.'s iOS platform with the name Manpo. It has both browsing and editing functions. With Manpo, illustrated map can be imported by image or camera, POIs and medias can be added and edited by simple steps. Users can appreciate the created content in the real world, with the assistant of GPS to show their locations and trajectories on the maps. Maps and POIs are interactive both by users' operations and their actions in the real world.

We have made content and experiments for walking tours in many places, including Kashiwa, Kawagoe and Kesennuma in Japan, and also Columbus, Ohio in the USA and Munich in Germany. An iPhone App "UT Kashiwa Rally" using the same approach was made for the Open Campus event of the Kashiwa Campus of the University of Tokyo in October 2012.

We hope our approach can contribute as one solution to enable diverse maps in our latest mobile devices and innovate location-based services.

Keywords: Location-based Learning, Gamification, Illustrated Map, Ubiquitous Mapping

Japan Geoscience Union Meeting 2013
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Proposal of Mobile Geotagging on Digital Audios for Sharing Information of Fieldwork

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Visual information with text and photos is the mainstream for sharing place-related information with mobile location-based service. The visual information, however, is unfamiliar and unsafely with fieldwork, especially in streets, because its graphical user interface compels outdoor users to input and read much text. We think that recording digital audios is hands-free and familiar with fieldwork. Most of the digital audios, however, are not related with maps, because methods of geo-tagged audios are not established.

We have developed a mobile application that provides functions of recording digital audio and supporting manual geo-tagged audios. Furthermore, we have evaluated methods for mobile geotagging with digital audios on points and routes of maps. We propose that our mobile application and methods for geotagging bring opportunities for sharing rich knowledge with place-related digital audio books and digital audio archives for fieldwork.

fig. A mobile application for making geotagged digital audios "Map image from Google Inc"

Keywords: digital audio, geotag, user-generated content, fieldwork

Japan Geoscience Union Meeting 2013
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Managing private spatio-temporal information and story based spatio-temporal content

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Most of your experiences in daily life are related to a location and a date. User generated content like Blogs and SNSs come into wide use, and mobile devices what utilize GPS, acceleration sensor, other sensors and networking function become popular. So you can record private information related to current location and date with using these environment. But most of these systems display only your information items are lined up in order of making date. When a person transmits a series of information items to others, it constructs a story using these items for efficient communication. Although a story is mainly constructed like a chronological table, if it has geographical representation on a map, it will be more understandable story.

We developed a new location information system with user defined maps and chronological table. It provides users with an environment for recording their own spatio-temporal information, and they can create and publish story based spatio-temporal content using their own information. If you express an old thing on current map, the map does not have appropriate information because geographical space is changed with time. Then our system utilize user own images for background maps, and it makes links between current maps and user defined maps using shared information items on both maps. On the pTalk, users can create story based spatio-temporal content for publishing private spatio-temporal information items. Appropriate organization of private information is a method for publishing safely and understandable.

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Visualization of the diversity of the trees in a city park and a street tree at Ginza area

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In recent years, it is an important subject how to live with various environmental issues such as global warming. Tokyo was blessed with a rich ecosystem before modern industrialization. But by the extension of urbanized area, the green space was changed into a city park or a street tree, which is difficult to maintain ecosystem existed before. Diversity of trees is essential for the visualization of urban green space structure.

Chuo-ku in Tokyo has made a map of green coverage following the green survey in 2005. This map that shows the green space morphology is usable for open space planning. But as for the map cannot show the internal structure of vegetation, it is desirable to include the distribution of vegetation.

This study investigates the vegetation of city parks and street trees at Ginza area in Chuo-ku, and described every distribution of trees inside the green space as a thematic map.

Keywords: Ginza, urban green space, spatial structure, diversity of trees, visualization

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Changing and confusing housing landscape in Japan

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Japanese cityscapes are often disorderly changing and diverse because of rapid urban development and economic growth after the World War II. Lack of landscape knowledge and late legal preparation are one of the main reasons. Housing landscapes has the same problem. In this article, housing landscapes means housing estates landscape. Today, it becomes confusing conditions because of new techniques and materials, people can build western or modern style houses from a variety of choices. And also traditional Japanese style houses are remained. Built houses show a marked tendency toward western, modern and simplistic style compared to Japanese traditional style. This resulted in diversified and confusing housing landscape in Japan.

In Japan, there are many researches on house landscapes by the house styles. However, not many researches are done to study the changing colors of house landscapes or the awareness of residents whom are responsible for the changing landscapes. Furthermore, in some regions with unique historical landscapes, residents feel apprehensive of the change of landscape but could not think of an effective way to avoid it, thus making the change of landscapes an unavoidable problem.

I chose Higashi-Hiroshima City of Hiroshima Prefecture for this study. Higashi-Hiroshima locates in the basin of hilly region. The city had a unique landscape of houses with reddish brown roof shingles and white walls scattered in rural districts. However, increasing in population and houses due to the relocation of some universities and industrial buildings, housing landscape is changing and resulted in the ruin of regional landscape by various housing styles. This study is analyze the changing of house landscapes from the view point of housing styles and housing wall colors in housing estates over the years. Moreover, I will try to illustrate investigation results.

Keywords: housing landscapes

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Global Map Version 2 and accuracy verification

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Global Map is fundamental geospatial information datasets composed of eight kinds of thematic information based on consistent specifications. It is developed under international cooperation of respective National Mapping Organizations around the world. An analysis using Global Map data combined with other useful geospatial information enables us to understand the present status of human activities which affect natural activities in various ways as well as the status of forest distribution and the present status of land cover. This presentation introduces the global version of Global Map Version 2 completed in 2012 and reports the result of accuracy verification on Global Map conducted by Geospatial Information Authority of Japan which serves as the secretariat of International Steering Committee for Global Mapping.

Keywords: Global Map, geospatial information, Land Cover, Percent Tree Cover

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Activities of Survey of Bangladesh for Geodetic Works and Services towards Digital Bangladesh

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Geodetic Survey in Bangladesh was carried out with reference to old Datum until 1990. Survey of Bangladesh (SOB, website: http://www.sob.gov.bd), the National Mapping Agency of Bangladesh, established a Tidal Observation Station (1993), Horizontal (1994) and Vertical (1994) Datum under a JICA funded project "Study on Geodetic Survey in the People's Republic of Bangladesh". First Order Geodetic Control (Horizontal and Vertical) Network was carried out in two phases (1993-95 and 2000-03) under JICA funded project. SOB also carried out network adjustment of First Order Geodetic Control (Horizontal and Vertical) Network. Densification of Geodetic Control Points by Second Order Geodetic Control (Horizontal and Vertical) Network is being carried out since 2007 covering whole Bangladesh. Present density of Horizontal Control Points is about ten kilometers totaling nine hundred fifty. Vertical Control Points are laid for a leveling route length of sixteen thousand kilometers along major road systems of Bangladesh with a density of five kilometers totaling eighteen hundred numbers.

Horizontal Datum of Bangladesh was fixed in ITRF-1992 through seven days of measurement with four IGS stations: Tsukuba (Japan), Wettzell (Germany), Hartebeesthoek (South Africa) and Yaragadee (Australia). SOB plans to switch to ITRF-2008 as soon as possible and adjustments of countrywide Horizontal Network will be done subsequently.

Tide data is recorded for every six second using fuse type gauge for about last nineteen years. 18.6 years of data in hand is being used to fix Mean Sea Level addressing Lunar and Celestial effects; adjustments of countrywide Vertical Network will be done subsequently. Leveling surveys across big rivers and inside the mangrove coastal forest of Sundarban were very challenging experiences. SOB Tidal Station on the coast of Bay of Bangladesh is located at Chittagong on the confluence of River Karnafuli and this is recognized as the thirty sixth Global Sea Level Observation Stations under Indian Ocean Tsunami Early Warning System and having satellite link to Intergovernmental Oceanographic Commission (IOC).

A Geoid Undulation Map for Bangladesh is developed with one hundred eighty five three dimensional points; orthometric height accuracy is 10-20 centimeter. With judicious planning and continuous commitment, the number of three dimensional points rose to five hundred sixteen in recent time: Geoid Undulation Map is being revised. Benefits of this is outstanding as survey and mapping works with lower accuracy would be cost effective since most of the areas of Bangladesh belong to flat plains delta of Ganges, Brahammaputra and Meghna.

Six Global Navigation Satellite System-Continuously Operating Reference Stations (GNSS CORS) were established to provide hundred kilometer countrywide coverage for real-time mapping and navigation with GPRS transmission; SOB plans for establishing additional sixty GNSS CORS to provide effective GNSS CORS Network Correction to the RTK users with 20-30 kilometer coverage. The present GNSS CORS is on operation since December 2011 (To Access: http://202.53.170.98) and already being shared. The very introduction of GNSS CORS in Bangladesh is expected to boost up business for GPS enabled systems, so as in Geological and Geodetic Sciences.

SOB plans for introducing terrestrial Gravity and Magnetic Surveys to prepare Gravity Anomaly Chart and Magnetic Declination Chart for Bangladesh.

Presently SOB is in cooperation and association with many international organizations like GGIM-AP, Global Map, IOC, PCGIAP and IGS.

Keywords: geodetic survey, geodetic control point, tide data, geoid undulation map, GNSS CORS, Survey of Bangladesh

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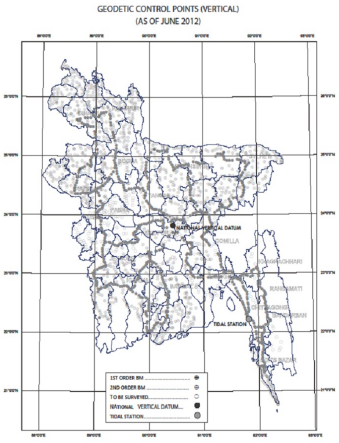

Japan Geoscience Union Meeting 2013
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Proposal for revision of the certification system for surveyor and assistant surveyor

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In this presentation I will propose the revision of the certification system for surveyor and assistant surveyor, based on the GSI's report (http://www.gsi.go.jp/common/000054020.pdf).

Keywords: surveyor, assistant surveyor

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Visualization of tsunami behavior for evacuation against tsunami

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The consciousness of people to tsunamis increases by 2011 Tohoku tsunami and, coming tsunami along Nankai Trough. Currently, evacuation routes and the place to refuge in the event of a tsunami are decided by estimated tsunami inundation areas. It is necessary to plan how to evacuate more reasonably by considering tsunami behavior, because as people evacuate from tsunami, so the tsunami inundation area is wider in actual fact. We simulated tsunami numerically and tried to visualize the tsunami behavior that it is useful to plan to evacuate from tsunami.

In the numerical simulation, we simulated 2011 Tohoku tsunami and focused on tsunami that reached and ran up in the coastal area of Miyagi. An initial condition was decided by the deformation of seabed ground calculated by using the equations of Okada(1985) from the fault model of Tohoku university (Imamura et.al., version1.1). The propagation in the offshore and the inundation on land were calculated using non-linear long-wave equation with Staggered grid and Leap-Frog Scheme. A grid size of bathymetric and topographic datasets of each region were 405,135,45,15,5m. A time interval of calculation was 0.1 second.

As a simple method to visualize tsunami behavior, we drew inundation area and inundation depth, flow velocity, and set some drawings to compare these parameters each time. This visualization is useful to understand easily tsunami behavior. However, it is difficult to find important numerical value because it is necessary to compare drawings of each time.

Therefore, we try to draw a distribution of maximum inundation depth at each grid. We also try to draw a distribution of tsunami arrival time. A distribution of maximum inundation depth shows height of arrival tsunami at tsunami shelter. If you see the drawing, you should understand it necessary to evacuate to place higher than tsunami height. A distribution of tsunami arrival time should show you evacuation route which you arrive to the place to refuge earlier than tsunami.

It is considered that these methods to visualize tsunami behavior are useful to decide evacuation routes and the place to refuge from tsunami and to evacuate more reasonably against coming tsunami.

Reference

Imamura et al.(2011),simulation of tsunami by The 2011 off the Pacific coast of Tohoku Earthquake with Tohoku university model(version1.1),online<www.tsunami.civil.tohoku.ac.jp/hokusai3/J/events/tohoku_2011/model/dcrc_ver1.1_111107.pdf>

Okada,Y.(1985),Surface deformation due to shear and tensile faults in a half-space.Bull.Seism.Soc.Am.,75,1135-1154.

Keywords: Tsunami behavior, Visualization, Evacuation

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Flood hazard map and map design

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Hazard maps gather attention as a tool for reducing the damage of disaster. This study is considered the map design of flood hazard map on the view of the feature and failure of the role of hazard map. The results are below; 1 there are a lot of maps which have inadequate scale and legend, 2 some base maps have ambiguous expression, 3 the map scale of some maps has inadequate scale for the map objectives, 4 in many cases, the map producers don’t assume the usage of hazard maps in ordinary times, 5 map producers are not take up sufficient opinion from residents. 6 they don’t use adequate visual variables for the quality of the data. Map producers should improve these failures.

Keywords: hazard map, map design, scale, resident

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Revealing Tourism Space Territoriality Using GIS from Perspectives on Critical Cartography

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Introduction

Researchers came to realize that maps are not only a tool to convey geographical information, but are a social construct that deliver the meaning, context & historical background of the contents hereinafter referred to as critical cartography to describe the approach.

To decipher the prejudices & preconceptions, critical cartographers have owed a lot to qualitative methods rather than quantitative ones. In the present study, the author intends to quantitatively visualize & analyze tourist maps by using GIS to reveal tourism space territoriality, in order to pave a way for quantitative methods.

Target area

Tomonoura, a small port town being at the center of a nationwide controversy over the enforcement of a construction of the cross-linked road bridge project by the local governments. Tomonoura was caught in a dilemma between the national voice of opposition & local residents hope of its opening.

Because this town was once ruled by samurai, the road network contains many cranks for security reason. As the road width is also too narrow for cars, it has caused delays in fire ambulance service delays as well as traffic jams. On the other hand, many old houses still remain, which attracts tourists. Consequently, Tomonoura sways over whether to conserve scenery with respect to its historical value or to cross-link the roads to secure the safety & convenience of local residents' daily lives.

Tomonoura roughly consists of three districts. "Tomo" located in the midst shore of the harbor, "Hira" in the southwest, and "Hara" in the north. The cross-linking bridge is located in Tomo, just around the corner from its aesthetic townscape zone. Due to the disparity of such geographic conditions, residents of these areas possess different values toward the same location, & therefore have deepen the conflict.

Purpose and methods

When mapmakers intend to represent a place as a tourist area they likely to neglect the living environment. Therefore, by investigating the degree of coincidence in the drawn tourist map areas, we can clarify whether there is a certain inter-subjective agreement among the mapmakers over tourism space in Tomonoura or not.

The analyzing process is as follows. First, 11 tourist maps and 4 erect billboards/plates and web maps were collected and captured into electronic image for the analysis. Then, by using geo-referencing that is mounted on the GIS, all digitalized maps & billboards/plates were matched respectively to the prepared base map. Almost all tourist maps were distortion-free & successfully matched without strict geometric corrections.

Results and discussion

The layered tourism space is displayed Fig.1. The shading value shows representation density, therefore the darker colors demonstrate more tourist maps include the area in the scope of tourism space. It is apparent that there is an overwhelmingly high density area surrounding Tomo. In contrast, Hira is neglected by all from their depictions.

Then, by using directional distribution implemented in GIS, a standard deviational ellipse was calculated through the use of gravity centers of each digital image. Again, the gravity centers are concentrated in around about 300m from Tomo castle ruin, the center of Tomo district. The ellipse revealed the sphere of tourism space in Tomonoura is almost exclusively in the range of only 800 square meters centered in Tomo. Although the remaining places also belong to the same unit of local administration, they were omitted and neglected from Tomonoura when the mapmakers put out the tourism information on the maps for visitors.

Results demonstrate that it is crucial to consider the disparity of geographical conditions as well as the value-based variance among the residents. Any policy on tourism-oriented regional development cannot be supported by residents without considering the view of neglected people who reside in erased areas in the tourist maps drawn by tourist oriented industries.

Keywords: Critical cartography, Geographic information system, Tourism space territoriality, GEO-Body, Georeference, Standard deviational ellipse

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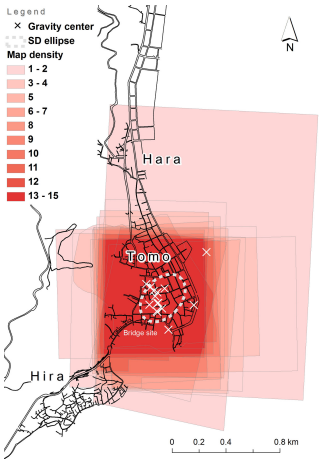

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Creating Database of Fuji-Duka and Map Expression using high precision DEM

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There are ”Fuji-Duka” which imitated Mt. Fuji as artificial terrain.
It is assumed that the construction continued from the second half of the 1700s to the 1960s, and although the part is still existing on Kanto. But the recognition may be low, and the distributive characteristics has some questions.
Then, we have mapped the position of the Fuji-Duka in Tokyo, and started creating database the sizes (a diameter, relative height, etc.) measured by the field survey and the aerial photograph, and other attributes.
Moreover, we have verified possibility of map expression using high precision DEM data (2m grid).

Although we recognized that the number of Fuji-Duka is dozens to 100 in Tokyo, we can not found out the causal relationship between distribution and geographical characteristics.
On the other hand, if the Fuji-Duka have over 5m in relative height and over 20m in diameter, it may be able to read quite clearly by relief map made from 2m DEM. It’s proved the validity of the airplane loading type laser scanner.

Keywords: Fuji-Duka, high precision DEM, Database

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Mapping the supply-demand gap in childcare services with GIS: A case study in Naha City, Okinawa

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The aim of this study is to visualize the spatial pattern of the gap between childcare supply and demand on a map. Study area is Naha City where the number of children awaiting enrollment in licensed childcare centers is exceptionally large for local cities. To map the supply-demand gap with geographic information systems, we calculated difference between supply and demand densities after converting the vector data concerning childcare supply from the public sector and pre-school children into raster data using kernel density estimation. The result of the analysis showed a spatial imbalance between childcare supply and demand. The map that added the distribution of unlicensed childcare centers proved that the shortage of the childcare supply by the public sector is spatially complemented by the services by the private sector.

Keywords: childcare services, supply-demand gap, kernel density estimation, raster calculation, Naha City

Japan Geoscience Union Meeting 2013
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Geovisualization of Endemic Malaria in the Sakishima Islands in the First Half of the 20th Century

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In the Sakishima Islands in the first half of the 20th century, 1,000 to 2,000 malarial patients were reported in every year. According to the old research findings, there was much endemic malaria in the Sakishima islands in the island of continentality or volcanic island, and it was distributed over the area where is a vertical interval of land and the basin system network progressed.

This research restored the geographical environment of endemic malaria in the Sakishima Islands in the first of the 20th century combining high resolution DEM, old topographic maps and historical records, and performed consideration from a viewpoint of landform, land use and settlement form. We studied the Miyako Islands, the Ishigaki Islands and the Iriomote Islands. As a results, we compare the settlement form and geographical environment of the Islands.

Keywords: the Sakishima Islands, Endemic Malaria, Geographical Environment, Geovisualization