

# Functional Design for Applying to Environment of Landsat Imagery

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**Abstract:** Landsat images were globally used to monitoring the Earth's. But it is not positively applied to a field of environment such as coastal environment, heat island effect and drought condition and so on.

Until recently, Information about a ecology · natural environment came to do by direct investigation. But Information about a ecology · natural environment of wide area were quickly getting possible with the progress of remote sensing technique. Specially, the up-to-date characteristic information about an ecology · natural environment as the basic intelligence for a country development activity are very important. So, it applies the satellite images that the periodic observation of data is possible.

In this study, We planned the function which is possible helping the renewal of an ecology · natural environmental information using Landsat imagery. Also planned the DB suitable for these purpose. For application of thermal infrared band images we developed the function that extracts an isothermal line. It used the thermal infrared band images and it grasped a temperature distribution. The result is useful in analysis of the city heat island effectiveness.

**Keywords:** Landsat, Environment, Ecology .

## 1. Introduction







The Landsat was marked more than quarter century mission to monitor the Earth's land and shallow sea areas. Begun in 1972, Landsat observatories pioneered the use of space platforms for systematic collection of land images (Short, Lowan, Freden, & Finch, 1976). These measurements produced a virtual revolution in earth science research, revealing the importance of remotely sensed images for monitoring the patterns and processes that define the Earth's land areas. In fact, the science and technology introduced by the continuing Landsat mis-

sion have served as a primary stimulus for current interest in Earth System Science and global change investigations, in particular the role of land conditions and dynamics in the Earth system. Specially, Landsat images were globally used to monitoring the Earth's. And it is positively applied to a field of environment such as coastal environment, heat island effect and drought condition and so on.

In this study, We planned the function which is possible helping the renewal of an ecology · natural environmental information using Landsat imagery. We analyzed the feature of subject information that is plentifully used. And classified subject attribute information and designed graphical representation standard. Also planned the DB suitable for these purpose. For application of thermal infrared band images it developed the function that extracts an isothermal line. It used the thermal infrared band images and it grasped a temperature distribution. The result is useful in analysis of the city heat island effectiveness.

## 2. Analysis of Subject Information

**Table. 1. Standard of Country Use Plan.**

Area	Graphical representation standard
Urban Area	 Red
Semi-Urban Area <ul style="list-style-type: none"> <li>Settlement Area</li> <li>Farming and fishing villages Area</li> <li>Athletics and rest Area</li> <li>Burial ground Area</li> <li>Facilities Area</li> </ul>	 Purple -After Painting Semi-Urban Area rubber stamp -Size - Width 2.0 Cm , Height 0.8 Cm -Font : Myungjo
Agriculture and forestry Area	 Green
Semi agriculture and forestry Area	 Yellow
Natural environment preservation district Area	 Background : None Line : Green
Fisheries preservation district Area	 Fishery resource -After Painting Natural environment preservation district Area rubber stamp -Size - Width 2.0 Cm , Height 0.8 Cm -Font : Myungjo

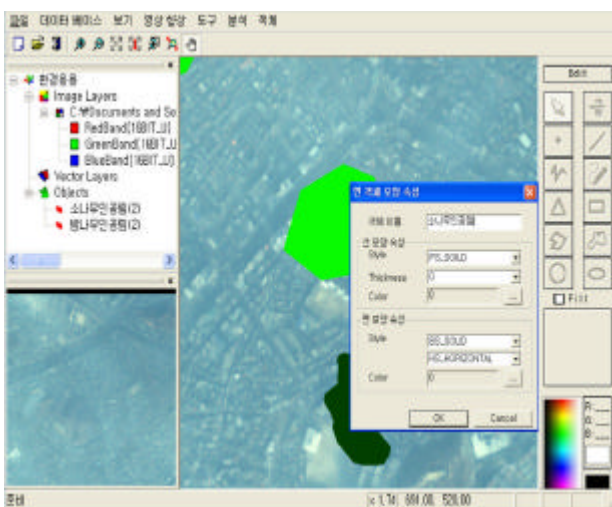
**Table. 2. Database of Country Use Plan.**

Explanation of subject	Area	AreaEast	AreaWest
Country Use Plan	Semi-Urban, Farming and Fishing Villages and	22240.526	285.000
Country Use Plan	Semi-Urban, Athletic and Rest Area	560.000	30.000
Country Use Plan	Semi-Urban, Burial ground Area	650.350	37.000
Country Use Plan	Semi-Urban, Facilities Area	2738.000	49.000
Country Use Plan	Agriculture and forestry Area	650.000	10.000
Country Use Plan	Semi-odiculture and forestry Area	370.000	30.000
Country Use Plan	Natural environment preservation district Area	760.000	451.962
Country Use Plan	Fisheries preservation district Area	753.000	496.000



**Fig. 1. Relationship of Total Database**

Until currently executed the investigation and result data of the field of environment is on site inspections data. These data of on site inspections are required many time and expense. So complementary measures were not appropriate in change of the resources caused by consequently with various developments. It complements like this weak point and satellite imagery Information as auxiliary measures is useful when it obtained more accurate, usefulness products on site inspection. Therefore we took out the subject which relates with a ecology · natural environment will be able to apply a satellite image. The result is each green natural map, forest type map, country use plan, land cover map, ecology · natural. These are plentifully used from present work, and the periodic renewal is necessary.



**Fig. 2. Application system**

In this study, we analyzed a classified subject attribute information and graphical representation standard. Also planned the DB suitable for these purpose. First, existing research data for the subject information analysis that corresponds to each subject. Used data is same Table. 1. and Table. 2. And those are graphical representation standard and database of country use plan. The Fig. 1. is shows the whole relationship of various subject information DB. We considered this relationship and designed the DB, and the addition of the field is possible. And also the amendment of the attribute against the edited figure is possible. Fig 2. shows produced application system that is based on referred DB. The attribute appears left top and the image that has become the display appears in middle. The tool is the possibility of painting and editing of figure is arranged in the right.

The Landsat satellite image application system is developed for the businessmen who work in environmental field, we look forward that spatial information about an ecology · natural environment is quickly renovated. And also it is judged with the fact that the periodic renewal will be possible.

### 3. Application of Thermal Infrared Band Imagery

The Landsat TM provides the images of middle infrared and thermal infrared wavelength territories. So it could be most efficiently used in extraction of environmental information. But thermal infrared band images are not plentifully applied in extraction of environmental information.

In this study for image application of thermal infrared territories, we developed the function that extracts an isothermal line from thermal infrared band images.

#### 1) Isothermal Line Extraction Algorithm

Automatic generation of contours for graphical display and map plotting has been studied extensively since the early days of computing. Most attempts to improve contouring efficiency have focused on contour tracing algorithms, another approach is to develop more efficient contour sorting algorithms. Anderson (1983) and Nickerson et al. (1999) describe fast quad tree sorting methods that could be adapted specially to contouring. The algorithm we used  $O(N \log N)$ . The algorithm requires additional memory but the storage requirements are not substantial. The algorithm is simpler to implement than the contour tracing approach and is significantly faster

than

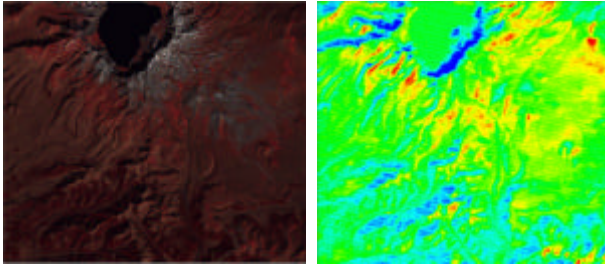


Fig. 3. Landsat Image (Left : Visible, Right : TIR)

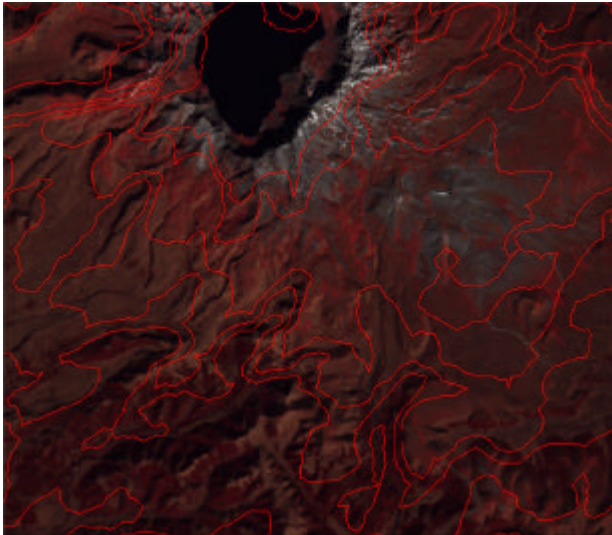


Fig. 4. Overlay isothermal line

contour tracing method. (Norman L. Jones et al., 2000)

The basic steps involved in the new sorting algorithm are as follows:

1. Traverse the triangles, creating and storing the contour segments in a linked list.
2. Store the vertices of the contour segments in an array.
3. Sort the array of vertices using an efficient sorting algorithm.
4. Transform the array into an embedded, doubly linked list.
5. Parse the list of vertices to remove all duplicate vertices.
6. Use a special technique to parse through the vertices and link them into open or closed contour strings.

The Fig. 3. shows the visible band images and thermal infrared band images of Landsat. And the Fig. 4. shows extracted the isothermal line that applied this method.

## 4. Conclusions and Discussion

Until recently, Information about a ecology · natural environment came to do by direct investigation. But Information about a ecology · natural environment of wide area were quickly getting possible with the progress of remote sensing technique.

In this study, We planned the function which is possible helping the renewal of an ecology · natural environmental information using Landsat imagery. Through analyzed a classified subject attribute information and graphical representation standard, planned the DB which suitable for these purpose. The Landsat satellite image application system for the businessmen of like this environmental field is developed with, spatial information about an ecology · natural environment to be quick. And also it is judged with the fact that the periodic renewal will be possible. For application of thermal infrared band images it developed the function that extracts an isothermal line.

It used the thermal infrared band images and it grasped a temperature distribution.

In the future, we will add a information extraction and renewal function against inland waters. Also we will add the relative temperature expression function in the isothermal line that is extracted from thermal infrared band image applications. Hereafter, The research about the application of thermal infrared band images is necessary.

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