

Spatial Information Knowledge System (SPINKS)

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Abstract

Korea Land Corporation introduced diverse methods and process such as GIS to create efficiency in service of housing developments of public sector over 40 years. SPINKS was created for its unique service such as analyzing development reserved land and proposed site, support requital service after authorizing the area, support land saving service for land banking and support past business area management. ArcGIS Server 9.2 based SDW was linked and utilized for these services.

The project was promoted for task holders with professional knowledge of GIS to embody Geo Processing web to easily analyze without collecting any database for anyone at anywhere. Concerning utilization of user participation, this was promoted as a business model based on ArcGIS Server.

Conception

The concept of this reclamation is first, a system for whoever, wherever, whenever following public corporation easily utilize and approach. Second, an easy utilizable system without any general idea of GIS. Third, a system reducing manpower, time and cost by innovating the task process.

Introduction

Korea Land Corporation was founded in 1975 and contributed the economic growth of Korea by acquiring, managing and developing land. Supplying and managing land efficiently is the essential service from Korea Land Corporation's history.

Korea Land Corporation has been utilizing GIS system since 20 years for acquiring and managing massive land. It was always the question to create a convenient system for anyone on the point of view of developing people as a generalist rather than a specialist. Rapid spread of web in general on twenty century was the issue for Korea Land Corporation where head office had to handle task with regional office as an organic whole.

There are three main purposes in this project out of diverse primary responsibilities at Korea Land Corporation. First is to analyze the reserved land as housing development. Second is to make a draft research for requital service of service area. Third is to manage service area as land managing sector. For the success of these three purposes following had to be examined. First, service process to analyze web based space. Second, range and factor of process analyzing. Third, ArcGIS Server had to be clearly understood as well.

This project was processed generally in 4 stages. First stage is to draw the major service analysis and analysis model of public corporation by depth interview. Second stage lie emphasis on constructing the data mart utilizing data of SDW(Spatial Data Warehouse) owned by public corporation and SPINKS to let the system analysis plot in country base. Third stage lie emphasis on server control and user's practical use to reflect user's convenience and the reality of the service. On the fourth stage processed the project by researching the usage of Mash-up service in Google and the new task model and drew the developed phase.

Preliminary Needs Assessment

The purpose of network environment for SPINKS is to draw the task service utilizing SDW data. The architecture is composed to physically use ArcSDE and RDBMS of SDW and set a separate web server to service many users on web without buying additional ArcInfo license.

The result of using SPINKS was built by choosing the data mart section of SDW and giving a summary. The F&Q of the users were to practically use and analysis by the interplay of the file they use and web.

Phase 1: Full analysis and model draw for GIS function draw of primary duties at public corporation

Interview

This project was executed in 4 stages of interview procedures for full analysis of tasks and acceptance of various opinions. First stage was collecting the whole quantity of documentation data to operate process by unit service. Second stage was analyzing the

function base reference of the system possessed by related organization and draw similar function. Third stage was to choose the data of the interview subject and reflect the minute request by separating pre interview and depth interview. The interviewer was 56 people and time given per person was 40 min. Fourth stage was to rearrange the interview result and Draw the requests by finishing design and menu construction of the interface. Verification was executed through the drawn results at the announcement meeting. Function factor was usually drawn by brainstorming.

Database organization

Database of this project utilized SDW of Korea land Corporation. SDW of Korea land Corporation is servicing by recruiting ArcSDE, ArcIMS and Oracle. Original copy gets renewed by period through ETT. Main SDW hold data is mainly city-planning data of Korea, intellectual data and diverse law-stabilized data. Consisted in 125 layers of major and accommodate more than 100 metadata list. Basic city-planning image was constructed as an additional construct data. Land use information including housing reserved development area was additionally constructed and consisted as data mart. It was loaded and included as subject of service (fig 1. ArcCatalog SDW Feature Classes)

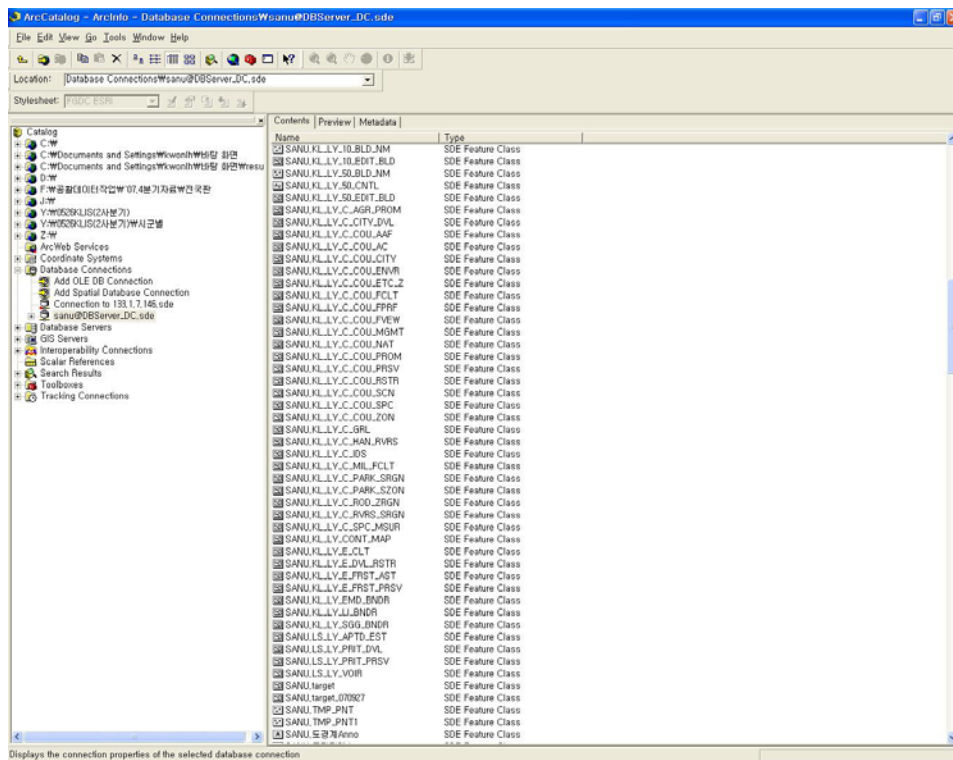


fig. 1. ArcCatalog SDW Feature Classes

Consideration of Function and User of the System

SPINKS system users were separated into simple users and analysis users, and organized to give separate authority by the ID approaching the system.

Simple users utilize Pooled method recruited service and analysis users utilize Non-Pooled method system. Analysis service concurrent users are limited to 40 people. The Concurrent limitation is applied by the composition of hardware of ESRI System Strategy and DPM.

Creating Service Model

Utilizing analysis module was usually the main purpose in SPINKS which made applying Geoprocessing concept to the task model a key to success. Interview base request was applied to functionality matrix of ArcGIS Server and executed possibility of execution and technical analysis. Including basic functions, main functions of Core Analysis was included. Among Core Analysis functions such as Clip, Intersect, Union, Erase and Near was linked and utilized with GIS web service. Domain under Web Editing Application Functionality was accommodated to be utilized as user definition area for analysis.

14 unit task model was made and organized to operate from SPINKS server to draw a conclusion. For example, for specific physical analysis, made a raster data (5m*5m) and loaded in a server and used it to analysis SHP file user sent to server or set public administration boundary. By the standard of slope and DEM value that user define utilize reclassify and follow space operation and draw conclusion. User can not only check the final product by web but also download by separate *.shp geo reference.

(fig. 2 Physical specific analysis model)

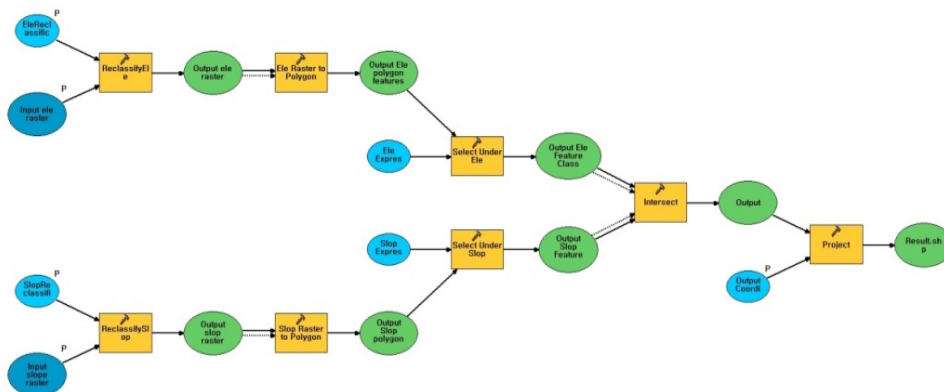


fig. 2 Physical specific analysis processing model

Phase II : Full unit task model embodiment (intro of some functions)

Analysis of development possible land

Analysis of development reserved land starts by choosing administration section consisted by city/ county/ district unit. User input standard of slope and DEM to extract development reserved land. Utilize administration area vector data and raster data and extract by clipping district that meet the condition. Extracted first result is saved in temporary folder of the system, user can utilize this by downloading in *.zip.

User choose created thematic map as Habitat and national park which is uninfluenced by environmental effect factor and potential development area. After selecting and clipping, second output comes to conclusion. User can also download and utilize the output. Second output does not have a shape of square which is an advantage for land development as it analysis diverse law based land regulation related space data. Make up diverse proposed group by crowding through clustering the standard of area and close by distance.

Finish analyzing by registering standard satisfying area among diverse proposed group as the development reserved land.

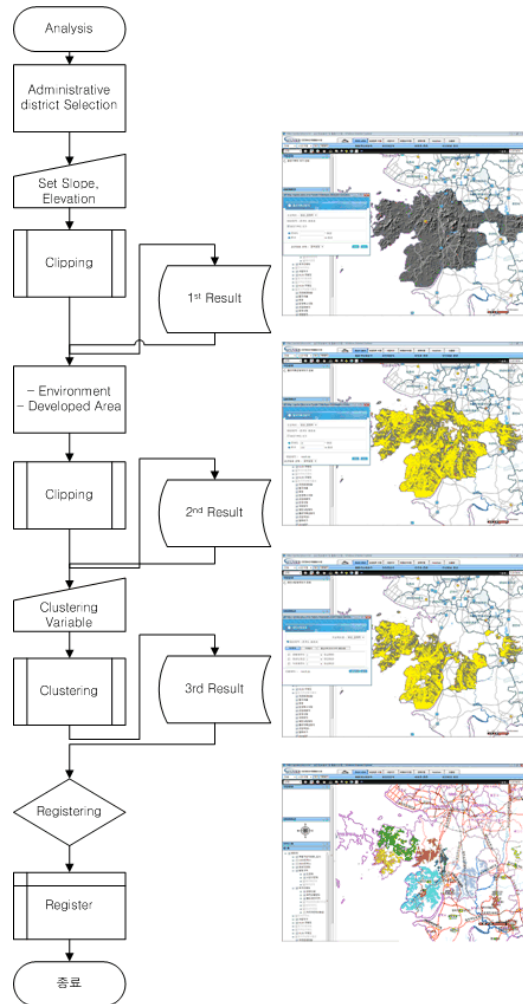


fig. 3 Analysis of development reserved land

Analysis of proposed site

The purpose of analyzing proposed site is to analyze by individual parcel which is different from development reserved land. User use two ways as the subject is a small scaled area.

One is to let the user make the boundary of proposed site on web, another is to let the user upload the created file in PC or workstation on the server and analyze it. When user update PC created *.SHP file on the server, send them by abstracting them in formatting into *.ZIP file. Extract all individual parcel by the standard of sent or created boundary. Extract parcel in area within the boundary and select it as a subject for analysis.

Execute separate analysis by physical trait analysis, analysis of soil status, analysis of land value, environment related regulation analysis, created development reserved land and traffic, analysis of distance between public institution.

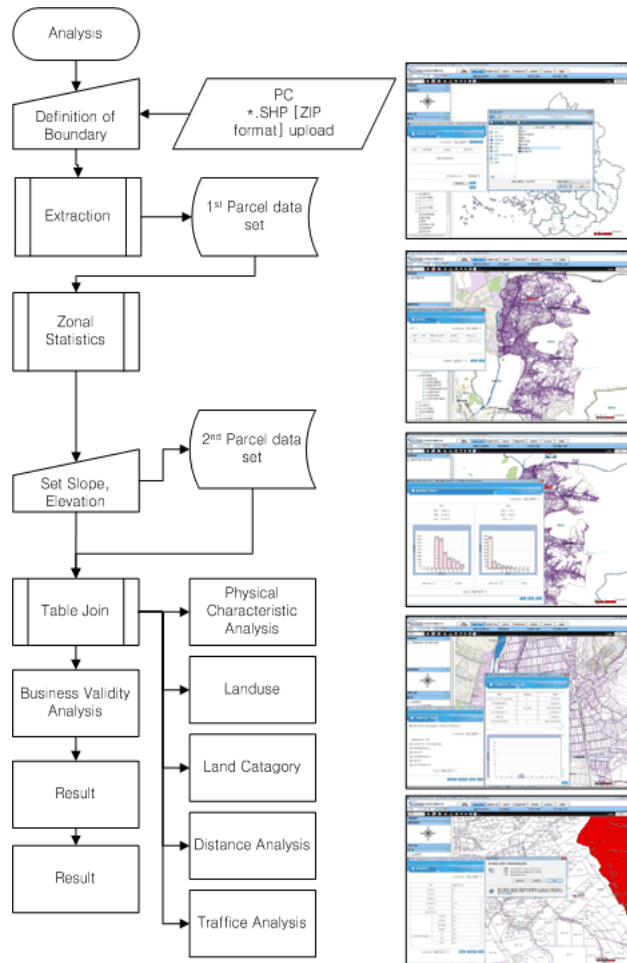


fig. 3 Proposed site Analysis Process

Physical trait analysis use Zonal Statistics for individual parcel and save the output of the analysis. Soil status express through individual vacant land value data and Table Join. Created development reserved area, traffic and distance between public institution is not applied as analysis based on parcel. Calculate distance between the boundary of proposed site area or created boundary area to the area subjected for analysis in shortest distance. User can check the output by web and download the file by *.XLS form.

Phase III : Overcoming Technical Condition Matter

Overcoming the dynamic layer usage

General developing method using GP Service only support ArcGIS Server data source and publish the tool of toolbox and model as geoprocessing service. This is possible by using `ServerContextInfo.ServerContext` Property of `GeoprocessingResourceLocal` Class and approach to Server Context. But can only set first registered layer of GP Service as a variable of `GeoProcessing` and can't use it as a variable of GP Service Input for `Feature Class`. In complicated `GeoProcessing` generally use the variable of `FeatureClass` created in the middle. In this case add the dynamic layer of map service and added layer utilize Input of GP Service but not reflect dynamically at GP Service.

This problem was solved by loading Dynamic Layer in GP Service. (fig. 5 Dynamic Layer GP Service) The source is as below, later If the Input Type is `FeatureClass` Got string as a input variable of Python used it in Geo Processing by Choosing the way and name of `FeatureClass`.

```
# Import system modules
import sys, string, os, arcgisscripting

# Create the Geoprocessor object
gp = arcgisscripting.create()
gp.overwriteoutput = 1

# Get the path parameter
GPInputFClass = sys.argv[2] #something like: "C:WWDataWWUSA.gdbWW Lakes"
OutputLayer = "GPInputFeatures" #Local variable
gp.AddMessage("Creating layer from " + GPInputFClass + " ...")

# Use "Make Feature Layer" Tool (in Data Management toolbox) ...
gp.MakeFeatureLayer_management(GPInputFClass, OutputLayer)

# Set the output parameter (layer)
gp.SetParameterAsText(0, OutputLayer)
```

fig. 5 Dynamic Layer GP Service

Future

Blending analysis base web application

By using SPINKS, Korea Land Corporation is able to utilize it as a tool to extract objective and metric analysis result by placing GIS as an essential duty. In Korea, diverse institutions executed developing and creating data of system related to GIS. Korea Land Corporation is considering service of result and procedure of analysis to other institutions as well. Intranet base is developed for the present but trying to consist simple system that service up to space information distribution including diverse field by applying 2.0 web concept as an alternative plan. The result of analysis, ownerless contents can be easily accessed by mash-up service of Google.

Future Plan

SPINKS succeeded in realizing task based analysis system as a first goal of Web application. Planning to add 2D and 3D part analysis module such as raster analysis grafted with data such as Scene analysis and population census and embodying in SPINKS is the second goal. Our project team in future organization of system is to increase SOW of row and extract service optimization for additional development of user increase and analysis logic and think of better solutions for system architecture. To show more flexible attitude by analysis service pattern will induce diversity in service organization to support diverse clients by service type.

Conclusion

SPINKS was developed mainly on making the object of present individual service analysis. It could suggest a solution of individual service analysis by accepting and utilizing diverse type of data from massive data community. It also created a sensation in Korea by web base analysis base solution by finishing analysis logic utilizing ArcGIS Server Geo-processing and Python. For solving some instability in certain parts and to let analysis service of ArcGIS Server meet fluent system management, diverse experiments on analyzing service of scenarios is essential.

References

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