COM12

Faculty of Science
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Easy Map: A Map System Indicating Points of Interest surrounding the coordinates specified in the form of image

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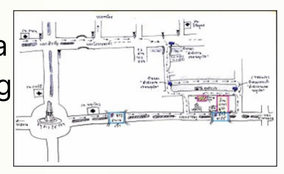
ABSTRACT

The map systems showing points of interest (POI) play an important role in transportation and travel. Due to the high volumes of POIs and road lines, it is useful for analysis, but showing all available data is a barrier to understanding the map. The objective of this research is to create an easy-to-understand map system showing the surrounding POI of a specified coordinate location, or hereinafter called Easy Map, using geographic data from Nostra to select prominent points of interest based on the information from Fundamental Geographic Data Set (FGDS) and geospatial experts. The development began with the use of class interval for classifying urban and suburban areas, where map data was taken (500 m x 500 m), each of which was grouped using the K-means clustering method into 4 groups according to the density level of POI: (1) Least (2) Low (3) Medium and (4) Most dense. The convolution method was used to adjust the clustering according to the density of the neighboring areas to be related in the same way. The data that has been processed is then stored in the map server as a web map service, which is then used for geo-processing to define the map display boundary around the user-specified coordinates. The results showed that the mapping process took an average of 1.2 minutes on a conventional computer and 58 seconds on an efficient machine. Experts accept a processing time of less than 1 minute, making the mapping process efficient in time. And by usability evaluating the results of the display by 105 assessors, the result was a most satisfied mean score of 2.836. However, Easy Map needs to be further developed for practical use in delivery services.

INTRODUCTION



Maps are devices that people use in their journeys. Digital maps contain a number of points of interest and roadways that are useful for analysis. But displaying all the available information is a barrier to understanding.

The research, therefore, intends to develop a map display model to show only useful information for traveling in order to develop a modern and convenient transportation system.

RELATED WORK

CARTOGRAPHY

- **Fundamental Geographic Data Set (FGDS)[1]**
- **Generalize (Editing)[2]**
- **Merge Divided Roads (Cartography) [3]**
- **Buffer[4]**

CLUSTERING MODEL

- **K-Means Clustering[5]**
- **The Elbow Method[6]**
- **Convolution[7]**

GEOSERVER

- **ArcGIS Server[8]**
- **Web Map Service[9]**
- **GeoProcessing Service[10]**

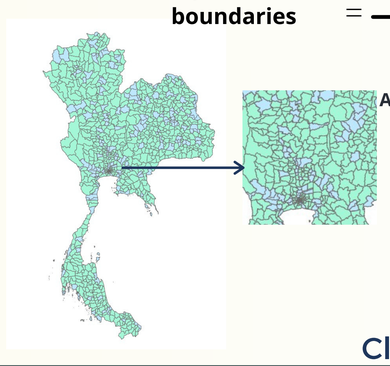
OPERATION

STEP 01 — Select Data
Select the Feature layer from Nostra Data

ADMIN_POLY : Polygon
LANDMARK : Point
LTRANS : Line

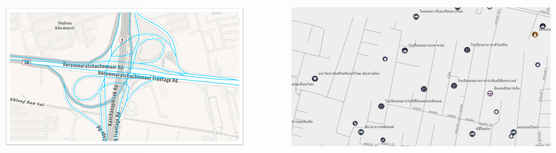
STEP 02 — Classify Data
Separate polygon data into 2 type

$$\text{Density of landmark boundaries} = \frac{\text{Total number of landmark boundaries}}{\text{Area size}}$$



ADMIN_POLY : Polygon 2 Type
- **urban**
- **suburban**

STEP 03 — Manage Data
Point of interest (POI) : select prominent points of interest based on the information from Fundamental Geographic Data Set (FGDS) and geospatial experts
LTRANS : select based on the department of Highways and manage by Generalize and Merge Divided Roads



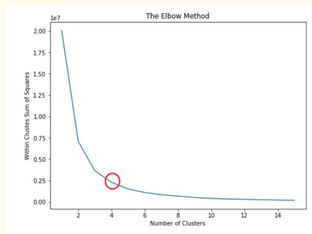
Managed data of POIs and LTrans

Selection POI and LTRANS based on polygon type urban, suburban upload the manage map data to Web Map Service

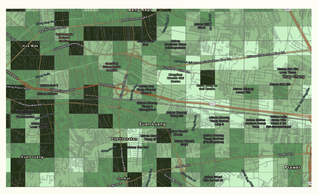
STEP 04 — Clustering Model
Map data was taken (500 m x 500 m), each of which was grouped using the K-means clustering method into 4 groups according to the density level of POI: (1) Least (2) Low (3) Medium and (4) Most dense.

STEP 05 — Geoprocessing Service
Create Geoprocessing Service using Python toolbox upload Geoprocessing Service on ArcGIS Server

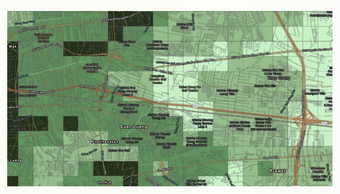
STEP 06 — Evaluate and Results
Evaluate Geoprocessing Service with time and call Web Map Service display via Website



Calculate the optimal K value using Elbow Method



Grid maps that are grouped using K-Means Clustering.



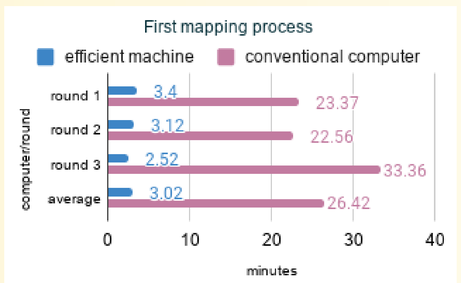
Grid map optimized for grouping using Convolution with padding.

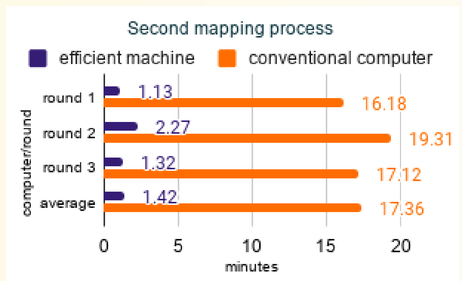
OVERALL OPERATION

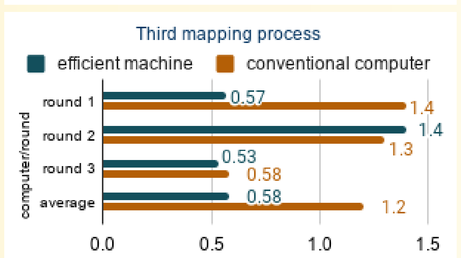
Usability Evaluation

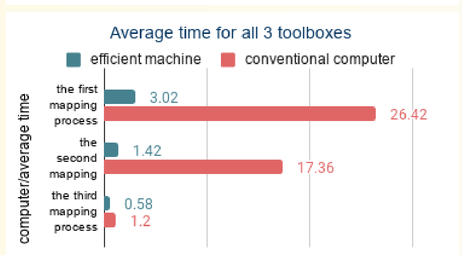
Average of execution time table of mapping process (Tool box) that compares the processing of two computers.

The first mapping process took 26.42 minutes on average of execution time on a conventional computer and 3.02 minutes on an efficient machine. The Second time took 17.36 minutes on a conventional computer and 1.42 minutes on an efficient machine. And the third time took 1.2 minutes on a conventional computer and 58 seconds on an efficient machine. The expert evaluation accepts the processing time no more than 1 minute. As described in table.





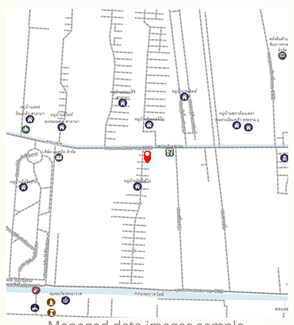




RESULTS — Different display of POI density levels

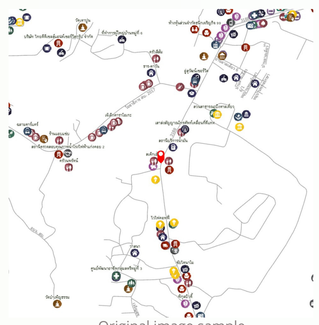
(1) Least

Original image sample



Managed data images sample

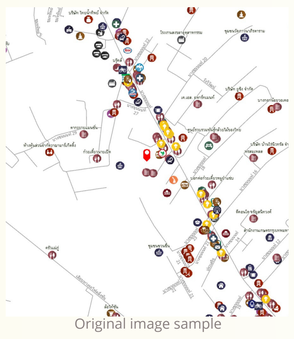
(2) Low



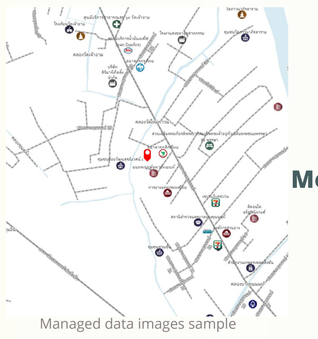
Original image sample

Managed data images sample

(3) Medium



Original image sample



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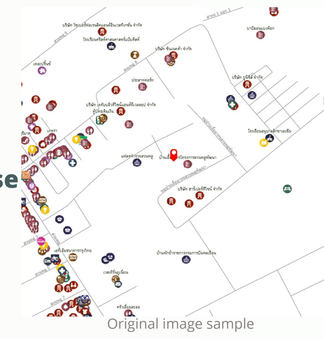
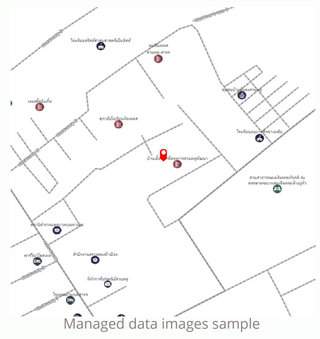
(4) Most dense



Original image sample



Managed data images sample

CONCLUSION

The results showed that the mapping process took an average of 1.2 minutes on a conventional computer and 58 seconds on an efficient machine. Experts accept a processing time of less than 1 minute, making the mapping process efficient in time. And by usability evaluating the results of the display by 105 assessors, the result was a most satisfied mean score of 2.836. However, Easy Map needs to be further developed. So that it can be used on the company's website and can be used for transportation.

REFERENCES

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