

OBJECT IDENTIFICATION FOR THE SPATIAL ARRANGEMENT OF THE URBAN AREA USING REMOTE SENSING DATA

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Abstract. City is the channel system human life which is marked by high population, economic social heterogeneity, and materialistic. City also becomes a big magnet to human, this is because city has the complete facilities, jobs, and the easy transportation. Remote sensing satellite data high resolution SPOT 6, has capability to produce spatial information to land use pattern. Identification is used to analyze the urban area space structure by using image interpretation parameter visual. The result of the research are thematic accuracy and capability of SPOT 6 image data with very detail scale is 1:10.000.

Keywords: Urban, Spatial, Remote Sensing, SPOT-6

1. Introduction

City is the channel system for human living which marked there high inhabitant density, heterogenous of social economic, and materialistic (Bintarto, 1983). city also becomes magnet that has big appeal for human, because it has high level services for public facilities, high level of income, many jobs, easy to access to other areas, and the big opportunity for increase self identity. While supporting factor from rural territory because it has low level of public serviced, low income, difficulty in economic development, and the decrease of productive farm land (Yunus, 2001)

The planning of urban arrangement is a sustainable urban planning system, application, and urban control. According to urban planning law No. 26, 2007, urban structure is settlement centers and network system of the means and infrastructure that has function to support the social economic activities that has functional connection in hierarchy. Urban arrangement which has been formulated should be applied gradually, begin from the public level until the detail level, and it is used from national level, province, regency, city, until village level. besides, urban arrangement is also used for thematic urban planning, for example coastal area, small island, ect.

As the number of inhabitant and social activity increase, so the need for spaces also becomes high both as a place to stay or for other function. In order to increase the city space usage optimally, we need to do urban structure evaluation for land use and the road system and othe factors that may become the cause of deviation from the plan that has been designed.

Considering many need and demand for space usage, so object identification is needed for urban areas. Remote sensing is one of technology that able to supply spacial data/information quickly. It has accurate and detail information, easy acces, and ability for processing. Technology of remote sensing which has been growing from years to years produced good quality data. It is also able to give object identification of land use in urban areas.

One of satellite image used were SPOT-6 satellite optic which was accepted in Parepare LAPAN earth station since January 2013 that has geometric processing ortho level. According President Instruction No. 6 2012, LAPAN was assigned to supply remote sensing satellite data high resolution 4 m pixel or smaller. To Cover that need pansharpning process or multispectral stretching image need to be done. Data input SPOT -6 is 6 m for multispectral image (Blue, Green, Red, Near-Infrared)/(NIR) and 1,5 m for pancromatic spatial resolution. image application SPOT-6 include city mapping and village, natural resource and disaster, farming, forestry, mining, and land use change detection. According to it ability, the result of spatial information is 1:10.000 scale that can be used to support regency urban planning area.

2. Methodology

Location of this research is DKI Jakarta Province. This area has many activities and heterogeneity of land use. The data was from SPOT-6 satellite image with spatial resolution 1,5 m and Indonesia Based Map. In the processing data SPOT-6, it begins with georeferencing that has purpose to get actual coordinates in earth surface (Danoedoro, 1996). That data is then corrected by atmospheric TOA correction, mosaic, cropping, and colour sharpening.

The next step is doing object identification using visual interpretation technique. In doing image interpretation, we can do object identification based on spatial and spectral characteristics. Object spectral characteristic is defined by reflection of electromagnetic power from an object in colour. While spatial characteristic is reflected by the shape, size, texture, pattern, shadow, site, and association. Object identification on the satellite image can be done observing image interpretation elements (Sutanto, 2001).

Interpretation is done to separate of the open space (include roads in the size and geometric shape), to get solid and void pattern area which showed by surrounding picture and other spatial phenomenon. It is related to vegetation, roads (size and geometric shape).

- a. Colour is the dark level or object brightness which recorded in the image
- b. Shape is specific elements, it can be recognized easily
- c. Pattern is spatial composition of an object in the image
- d. Site is an object location compare to other object, in relation to environment
- e. Size is characteristic, for example distance, large, high, slope, volume
- f. Shadow is think that can hide in object in the dark area
- g. Texture is colour change frequency in image, such as coarse texture, medium, and soft texture
- h. Association is connection between one object to other object in image, so it can be identified

Those image interpretation elements are used in spatial arrangement analysis:

- a. Object identification land use in urban area
SPOT-6 data ability and thematic can be used to identify land use. In objects identification there are 3 stages in analyzing, they are detection of an object, identification, and analysis to object identification result
- b. Identification of means and infrastructure
SPOT-6 data is used for means identification, such as education facilities, religion facilities, trade and health, offices, tourism, and other facilities. While for infrastructure is traffic system, such as highway, an artery road, a collector road, a local road, other road, dan railway.

The result is thematic accuracy and SPOT-6 data ability for producing spatial information in 1:10.000 scale. They are basic components which are used in spatial planning.

3. Result and Discussion

3.1 Land use Object identification

DKI Jakarta Province is a metropolitan city which is very heterogeneous and has it appeal for society. Beside as government center, it also become place for various activity. In the object identification in Jakarta city, not all interpretations elements are used together. But there are some kind of phenomenon or object that can be identified directly by one interpretation element. In urban area, land use object identification need more interpretation elements compared to medium until small scale in the large cover area.

In doing information extraction for the SPOT-6 image, there are some obstacle. One of them we can not differentiate the building plot in settlement area. Miss interpretation is usually found when shop and trading area which are identified as settlement area. On the building observing are difficult to be identified, it is also difficult to identify similar building which has similar size and shape. For example offices, hospital, apartment, and universities have similar pattern and shape with parked facilities. Mosque is recognized easily because there is a dome on the top, and for the hotels usually to completed by swimming pool and parking area. While for a church is difficult to identify because has its character. For to avoid much error on the interpretation, we need to ground check for help to object identification.

According to spatial analysis, SPOT-6 image has proved it's ability in landuse object identification, it can be seen from the number of detected componens. The result of identification and information extraction can be used sugjection in further urban planning. The result of the landuse mapping is expectedto give illustration of the streght opportunity of SPOT data when servies spsial information on the 1:10.000 scale (Table 1).



Figure 1. SPOT-6 Data 2015 DKI Jakarta

Table 1. SPOT-6 Data Ability In Identifying Land use Object In DKI Jakarta

1. Open Space	16. School
2. Chruch	17. University
3. Mosque	18. Railway Station
4. Hotel	19. Bus Station
5. Trade area	20. Airport
6. Mall	21. Harbour
7. Tourism	22. Water(Sea, Lake, River, Reservoir, pond)
8. Marked	23. Sport Hall
9. Offices	24. Stadion
10. Apartement	25. Building
11. Regular Settlement	26. Cemetery
12. Inregular Settlement	27. Highway
13. Open green Space	28. Artery Road
14. Industry	29. Colector Road
15. Hospital	30. Railway
16. Flats	31. Gate Station



Source: Analysis of Result

3.2 Means and Insfrastructure Identification

3.2.1 Means Indentification. According to result of information extraction SPOT-6 data, means identifications which obtainable in Jakarta City are education, religious, healthy, serviced and trade, offices, funeral, tourism, transportation. And other activities.


Education Means

Education means which can go identified are school and university. But to differenciate education level from kindergarten until university very difficult to identify. If used interpretation element, school identification easier compared to university.

 <p>School</p>	<p>Colour : Medium Shape : Rectangle Size : Big Pattern : Regular Association: usually near with roads, and there are open space in the building center</p>
 <p>Univercity</p>	<p>Colour : Bright Size : Big Pattern : Regular Association: there is parking facilities</p>



Religious Means

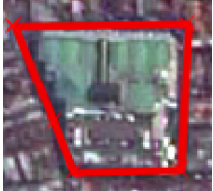
For religious means can be identified used SPOT-6 image is mosque. While it others very difficult to identify.

 <p>Mosque</p>	<p>Colour : Bright Shape : Square Size : Bigger to compared in around building Pattern : Regular Association: Has dome on top that look like a ball, <i>Has differend direction orientation with the arround buldin, but There are some mosque whith towers</i></p>
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Serviced and Trade Means


Serviced and trade means it can be to identified are mall, marked, and hotels. Shop there is in trade center can to identify. But for the shops which migled with settlement very difficult to identified and usually to settlement classifications.

 <p>Mall</p>	<p>Colour : Bright Shape : Square Size : Big Association: <i>The general location is in center of the city, Has a large building mass , There are parking area facilities, Roof of building usually is concrete and has special characteristic</i></p>
 <p>Hotels</p>	<p>Colour : Medium Size : Big Association: <i>The location is in artery road, There are supporting facilities likes swimming pool and parking area</i></p>

 <p>Marked</p>	<p>Colour : Brightness Less Size : Big Pattern : Irregular Association: <i>there are many transportation and parking area</i></p>
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Healthy Means

Healthy means we can identified is hospital. For “puskesmas”, “pustu”, and “Posyandu not can be identification because the building so small anda merges with the settlement.

 <p>Hospital</p>	<p>Colour : Bright Shape : Rectangle Size : Big Pattern : Regular Association: Usually there is in city center and it has parking area</p>
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Offices Means

Offices means in Jakarta city is not has only one floor, but usually more than 5 floor. The condition very difficult for interpreter to identified offices or not. If to differenciate government offices or private.

 <p>Offices</p>	<p>Colour : Bright Texture : Rude Size : Big Pattern : Regular Association: There are parking area</p>
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Funeral Means

Funeral means based on SPOT-6 image can be identifying with seen pattern and texture.

 <p>Funeral</p>	<p>Colour : Bright Texture : Rude Size : Large Pattern : irregular</p>
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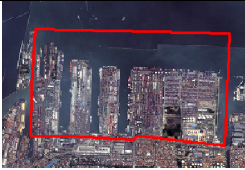
Tourism Means

The tourism means can be observing with much vehicle inside it. Usually can be identified from shape, size, pattern and site.

 <p>Airport</p>	<p>Pattern : Regular Shape : Longways Size : Big Association: There is many object inside it</p>
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Transportations Means

Transportation means can be identified are air port, railway station , bus station, harbour. While the consider very difficult to identify because the shape is smaller. Interpretation element it used identify are shape, pattern, site, association.





 <p style="text-align: center;">Airport</p>	<p>Colour : Bright Shape : rectangle Size : Big Pattern : Regular Site : <i>There are runway which has long rectangle shape with white stripes in the middle airfield . It has large size and bright colour</i> Association: <i>There area parking area dan planes</i></p>
 <p style="text-align: center;">Railway Station</p>	<p>Colour : Bright Shape : Longways Size : Not So big Pattern : Regular Site : <i>There are railway and station building</i> Association: <i>There are looking rail way and long transportation object is parking in these areas</i></p>
 <p style="text-align: center;">Bus Station</p>	<p>Colour : Bright Size : Big Pattern : Inregular Site : <i>has large if asphalt space</i> Association: <i>There are many buses, Has the large asphalt space , and the activity of the buses transporting passanger</i></p>
 <p style="text-align: center;">Harbour</p>	<p>Colour : Bright Size : Big Pattern : Inregular Texture : Rude Site : <i>has large if asphalt space</i> Association: <i>The object is there in beach there are many ships with container on it .</i></p>

Other activity Means

The other activity can be identified is sport means.

 <p style="text-align: center;">Sport Hall</p>	<p>Colour : Bright Size : Large Pattern : Inregular Association: <i>Has some building inside it</i></p>
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3.2.2 *Insfrastructure Identification.* According to result of identification SPOT-6 image, roads insfrastructures can be identified are highway, artery, collector, and railway. While to identification of local and environment roads, usage SPOT-6 data have obstacle is roads appeal can not maximal. The shape of pixels can not seen clearly.

 <p>Highway</p>	<ul style="list-style-type: none"> ▪ <i>Highway connects the national activity center with the region activity center</i> ▪ <i>Width of the road is 21 m</i>
 <p>Artey Road</p>	<ul style="list-style-type: none"> ▪ <i>Primary arterial road connects the national activity center with the region activity center</i> ▪ <i>Width of the road is 8 m</i> ▪ <i>The area is dominated by commercial</i>
 <p>Colector road</p>	<ul style="list-style-type: none"> ▪ <i>Colector road is as protocol road</i> ▪ <i>Width of the road is 7 m</i>
 <p>Railway</p>	<ul style="list-style-type: none"> ▪ <i>The railroad, is usually long and the track is branched</i> ▪ <i>There are train station</i>

4. Conclusions

1. SPOT-6 data has ability to object identification are Open Space, Church, Mosque, Hotel, Trade area, Mall, Tourism, Market, Offices, Apartment, Regular, Settlement, Irregular Settlement, Open green Space, Industry, Hospital, Flats, School, University, Railway Station, Bus Station, Airport, Harbour, Water (Sea, Lake, River, Reservoir, pond), Sport Hall, Stadion, Building, Cemetery, Highway, Artery Road, Colector Road, Railway, Gate Station.
2. There are some obstacle on doing object identification is the building have smaller size it not detection and only to able the result of mapping with 1:10.000 scale

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