A Study Of Carbon Dioxides Exhausted Extracting from Remote Sensing Image in Taiwan City by ANN Method

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Abstract: Nearly there are a lot of countries to limit emission of CO_2, and depend on plants of urban to filter the air. It is very important to study "Carbon Dioxide's exhausted" in 21'Th century. Now there are a lot of application in land monitor and image analyze using satellite images, but how to forecast Carbon Dioxide's exhausted in urban using Normalized Difference Vegetation Index (NDVI) is less. We combine the characteristic of ANN to forecast vegetation Carbon Dioxide's exhausted.
Buildings and urban green, is the most important thing to consult when urban designers design and plan. How to obtain vegetations really effect correctly and quickly is the most important thing. So how to study vegetations "Carbon Dioxide's exhausted" in urban is to brook no delay.
Using the "Carbon Dioxide's exhausted" location of urban environment, and compare relationship of vegetation location and Carbon Dioxide's exhausted. Meanwhile we can comparing with urban planning and confer the degree of urban green in vegetation Carbon Dioxide's exhausted conception. Also to confer the relationship between urban space development, Carbon Dioxide's exhausted and urban planning. In the future, we can use quickly, extensive and the other characteristic of satellite images to understand the effect to environment in urban development or spatial scheme of green designing.

Keywords : Carbon Dioxide's exhausted ,ANN, RS, Urban Spatial Structure, Normalized Difference Vegetation Index (NDVI)

1. INTRODUCTION

Urban green open spaces can make people comfortable in the sense of sight, but the most important thing is to purify air, decreasing greenhouse effect and cutting of noise etc. It is the most important thing in the environment.

Therefore, the most important value in urban greening is to purify air. If green degree is higher, it is meaning the environment has good quality simply. But how to use the function (to improve environment) of green open spaces to determine urban green degree is a direction to ponder.

We can find one thing in study of Carbon Dioxides Exhausted Extracting from plants: Different plants have different ability of Carbon Dioxides Exhausted Extracting. Evergreen arbors ability are batter then shrubs and grass. Therefore, we must take notice of plant's ability to improve environment in the calculation of urban green open space area. Basically, we can say the green degree in one area is good, if Carbon Dioxides Exhausted Extracting from plants is more and more higher. So we can define green degree of urban and Carbon Dioxides Exhausted Extracting from plants to estimate green degrees in urban area.

When we are starting to estimate green degrees, we must classify plants in urban quickly. And we can offer a suggestion for urban planning.

1.1 Study Background

It is important thing to classify plants accurately and quickly in calculation of Carbon Dioxides Exhausted Extracting. Then we can calculate the Carbon Dioxides Exhausted Extracting ability of plants depend on result of classification, and using the characteristic of remote sensing (immediately, extensive) to understand the environment influence of urban development or green planning.

1.2 Study Purpose

1.Conferring remote sensing, Carbon Dioxides Exhausted Extracting and ANN theory.
2.Discussing use ANN method to classify green open space in remote sensing.
3.Using ANN method to classify green open space.

1.3 Study Step

Step1. Studying relative theory.
Step2. Learning with ANN method.
(1) Image geo-coding.
(2) Vector file of Kaohsiung geo-coding.
(3) Export raster data to XYZ ASCLL grid.
(4) Sampling: Select training sample, include arbor and grass.
(5) Recode sample values of nine cells.
(6) Using ANN method to learning and building Net structure.
Step3. Describing learning result and following direction of study.

2. THEORY

2.1 Remote Sensing Image

Remote sensing is a science method that using sensor to search and collecting ground data with airplane or satellite, including all ground image information. It is a useful and economically investigation technique to explore ground information (Bai-Ling Xiao, 1999).

The theories of recognize are that every things in the ground have different characteristic of space location, space size, and space form and space relationship. Besides, different things have different spectrum reflection and we can use that to classify (Shu-Peng Chen, Ying-Shi Zhao, 1992).

The remote sensing of SPOT that is include three different band: 0.50μm-0.59μm, 0.61μm -0.68μm, 0.79μm-0.89μm. And one band: 0.51-0.73μm. There is good recognizing in plants classification. This study is using SPOT of Kaohsiung (Up and left N22.78 E120.22, Down and right N22.49 E120.40).

2.2 Carbon Dioxide's exhausted Extracting

This study use Carbon Dioxides Exhausted Extracting to define the green degrees in an area.

Before, the green degrees is define with green open space cover rate, but it is not a real meaning and effect of the plant's ability. And we can't quantification the effect also. However, how many green degrees are good for our environment, we also can't judge with green open space cover rate.

Based on the study of botany, plants' leaves and photosynthesis have a lot of relationship. And the effect of green is based on Carbon Dioxides Exhausted Extracting.

Green planning is depend on green open space cover rate, arbor, plants and plants' density in Building and urban statutes. But every plant has different ability to make environment batter. So we can use this characteristic to reach effect of environment protection.

The estimate of green degree in "green index" is classified sevens grade with leaves square. And use this method to know effect of Carbon Dioxides Exhausted Extracting. Those data show the effect of Carbon Dioxides Exhausted Extracting every urban plant in 40years (Xian-De Lin, A study of estimate index of green building community – The estimate index of ecological community, 1997, 5).

"Carbon Dioxides Exhausted Extracting" has one formula in the green index:

$$TCO2 = \sum Gi \times Ai \times \alpha$$

$$TCO2 > TCO2c = 0.5 \times A' \times 600$$

TCO2: The count value of Carbon Dioxides Exhausted Extracting (kg).
TCO2c: The datum of Carbon Dioxides Exhausted Extracting in green building (kg).
Gi: The Carbon Dioxides Exhausted Extracting of one plant (kg/m2).
Ai: The unit of one plant leaves area (m2).
α : Organism multiplicity coefficient
A': Lowest green area (m2).

The Carbon Dioxides Exhausted Extracting of Taiwan plants Gi (kg/M^2, 40 years).

Plants Type	**Carbon Dioxides Exhausted Extracting**
Big arbor of broadleaf (every plant over 9 M^2, soil deep over 0.9m)	808
Small arbor of broadleaf, coniferous or the arbor of little leaves (every plant over 6.25 M^2, soil deep over 0.9m)	536
Palm (every plant over 6.25 M^2, soil deep over 0.7m)	410
Bush (under 1m, deep over 0.4)	217
Perennial vine (soil deep over 0.25m)	82
Club, flower nursery or weeds (under 1m, soil deep over 0.25m)	46
Annual vine or weeds (tall 25cm, soil deep over 0.25m)	16
Grass	0

There are not definite regulation to quantification plant capacity and green degree in currently statute. And we can't estimate green degrees easily. So it is necessarily to estimate green degrees and ensure the environment quality.

Therefore, the study hope using green index to estimate green degrees at one area in the future. And confer urban green degrees with the ability of plants to improve environment.

2.3 Artificial Neuron Networks, ANN

Neural networks are the same with parallel-distributed processors, adaptive systems, self-organizing systems, neuron computers, connectionism, artificial neural networks etc. The model is development with human mind and brain activities. In network, the model formed with a lot of processing elements and it is a new type of information processing form organism model (Sheng-Fu Lin, Cheng-An Hong, 1995).

We can use the neural operation (figure 1) to show the organism model.

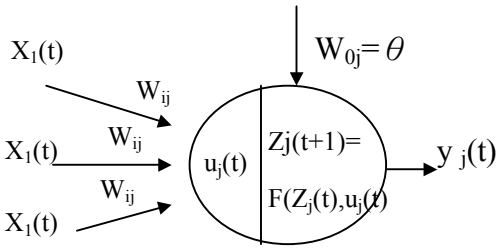


Figure 1 Structure of ANN

1. Learning phase: we use sampling to adjust the parametric inference. And the method is called learning rule (Sheng-Fu Lin, Cheng-An Hong, 1993).

The most important thing of learning is using training data to adjust the parametric of systems. There are a lot of training data including and we use different training data on different studies.

2. Retrieving phase: The ANN's structure and connection will keep constant when the network is in this step. In other word, the connection value of network will be fixed in the retrieving phase. That can be used in corresponding output.

3.URBAN GREEN CLASSIFY

3.1 Image Geo-coding

1.Proofread the image of SPOT

Enter coordinates, pixel size, sample numbers, and line numbers in ermapper. And geocoding remote sensing of SPOT in Kaoshiung (Figure 2).

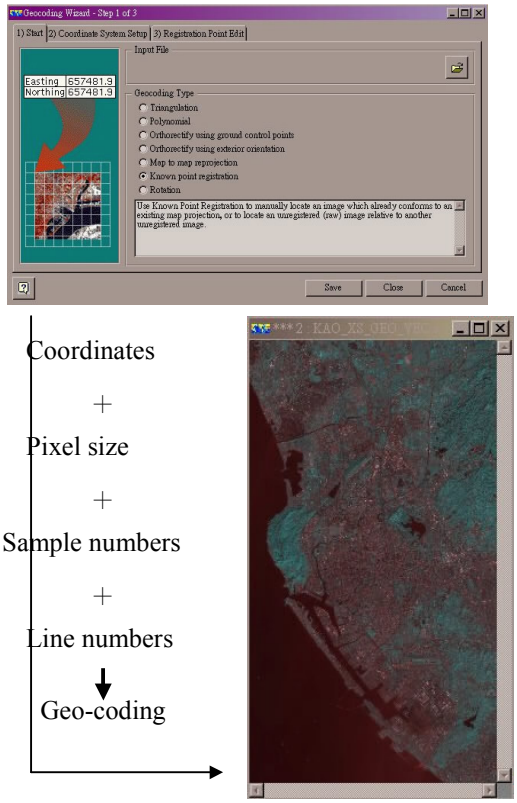


Figure 2.Proofread the image of SPOT

2. Vector file of Kaohsiung geo-coding

Then geo-coding vector files of Kaohsiung and street maps with the image of SPOT. We must be used the map to locate the aerial photography (Figure 3).

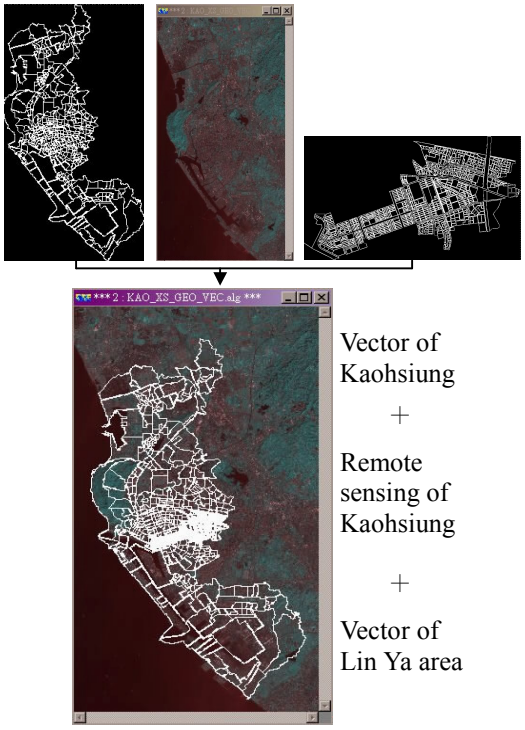


Figure 3 Vector file of Kaohsiung

3.proofread the aerial photography of Kaohsiung

Use the street maps which was geo-coding to proofread the aerial photography of Kaohsiung (Figure 4).

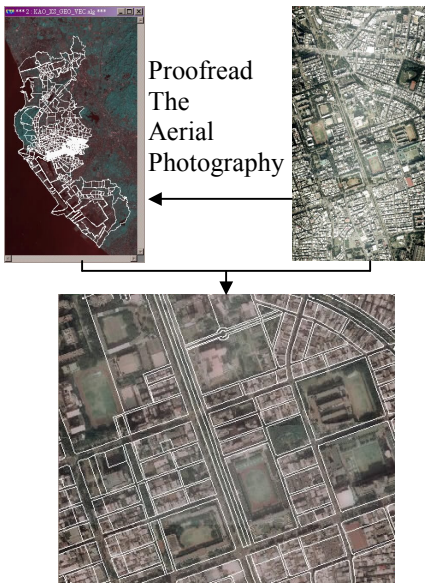


Figure 4 Proofread the aerial photography of Kaohsiung

3.2 Sampling

Select a lot of different train data. This study selects the sample of arbor and grass in the area preliminary. We select 300 arbor samples and 200 grass samples (Figure 5,6).

1.Select the sample on the aerial photography.

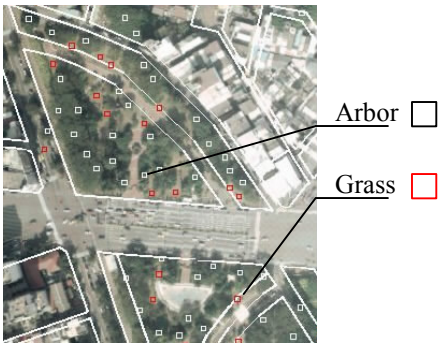


Figure 5 Sampling of aerial photography

2.Put samples on the remote sensing of SPOT

Put samples on the remote sensing of SPOT to start pick the numerical analysis of image.

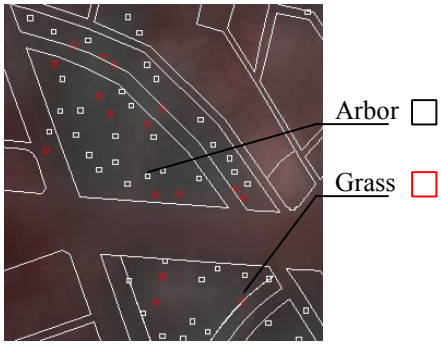
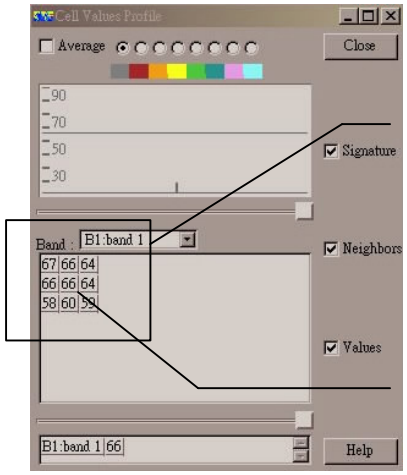


Figure 6 Sampling of remote sensing

3.3 Get The Cell Value

Get the cell value (9×9) of green band in the image. The value of middle cell is the most important factor to decide plant type (Figure 7).



Get eight value of classification to decide the plant.

The value of middle cell is the most important factor to decide plant type.

Figure 7 Get the cell value (9×9)

3.4 Use ANN to Learn And Build The Structure of Network

1.Select 500 samples.

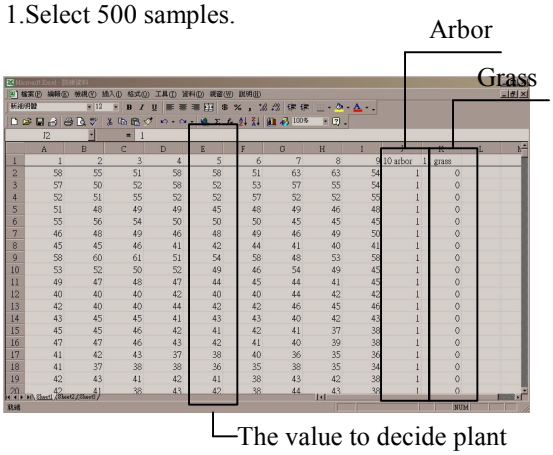


Figure 8 Select 500 samples

2.Building artificial neural networks: training (450 training data), network test (50 testing data) (Figure 8,9).

(1) Loading data

Load the data of samples to learn.

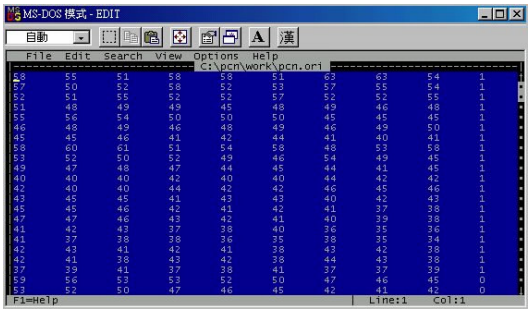


Figure 9 Loading data

(2) Building network

Build the structure of network with ANN method.

Input number: 9

Output number: 2

Samples: 500

Number of Train Examples: 450

Number of Test Examples: 50

Hidden: 11

Train Cycles: 100

(3) Network testing

Test the ANN and calculate RMS value (Figure 10).

RMS error of training Example=0.1955

RMS error of testing Example=0.2232

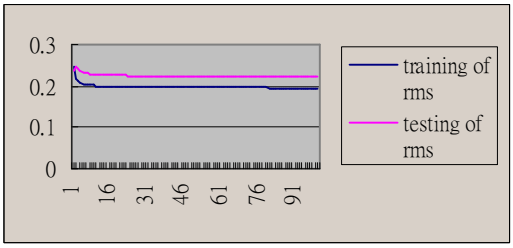


Figure 10 Training and testing RMS

4.CONCLUSION

4.1 Conclusion

About the learning to the sample, the result of ANN learning shows: RMS error of training Example=0.1955, RMS error of testing Example=0.2232. About the learning of classification in the future, it will need to adjust inside arguments further for reducing RMS to get more detailed ANN learning effect.

In the aspect of acquiring the samples, it needs using the aerial photography to proceed artificial contrast and select. Therefore it still will occur the erroneous judgment situation. In the future proceeding of acquiring the samples, we will use GPS to acquire more detailed local samples for acquiring correct classification and coordinate record.

From the acquirement of coordinate, it could integrate with the Geography Information System and further present the result of classification on the map. In the meantime with the calculation of Carbon Dioxides Exhausted Extracting, it will display the level of urban affore station.

4.2 Propositions And Continued Research

Current phase of this research, we study on the application of classify which depends on ANN to remote sensing. Depending on the research result, the effect of learning training is going well. In the future, we will further add the learning of coordinate in order to show the classification on the image and using this result to calculate Carbon Dioxides Exhausted Extracting.

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