跨越理想與現實的鴻溝

談建立數位時代資訊的分析運用與模式

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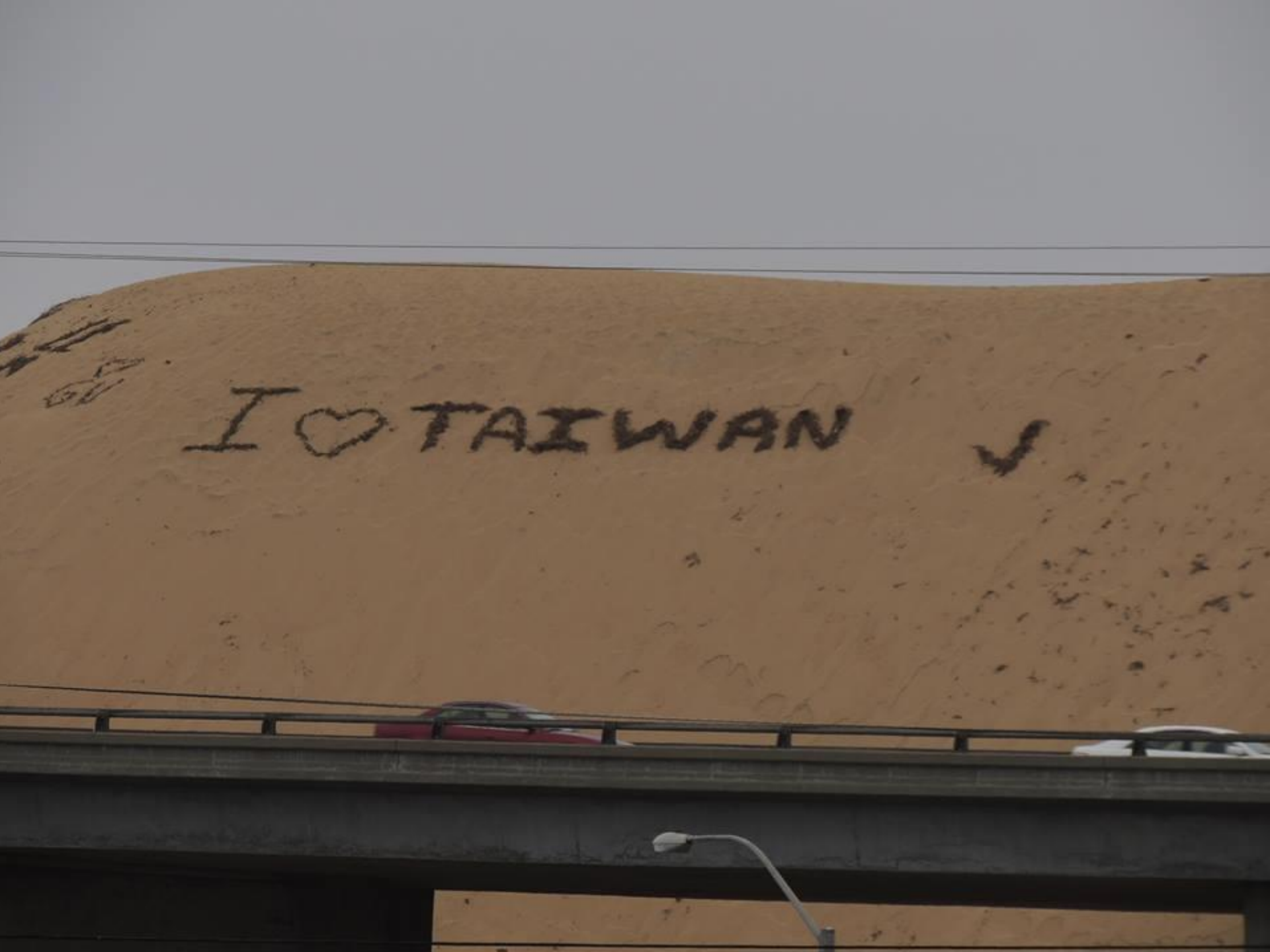
大綱
Outline

- 前言
- 理想與現實的鴻溝
- 數位時代的發展
- 資訊的分析運用
- 資訊模式的建立
- 結語


2012 PONY BASEBALL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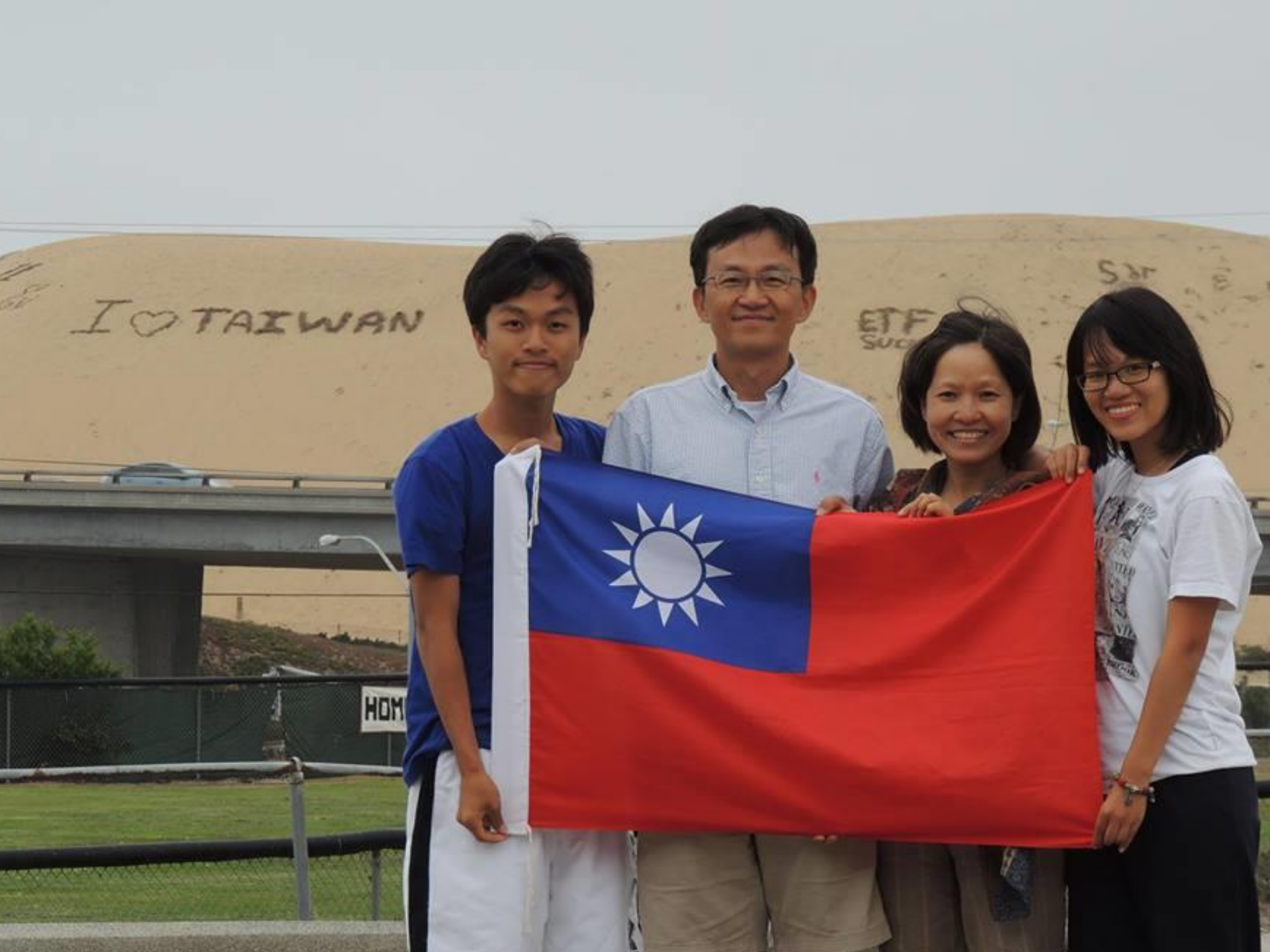
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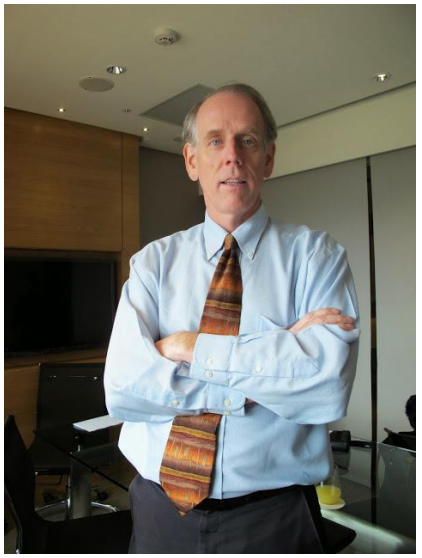
前言 Introduction

Teradata首席技術長寶立明認為，以後數據是每家企業的DNA，大數據這個詞將會在五年內消失。

❖大數據即將在五年內消失?

容量（Volume）、快速（Velocity）、多樣性（Variety）

價值 Value



http://www.bnext.com.tw/article/view/id/35404

數位時代的焦慮

The data landscape is radically changing

More connected people, apps and things generating more data in many forms

*IDC Worldwide HPC Server Forecast Update, 2015-2019

理想與現實的鴻溝?

數位時代的焦慮

- 容量總是不夠大(Volume)
- 速度總是不夠快(Velocity)
- 產品總是少一樣(Varity)
- 產品總是不夠好(Value)

Mega Trends and the Data Driven Organization Transformation

資訊的分析運用-資訊處理

- 學校有教的
  - 基本的檔案開啟/關閉
  - 讀取資料的語法
  - 讀取字串的語法
  - 有限量的實驗樣本空間
- 學校沒有教的
  - 真實世界的檔案大小，超過實驗室的容量太多
  - 真實世界的檔案內容，往往千奇百怪
  - 蒐集真實世界資料的儀器，到處都是
  - 蒐集真實世界資料的儀器，永遠停不下來...

數位時代的發展

- .com:
  - 資訊互聯網
- **社交網站**
  - 人際關係互聯網
- **物聯網**
  - 物品互聯網
- **金聯網**
  - 貨幣人際關係互聯網

知識型經濟

源自經濟合作與發展組織於1996年提出，定義為擁有、分配、生產和著重使用知識的新經濟模式

- Driving Force
  - Globalization
  - Information technology
    - Information/Knowledge Intensity
      - efficient production relies on information and know-how; over 70 percent of workers in developed economies are information workers many factory workers use their heads more than their hands.
    - New Media
      - New media increases the production and distribution of knowledge which in turn, results in collective intelligence. Existing knowledge becomes much easier to access as a result of networked data-bases which promote online interaction between users and producers.
    - Computer networking and Connectivity

Case Study

- 資訊發展與商業模式
  - 百科全書
    - 微軟
    - 維基百科
  - 哈根達斯活動
  - Google企業模式
  - 開放資料與大數據
  - 異質性資訊發展的商業發展整合運用
    - 氣象數值模式
    - 地理資訊系統
    - 都市發展計畫與商業投資

學習Learning to learn

- 學習XX這門課有用嗎?
  - 領帶理論
  - XX是否為關鍵課程：舉一反三
- 為什麼老是學不好XX這門課呢?
  - 沒有用：兒子的英文學習的故事
  - 信心不夠：微積分重修學生工數滿分的故事
  - 時機未到：雙榜狀元的故事
- 該如何學習呢?
  - 外部動機：努力學習，達到目標
  - 內在動機：渴望做好重要的、喜歡的、有意思的事

- 個人特質： **因為認知，所以認真**

我現在很喜歡英文，但是並不是從一開始就喜歡，幼稚園中班的我和小一的姐姐一起補習英文，二年後我就不想補了。爸媽很好奇問我，為何不補了？

我：因為全世界只有牧師和師母在說英文

爸：你不是常和我們一起看 HBO、Star Movie 嗎？

我：爸爸，那是演戲，不能當真的。

後來我就停了英文課。

半年後全家到美國加州迪士尼、海洋世界去玩，從下飛機、租車開始大家都說英文，才知道原來這個世界上真的有人在說英文，回國之後，我就認真學習英文。去年暑假全家再次到美國旅遊，這一次，可以使用英文流暢地與外國人士以英文溝通，內心感覺非常開心!

當我知道這是一件重要、該作且值得的事，我就會認真去做。

企業模式想法的改變

- 新的企業模式：行為動機
  - Autonomy(自主性)
    - 主宰自己生命的動力
  - Mastery(掌握度)
    - 對自己重視的工作有做好的願望
  - Purpose(使命感)
    - 對自己工作，能對個人以外有所貢獻的渴望
- 百科全書
  - 微軟
  - 維基百科

資訊的分析運用-資訊獲取

- 哈根大使冰淇淋的故事
  - 徵文比賽：
    - 1-3名鑽石
    - 佳作3名50個冰淇淋
    - 人氣獎

仲夏…
我揚著「愛琴海之帆」，
駛進「心動比利時」，
在那「夏果樂園」裡，
我思念著妳那「櫻桃之吻」。

「爸!你這好像是在替Haagen Dazs作廣告耶!」女兒聽完我就著全家人在Haagen Dazs天母旗艦店所點的四樣冰品，所編出來的即興詩時，她有點半開玩笑地揶揄。

…望著桌上的冰淇淋，卻一語
…接，會心一笑。
…勾起了一個少男心中的仲夏夜

後記
經過三年多的拖延，日前終於完成兒子的心願，到哈根大使旗艦店吃了非常奢侈的冰淇淋…

正好碰到哈根大使舉辦徵文活動，基於獎品是很多好吃的哈根大使冰淇淋，大家就在回家的車上，共同創作了這首打油詩，並且依照幾年前到美國旅遊的經驗，虛構了一個愛情故事。

資訊的分析運用

- 學習的特質(3C)
  - 好奇心(Curious)
  - 批判性(Critical)
  - 創造性(Creative)
- 企業三分
  - 分類
  - 分析
  - 分享
    - HP: Idea Economy
      點子經濟時代已來臨

地理空間資訊革命(~7:10)

- Google企業模式
  - ✓ 免費Google Map
  - ✓ 免費路線規劃與導航
  - ✓ 使用者變成Sensor
  - ✓ 交通流量分析
  - ✓ 無人車自動駕駛

A GIS-BASED ENVIRONMENTAL MODELING AND SIMULATION FOR URBAN PLANNING AND DESIGN

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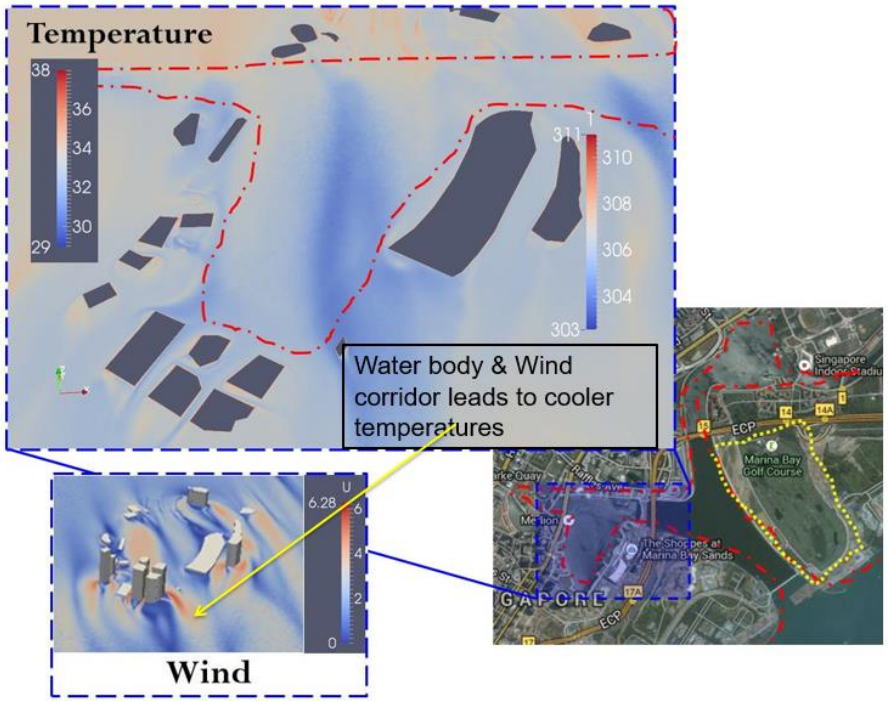
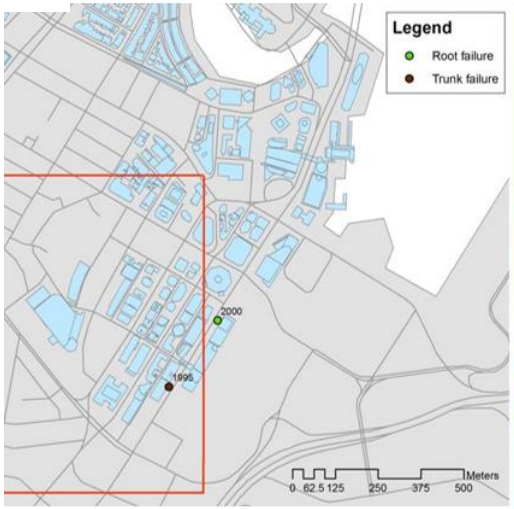
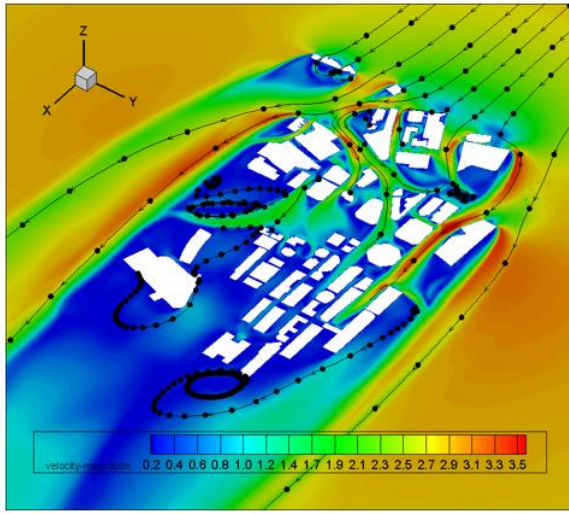
A GIS-based Environmental Modeling and Simulation for Urban Planning and Design

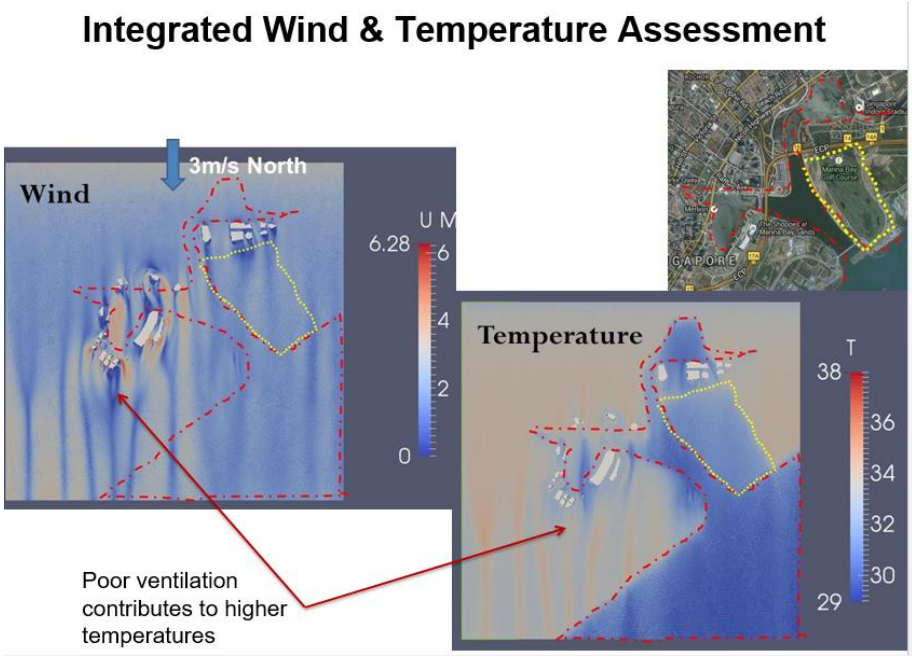


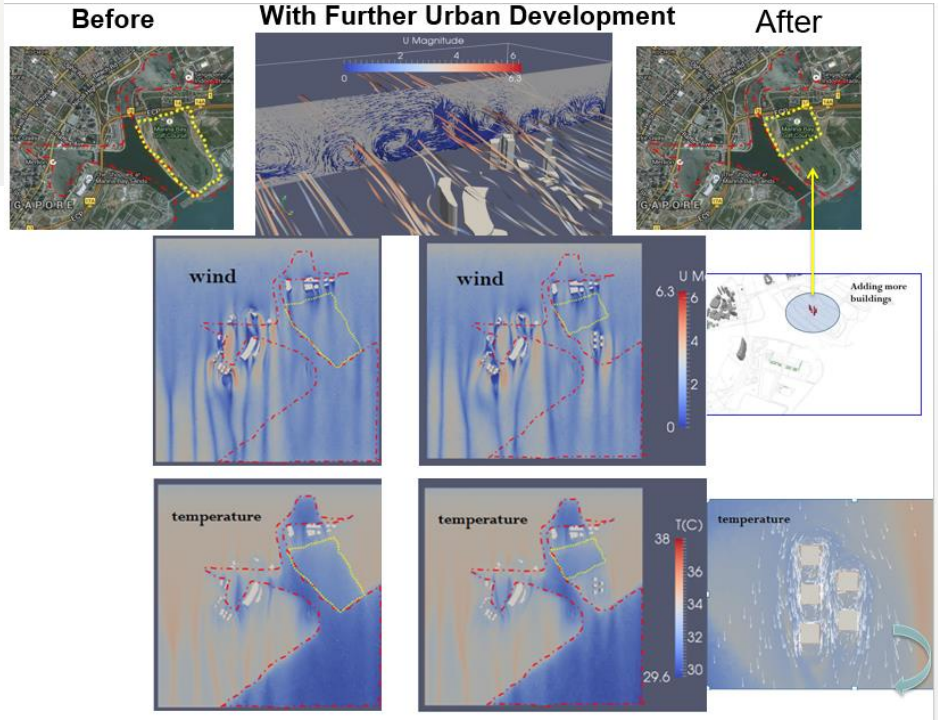
Integrated Multi-scales Environmental Urban Model





氣溫與都市舒適度


Integrated Wind & Temperature Assessment
3m/s North
Wind
U M
6.28
6
4
2
0
Temperature
T
38
36
34
32
30
29
Poor ventilation contributes to higher temperatures


Before
With Further Urban Development
After
U Magnitude
wind
wind
U M
6.3
6
4
2
0
Adding more buildings
temperature
temperature
T(C)
38
36
34
32
30
29.6
temperature

If you want to go FAST, go alone.
If you want to go FAR, go together!

Go together…

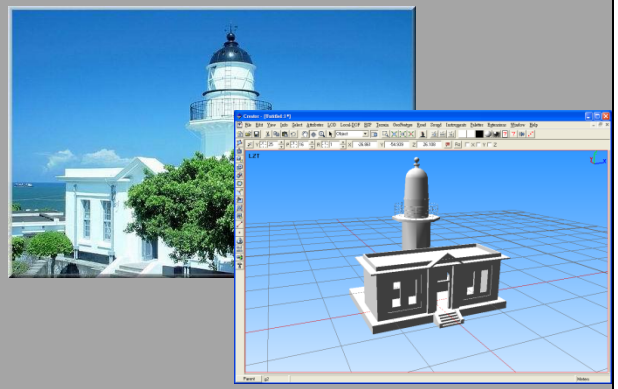
Case Study

- 科學研究
  - 都會區高精度影像分類方法
    - 分類關鍵
    - 建物提取
  - UAV影像處理
    - 高雄氣爆實例
  - 時間序列資料模式
    - SOM應用於衛星測高儀器反演海流(AVISO)分類
  - 鯨豚分類

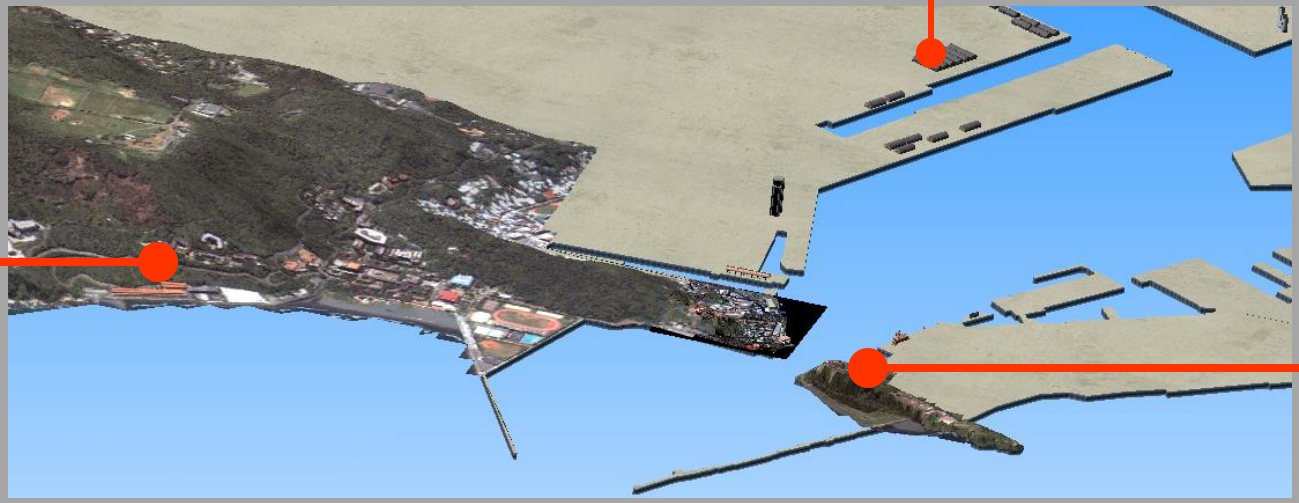
3D Cyber City/Harbor Construction

DEM + Image

city map + orthophoto

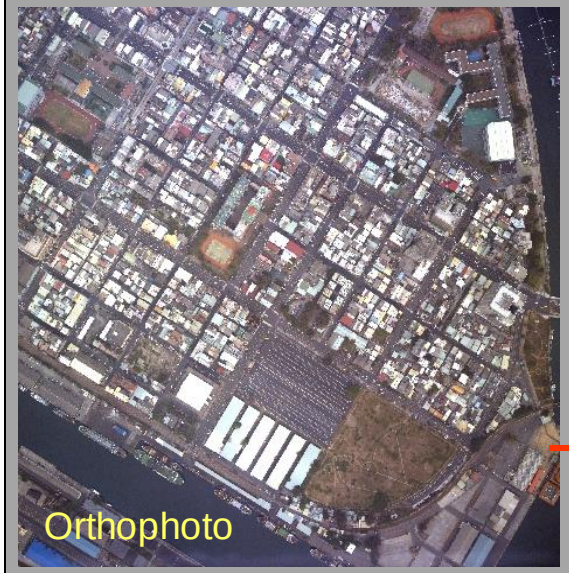


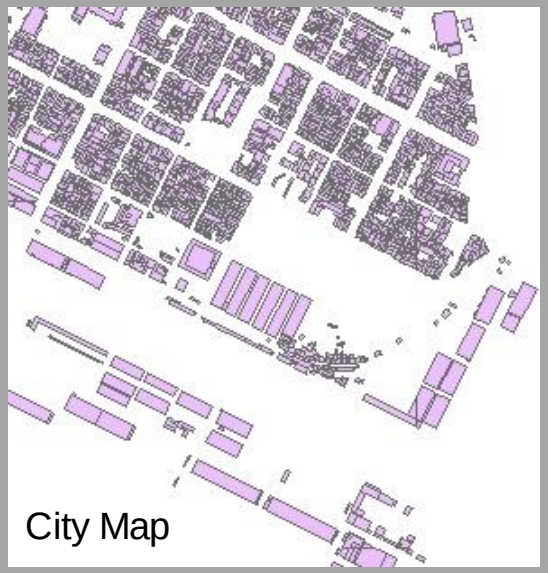
field picture + 3d model



研究背景(Background)

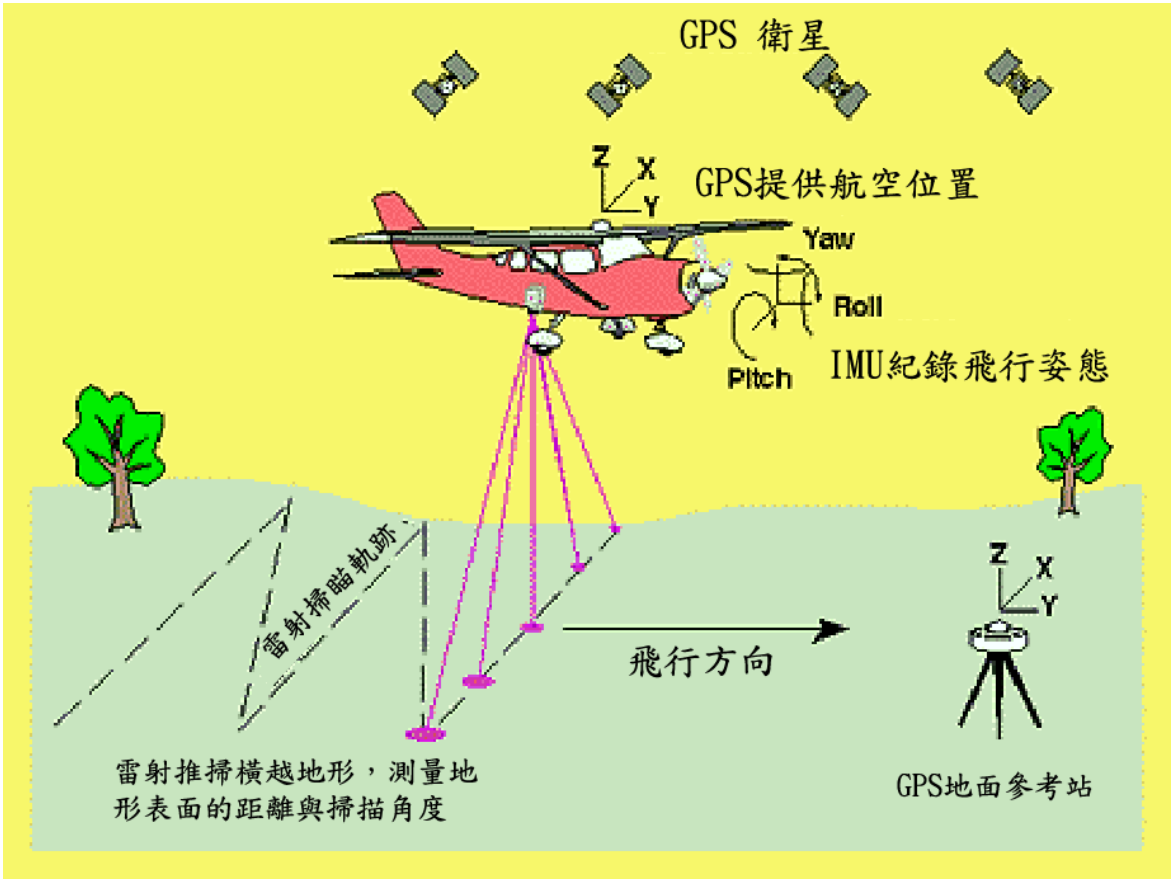
Data Sources for building the complex world

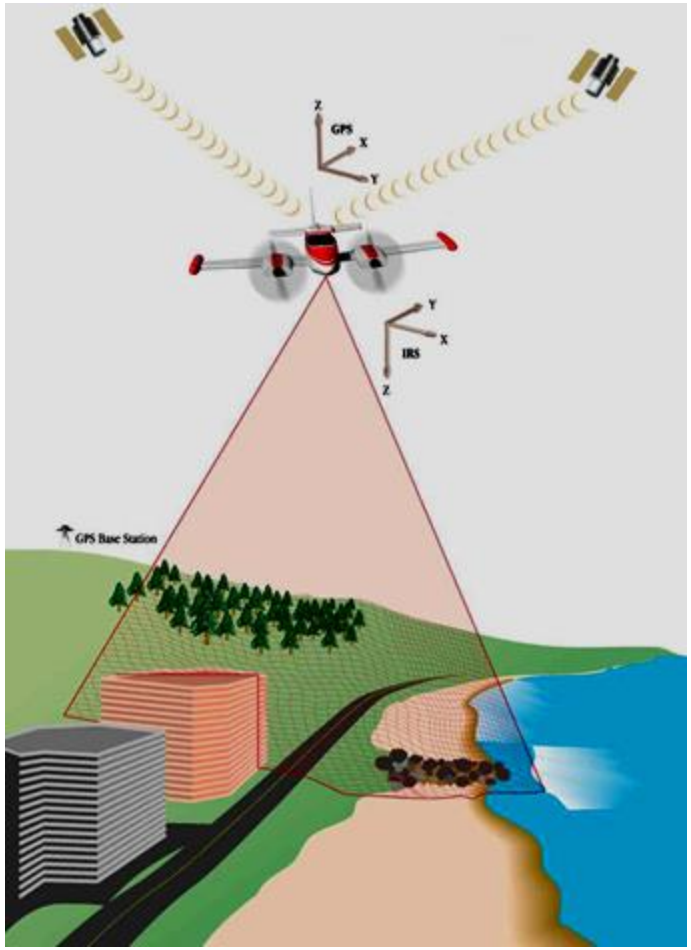




Principle of LIDAR

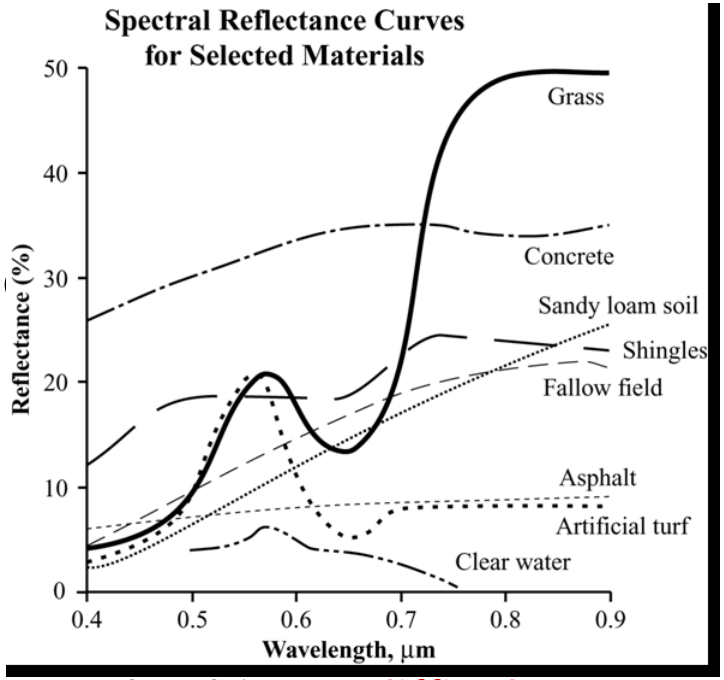
LiDAR: LIght Detection and Ranging





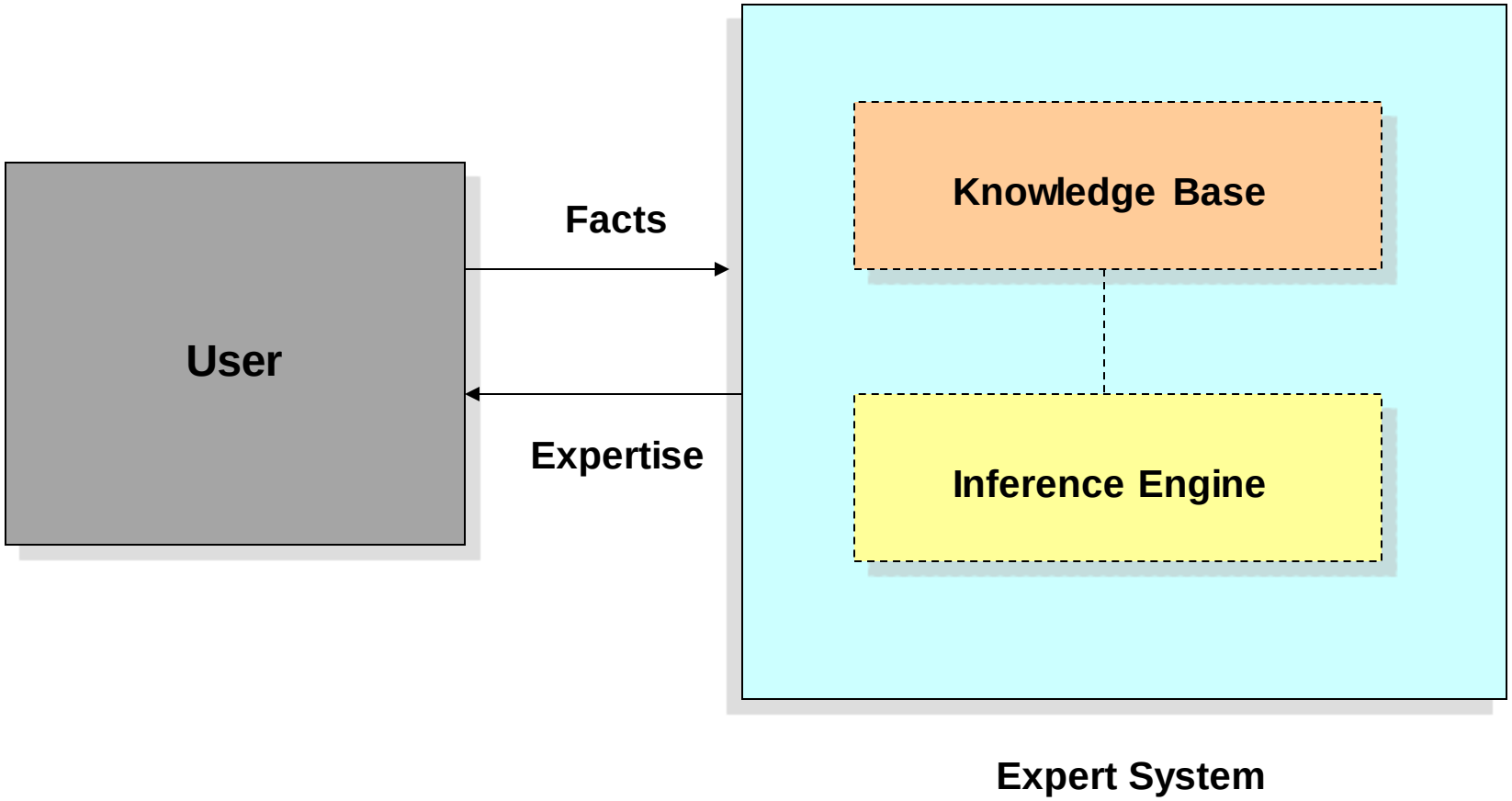
研究動機Motivations

(Jensen, 2005)



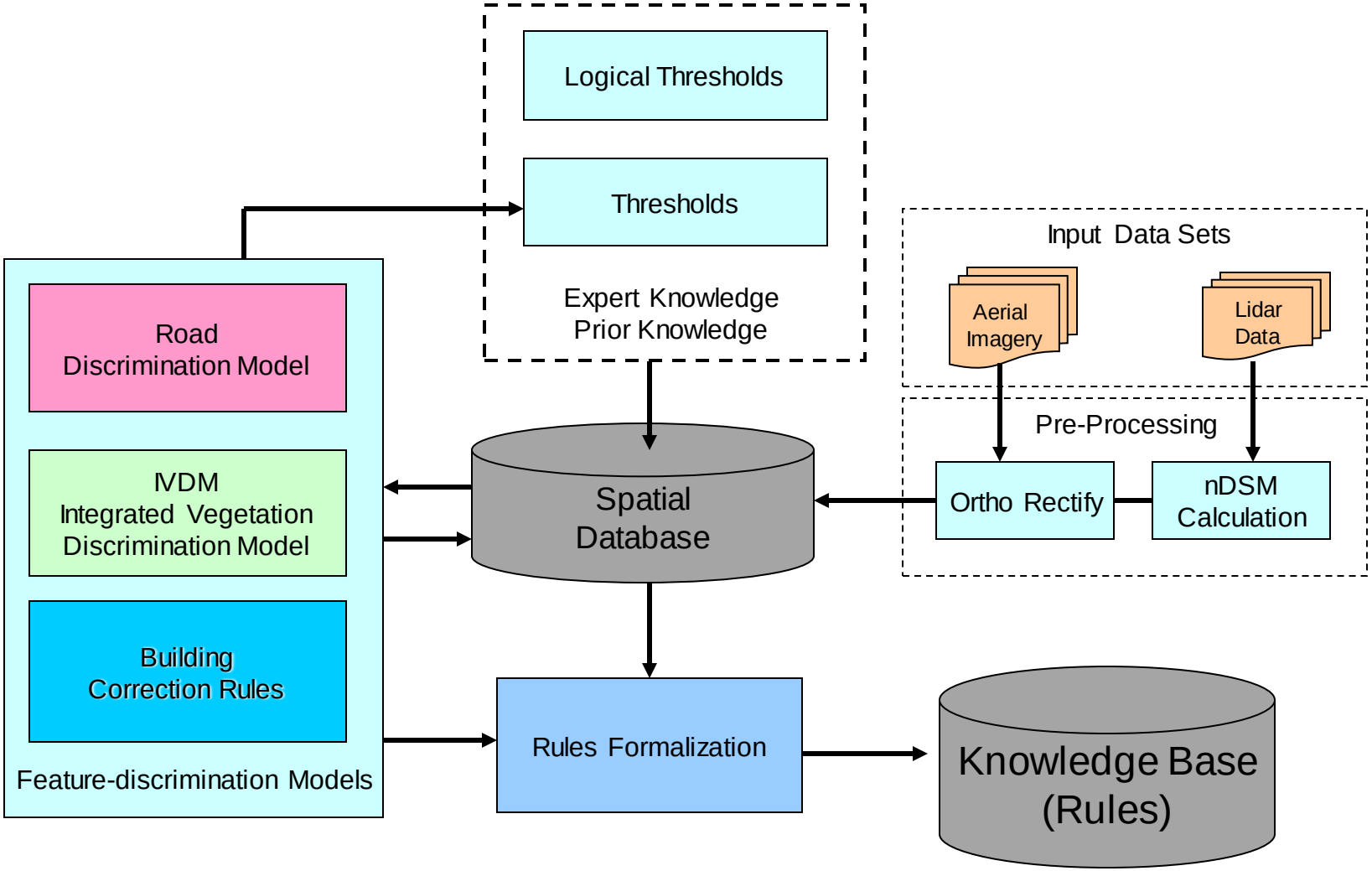
- Traditional Classification
  - Satellite multispectral imagery
  - Pixel-based classification (PBC)
  - Goal: feature types, shapes and boun
- Urban classification
  - High-resolution aerial imagery
  - Aerial DC equipped with NIR sensor
  - Difficulties
    - NIR can distinguish vegetations from man-made objects, difficult to discriminate between trees and grass
    - Building roofs: spectral variations caused by roof composition
    - Shadow effects
  - For urban classification, height information is more critical than NIR.

專家系統基本概念
Basic Concept of an Expert System Function



Giarratano and Riley, 1989. Expert Systems- Principles and Programming.

知識庫建構流程
Knowledge Base Construction Workflow



門檻值 Thresholds

Thresholds			**Value Used**	
#	Threshold Name	Explanation	Study Area 1	Study Area 2
1	$Threshold_{HL}$	Low height level height	0.5m	0.5m
2	$Threshold_{HH}$	High height level height	2.5m	2.0m
3	$Threshold_{IL}$	Low lidar intensity	5	5
4	$Threshold_{IH}$	High lidar intensity	18	15
5	$Threshold_{Smoothness}$	Smoothness threshold	3.0m	3.0m
6	$Threshold_{Penetrability}$	Penetrability threshold	0.05m	0.05m
7	$Threshold_{LBA}$	Smallest Building Block Area	1800 p	1800 p
8	$Threshold_{ShapeIndex}$	Shape Index	0.5	0.5
9	$Threshold_{Area}$	Smallest Area	225 p	225 p
10	$Threshold_{TVI}$	lidar-TVI	Automatic	Automatic
11	$Threshold_{NDVI}$	NDVI	Automatic	Automatic
12	$Threshold_{43}$	Remove grass from roads	1250p	1250p
13	$Threshold_{34}$	Remove roads from grass	750p	750p
14	$Threshold_{21}$	Remove trees from buildings	750p	750p
15	$Threshold_{12}$	Remove buildings from trees	750p	750p
16	$Threshold_{31}$	Remove roads from buildings	1500p	1500p
17	$Threshold_{41}$	Remove grass from buildings	1500p	1500p
18	$Threshold_{32}$	Remove roads from trees	0p	750p

知識庫建構
Knowledge Base Construction

- 知識庫基礎系統Knowledge Base System
- 先驗知識Prior Knowledge Rules
  - 三層高度規則Three-Level Height Rules (rules P1–P3)
  - 面積分析規則Area Analysis Rule (Rule P4)
- 道路鑑別模型Road Discriminative Model (RDM)
  - LiDAR回波強度道路規則LiDAR Intensity Road Rule (Rule R1)
  - 平滑度道路規則Smoothness Road Rule (Rule R2)
  - 穿透度道路規則Penetrability Road Rule (Rule R3)
- 整合植被鑑別模型Integrated Vegetation Discrimination Model (IVDM)
  - NDVI植被規則NDVI Vegetation Rules (Rules V1 and V2)
  - LiDAR–TVI植被規則LiDAR–TVI Vegetation Rule (Rules V3 and V4)
  - ND樹木規則ND Tree Rule (Rule V5)
  - AIS樹木規則AIS Tree Rule (Rule V6)
- 建物修正規則Building Correction Rules (Rule B1 and Rule B2)

都市區道路特性分析

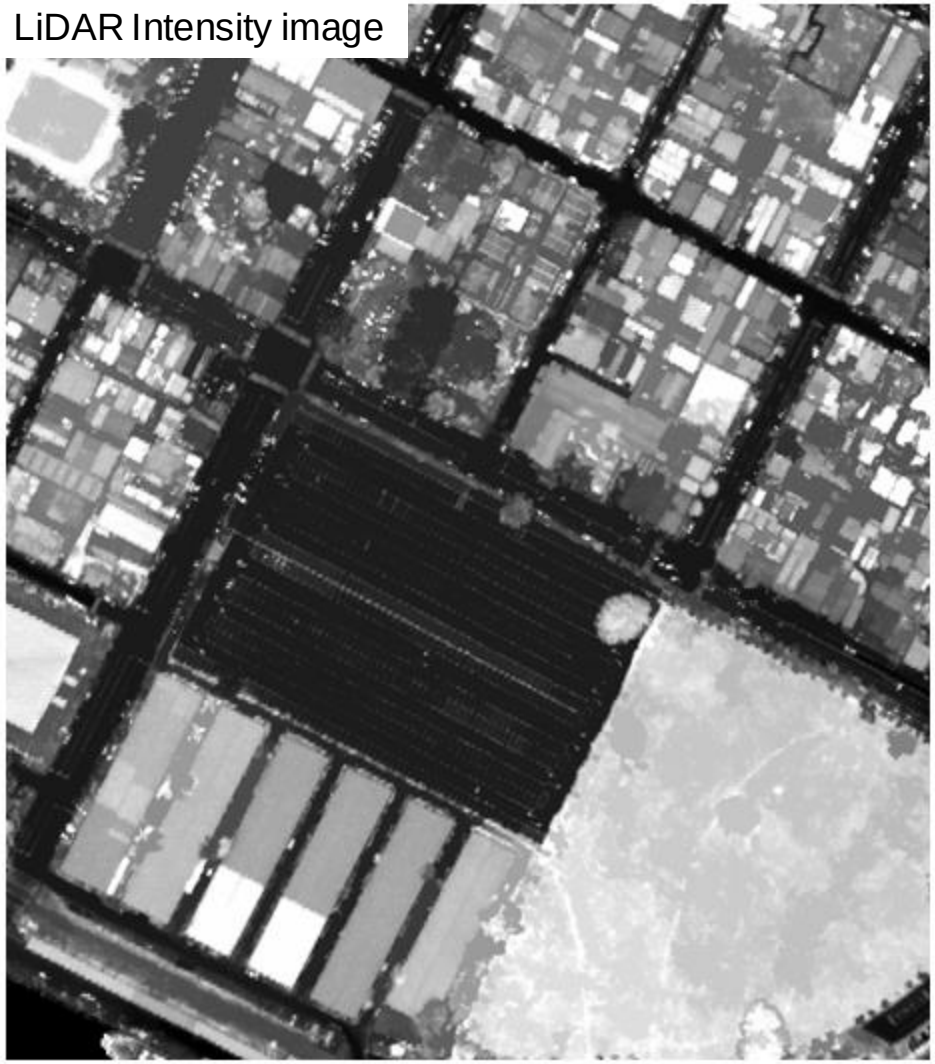
$$Rd = \begin{cases} Rd_I = Threshold_{IL} < LidarIntensity \le Threshold_{IH} \\ Rd_{H1} = Smoothness \le Threshold_{Smoothness} \\ Rd_{H2} = \left| H_{First\ Return} - H_{Last\ Return} \right| \le Threshold_{Penetrability} \end{cases}$$

(Hu, 2003)

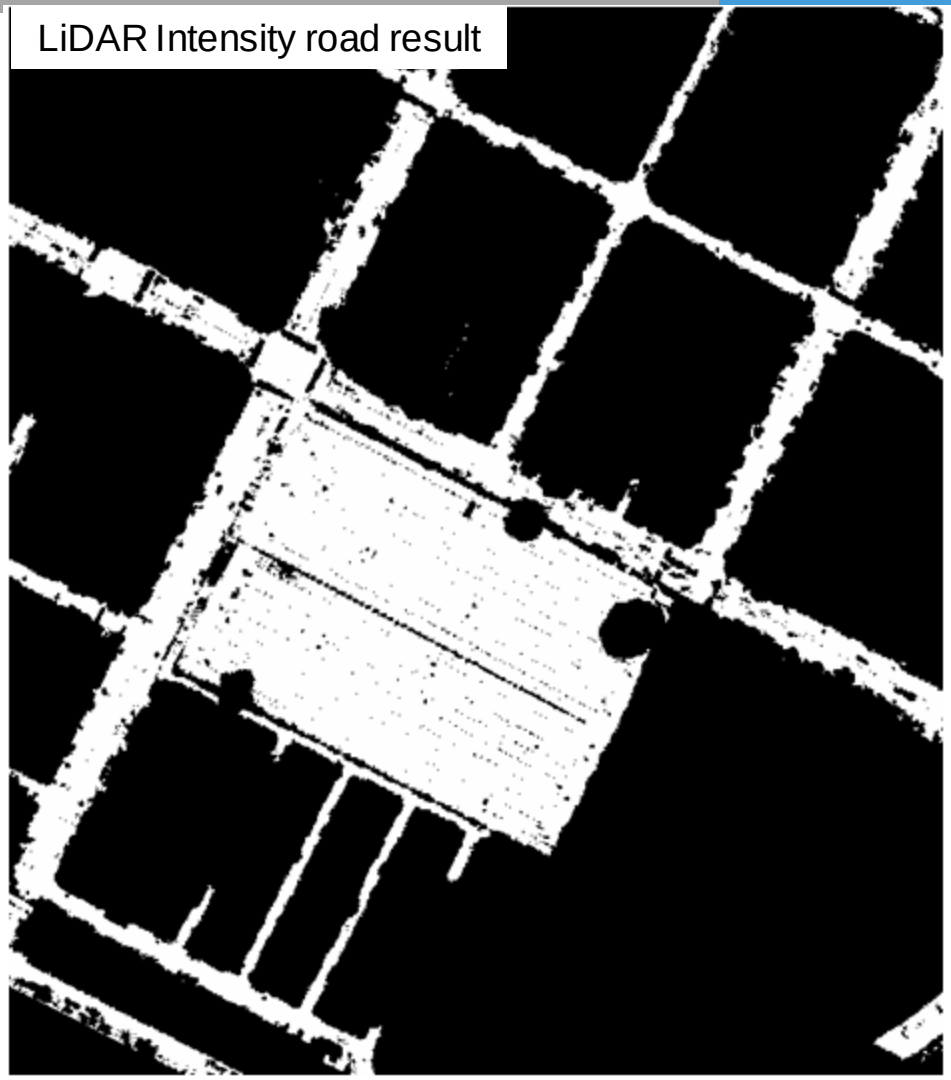
Rd_I為以光達回波強度所描述的地面分類模型；
$Threshold_{IL}$與$Threshold_{IH}$為回波強度門檻值；
Rd_{H1},Rd_{H2}為以光達高度所描述的地面分類模型；
smoothness為地面平滑程度；
第一次回波高度($H_{First\ Return}$)與最後一次回波高度($H_{Last\ Return}$)的差值為穿透度。

LiDAR Intensity Road Rule (R1)

LiDAR Intensity image

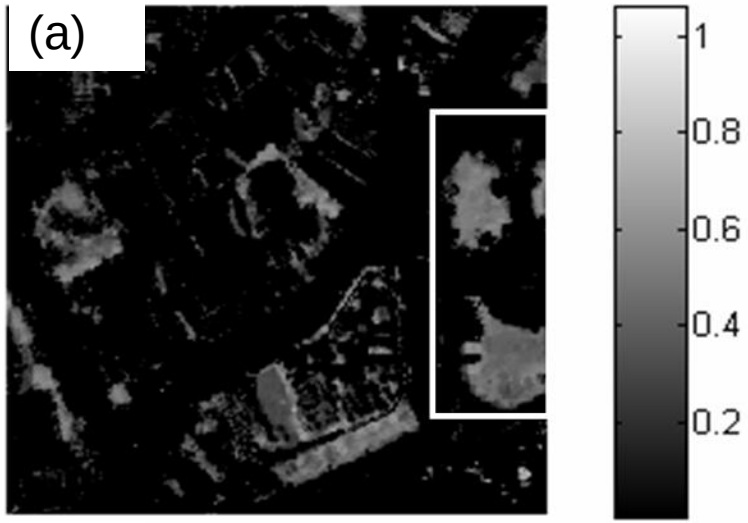


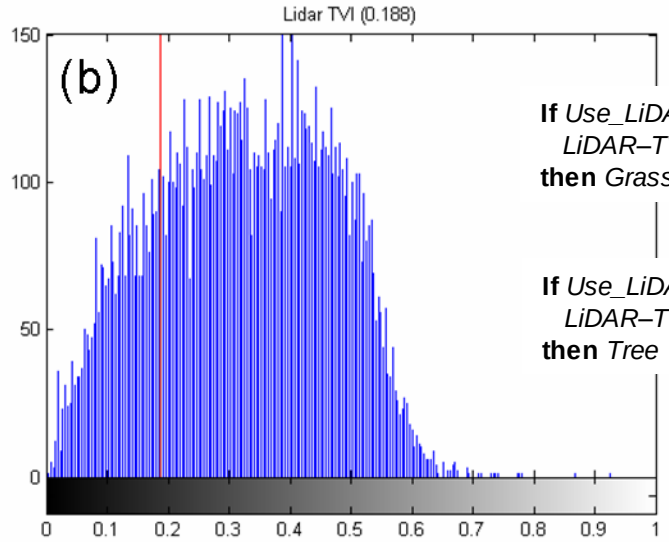
LiDAR Intensity road result



If *LiDARIntensity* > $Threshold_{IL}$ **and** *LiDARIntensity* < $Threshold_{IH}$ **then** *Road* = *true*

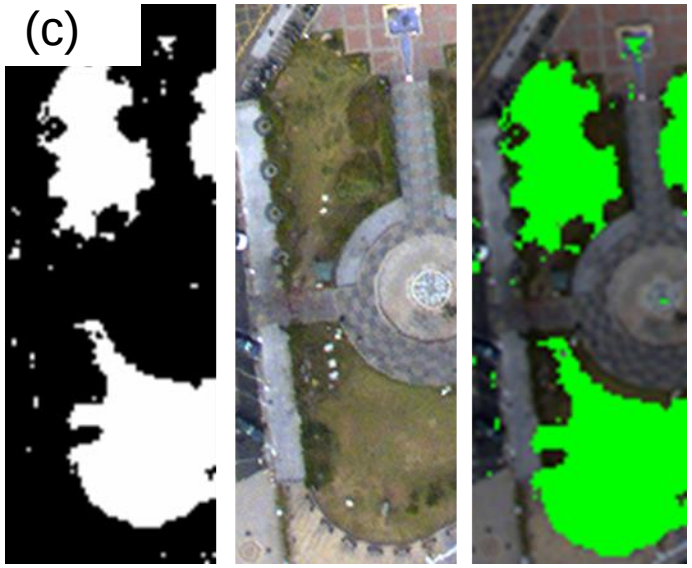
LiDAR–TVI植被規則
LiDAR–TVI Vegetation Rule (Rules V3 and V4)





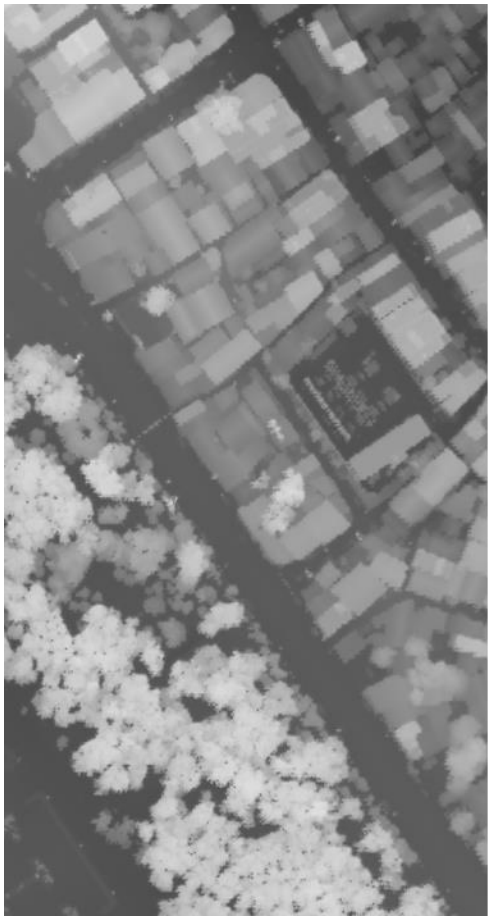
If *Use_LiDAR–TVI_for_Grass* = *true* **and** *LiDAR–TVI* > *Threshold*$_{TVI}$
then *Grass* = *true* **(V3)**

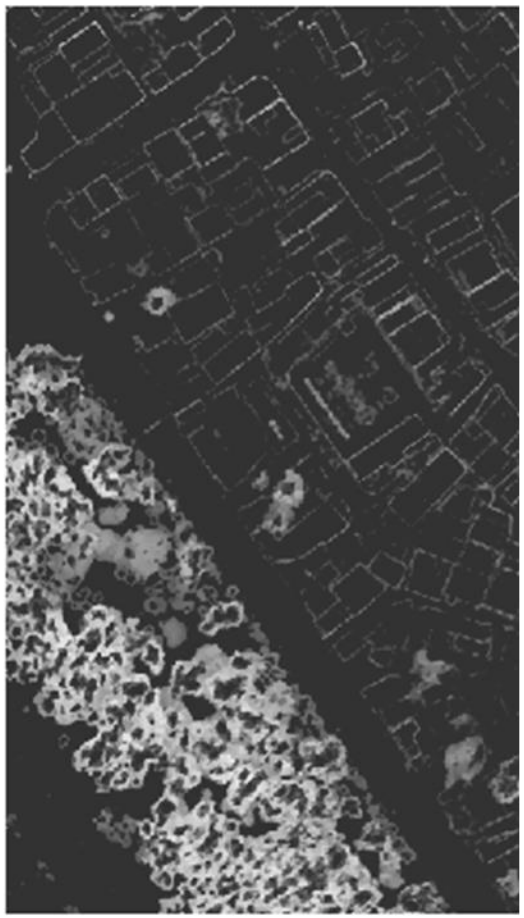
If *Use_LiDAR–TVI_for_Tree* = *true* ***and*** *LiDAR–TVI* > *Threshold*$_{TVI}$
then *Tree* = *true* **(V4)**



ND樹木規則
ND Tree Rule (Rule V5)

第一次回波(FP)與最後一次回波高度(LP)常態化差值(Normalized Difference, ND)





$$ND = \frac{(H_{First} - H_{Last})}{(H_{First} + H_{Last})}$$

Arefi *et al*., 2003

If *ND = true* **then**
Tree = true

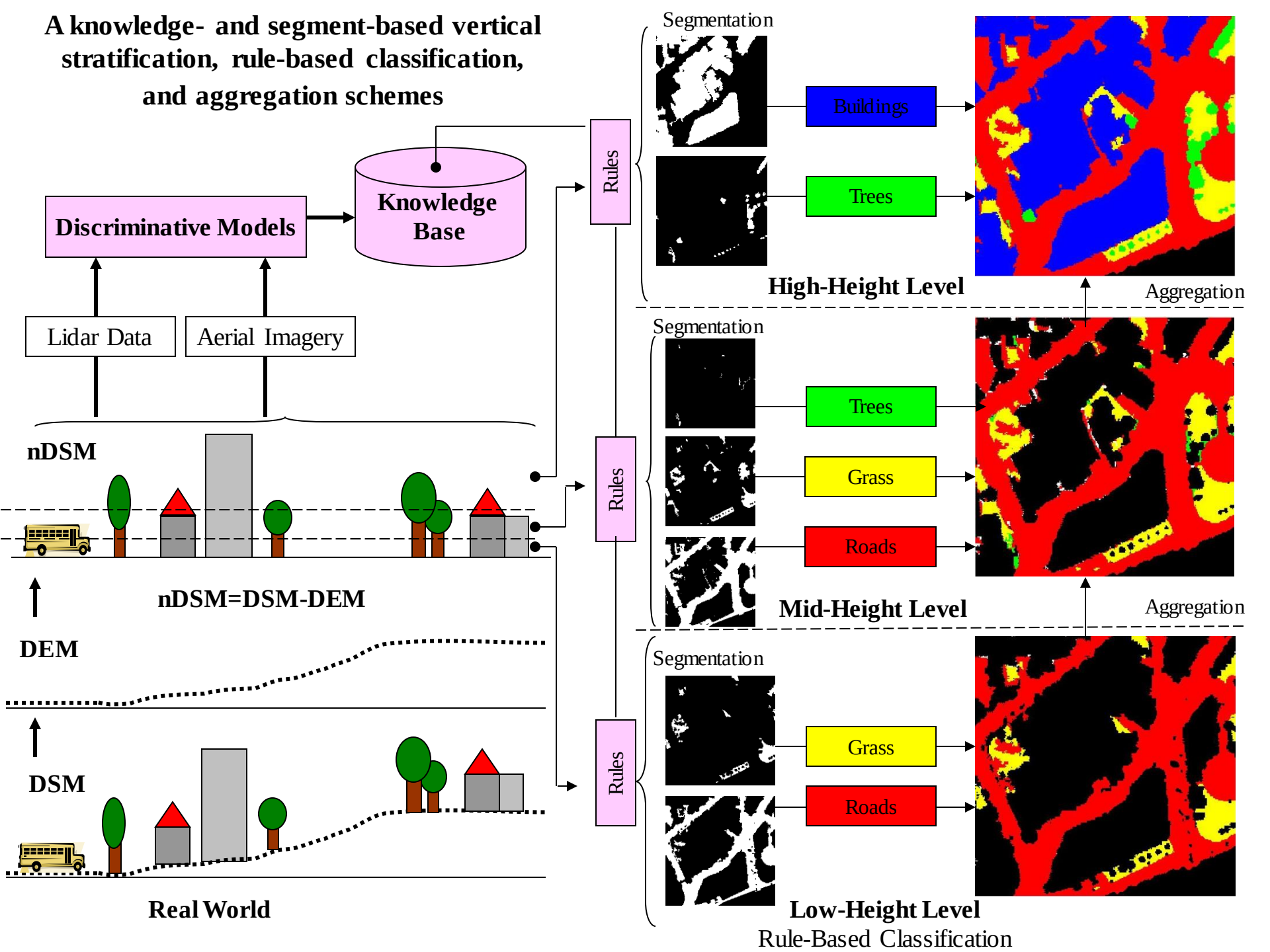
(V5)

高度梯度值>1.5
Otsu's method
形態學侵蝕
面積分析
形態學膨脹

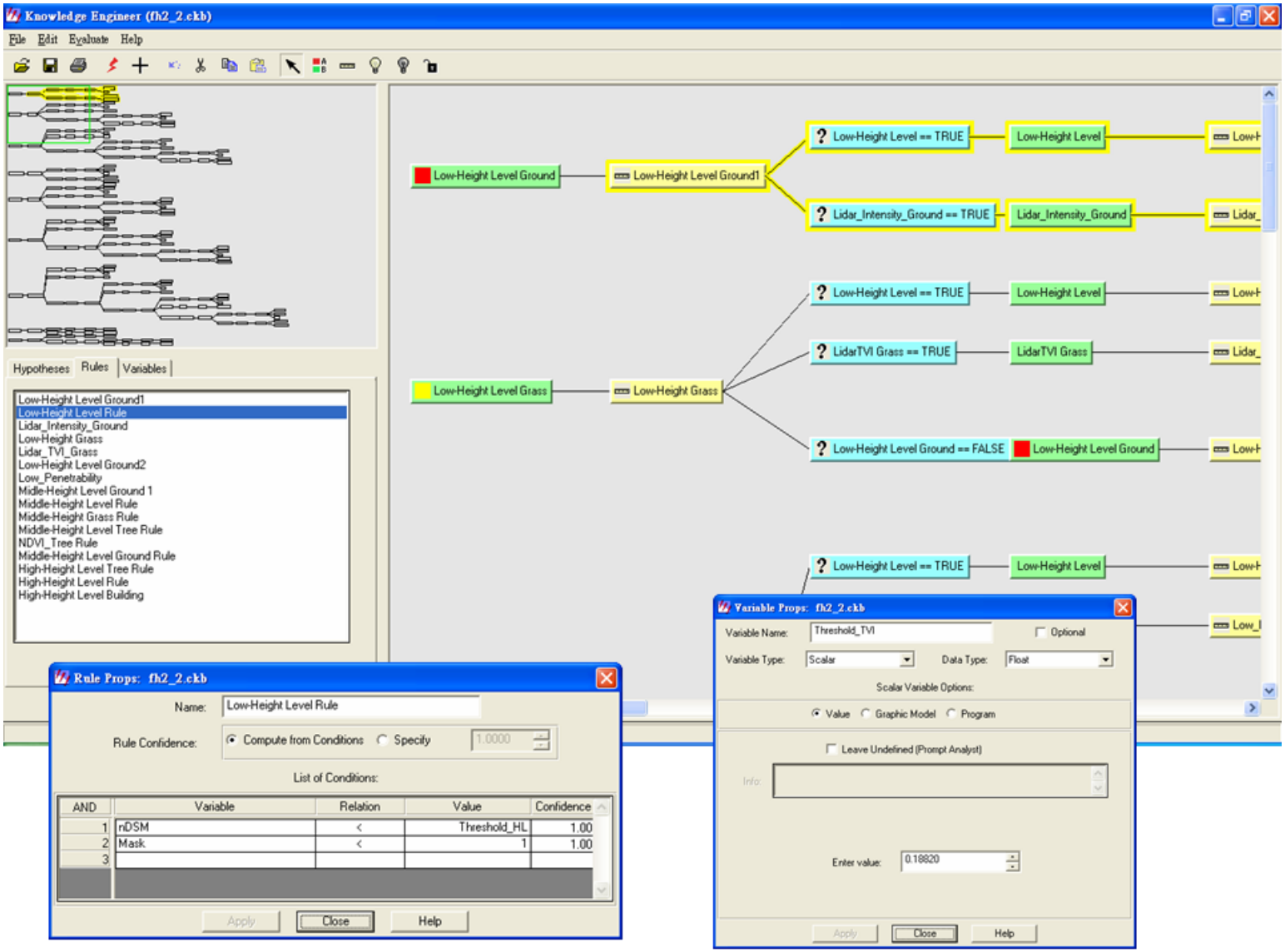
(a) LiDAR DSM

(b) ND image

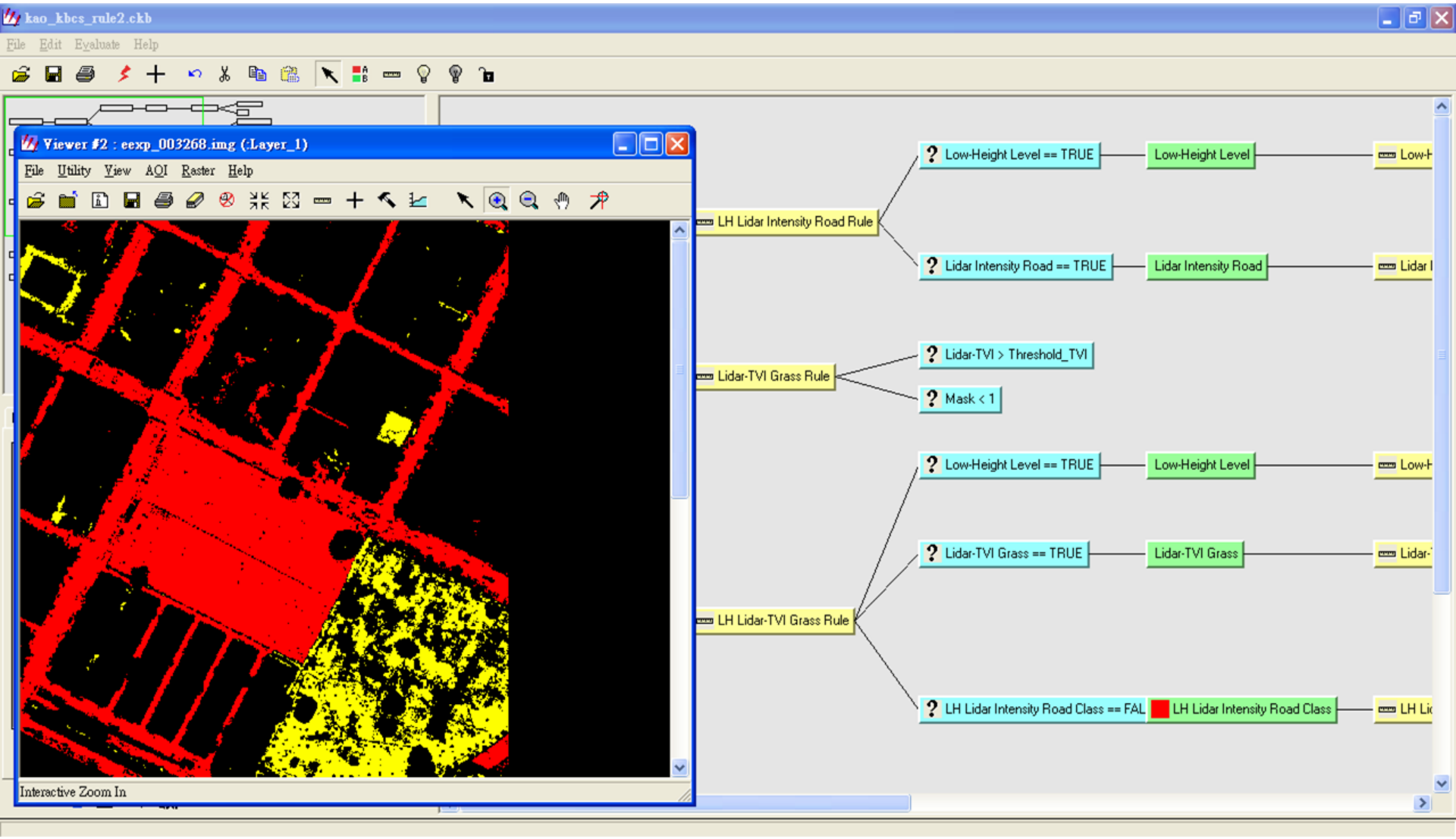
(c) The extracted trees


A knowledge- and segment-based vertical stratification, rule-based classification, and aggregation schemes
Discriminative Models
Knowledge Base
Lidar Data
Aerial Imagery
nDSM
nDSM=DSM-DEM
DEM
DSM
Real World
Rules
Rules
Rules
Segmentation
Buildings
Trees
High-Height Level
Aggregation
Segmentation
Trees
Grass
Roads
Mid-Height Level
Aggregation
Segmentation
Grass
Roads
Low-Height Level
Rule-Based Classification

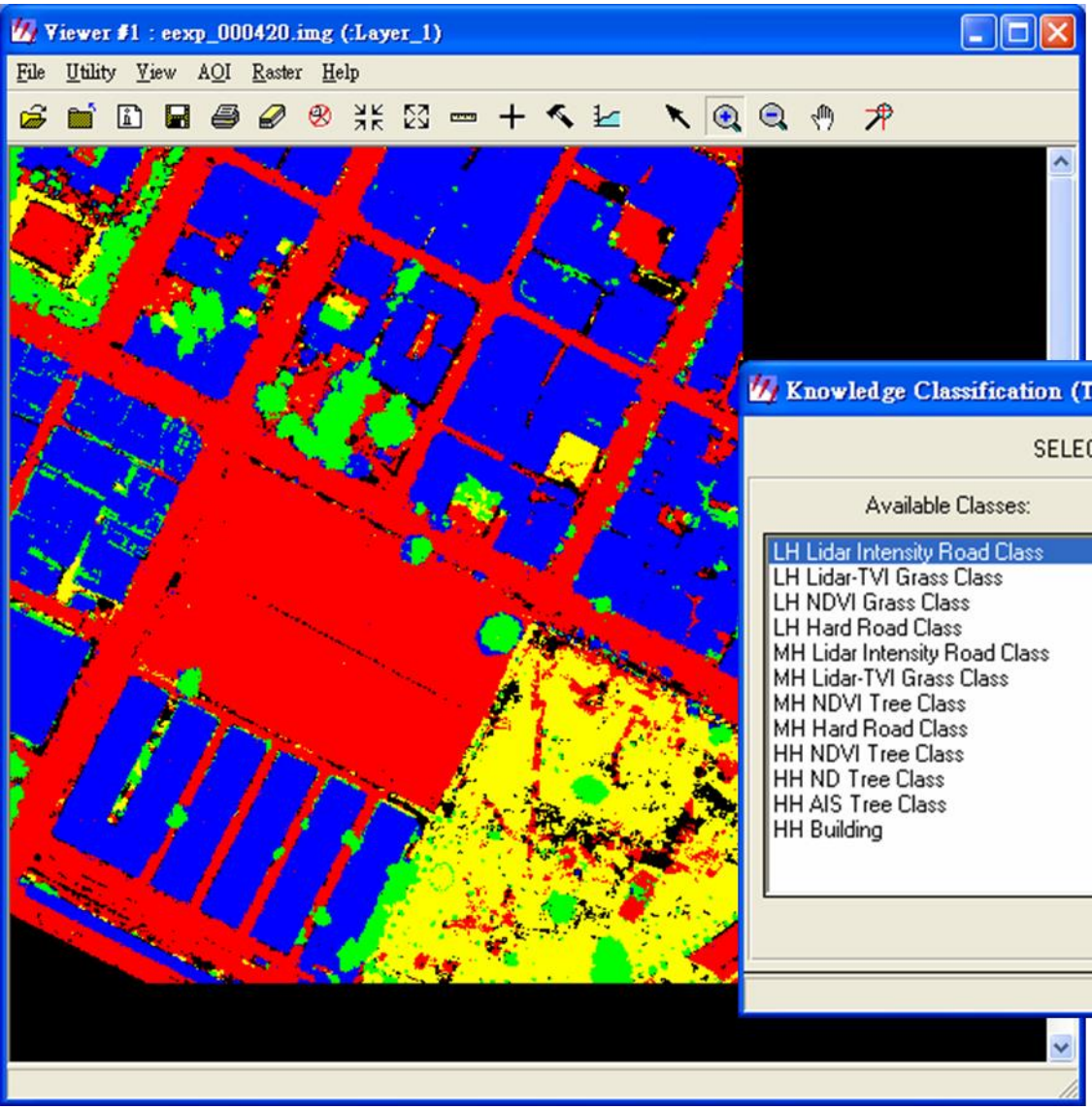
ERDAS Implementation

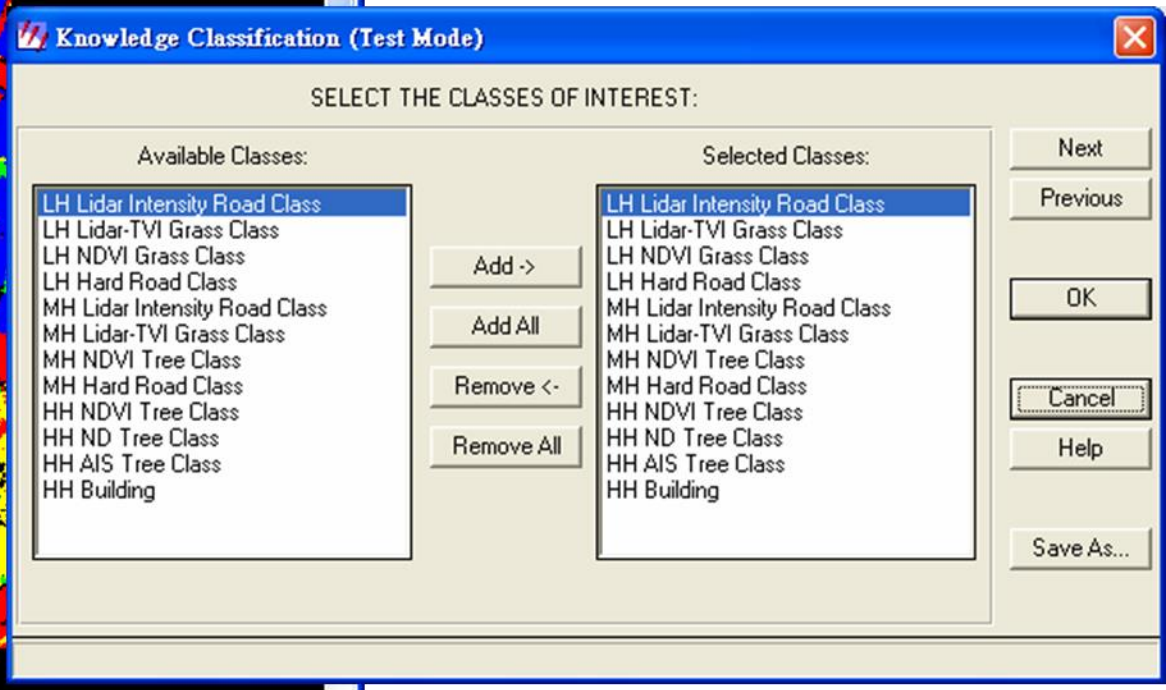


Low-Height Classification



KBCS Classification Result

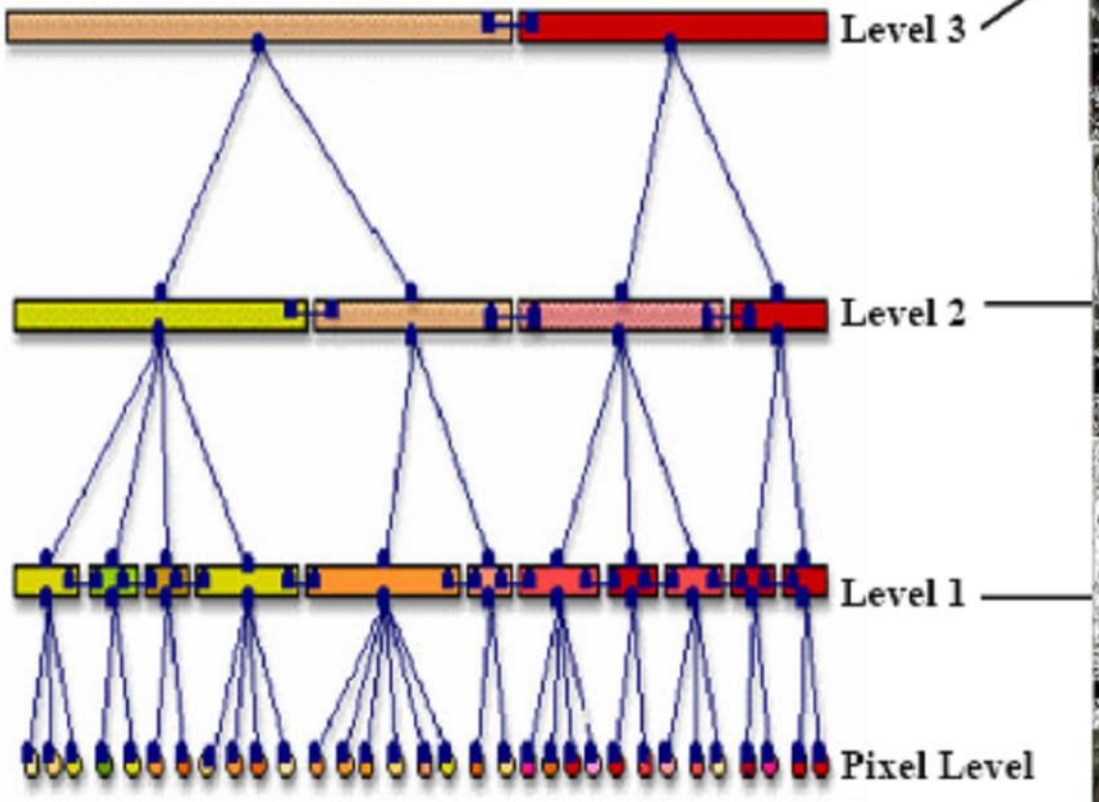




Object-Based Classification

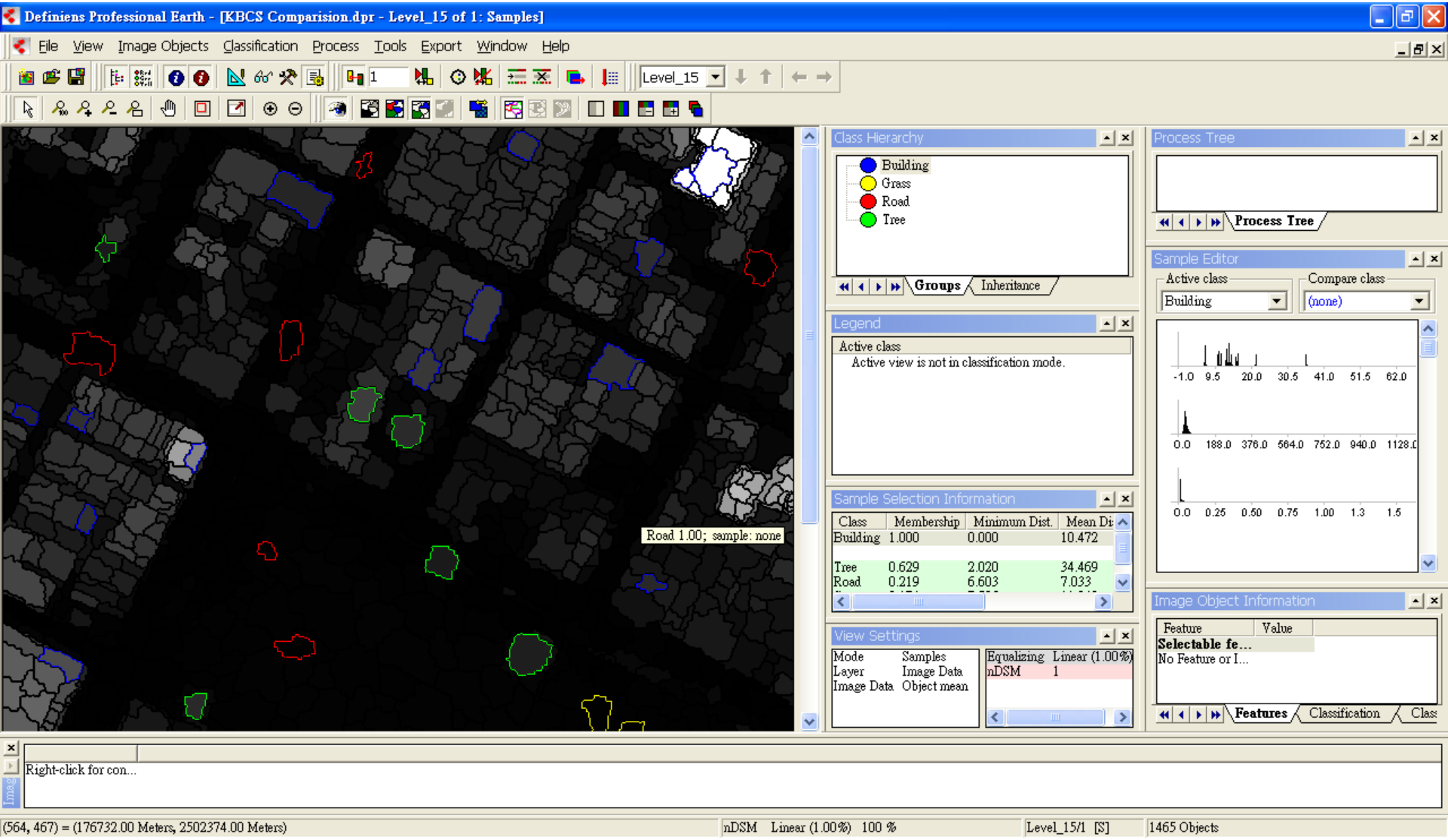
整體：同中求異

局部；異中求同

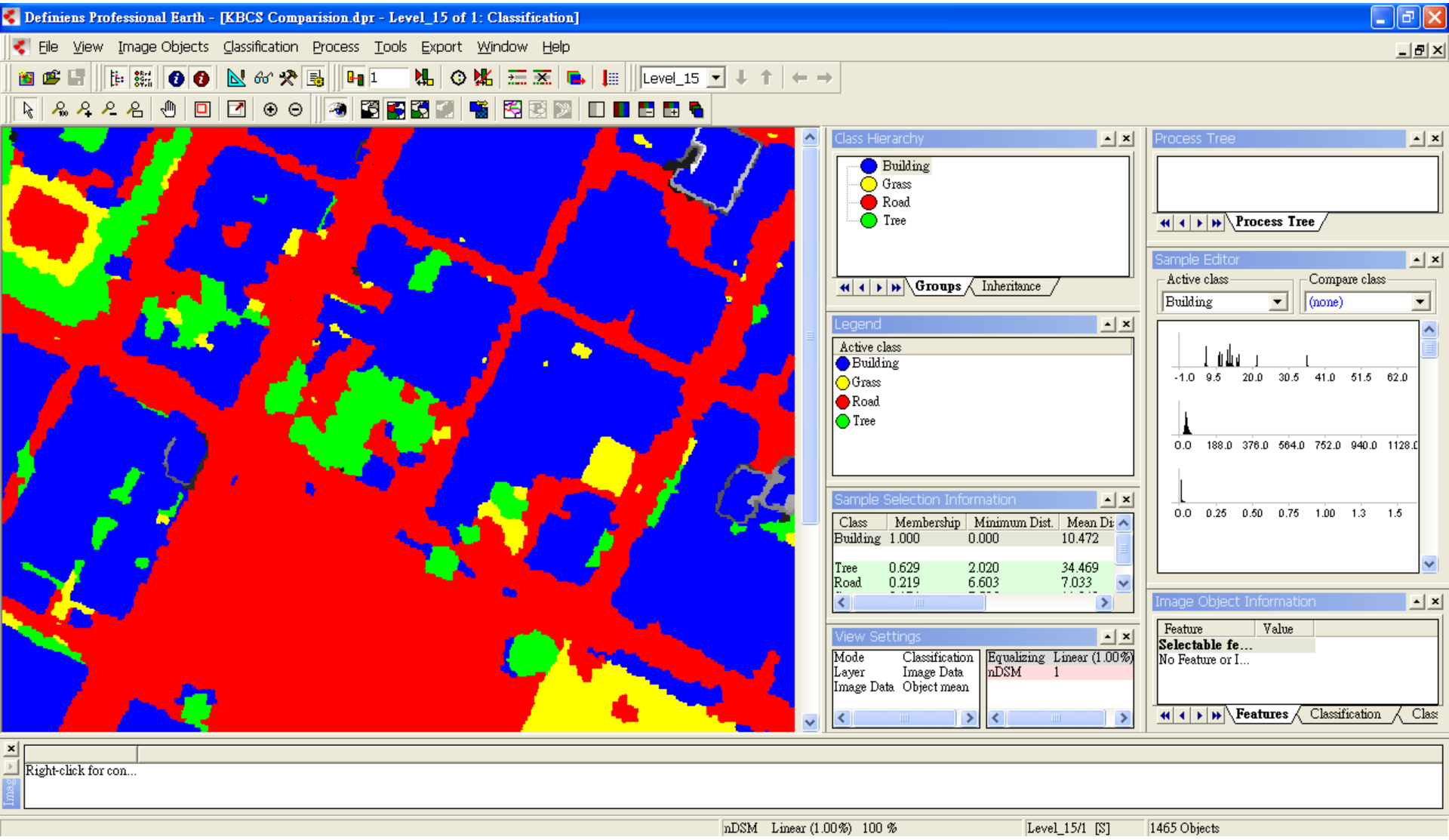


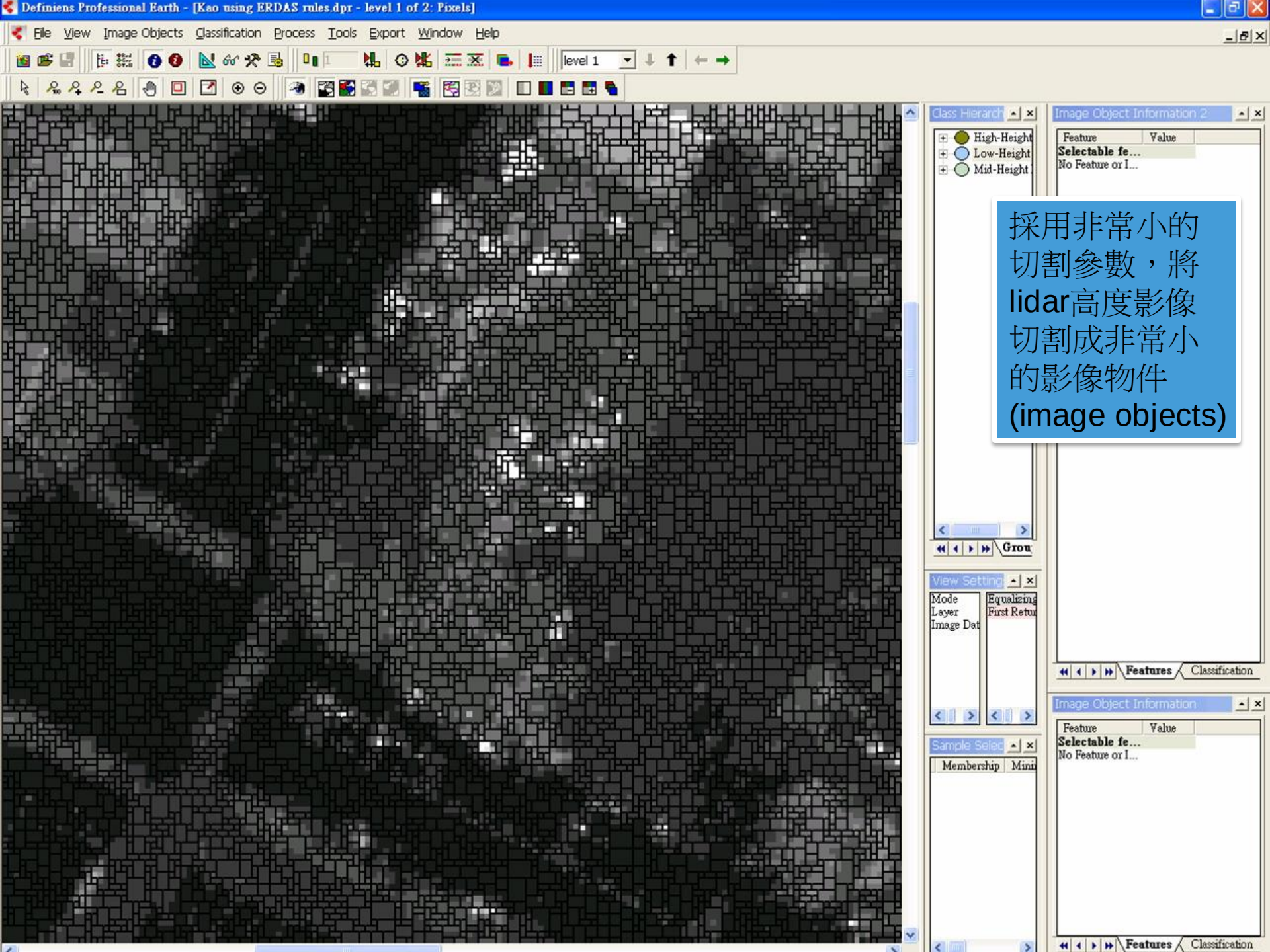
Hierarchical network of image segmentation

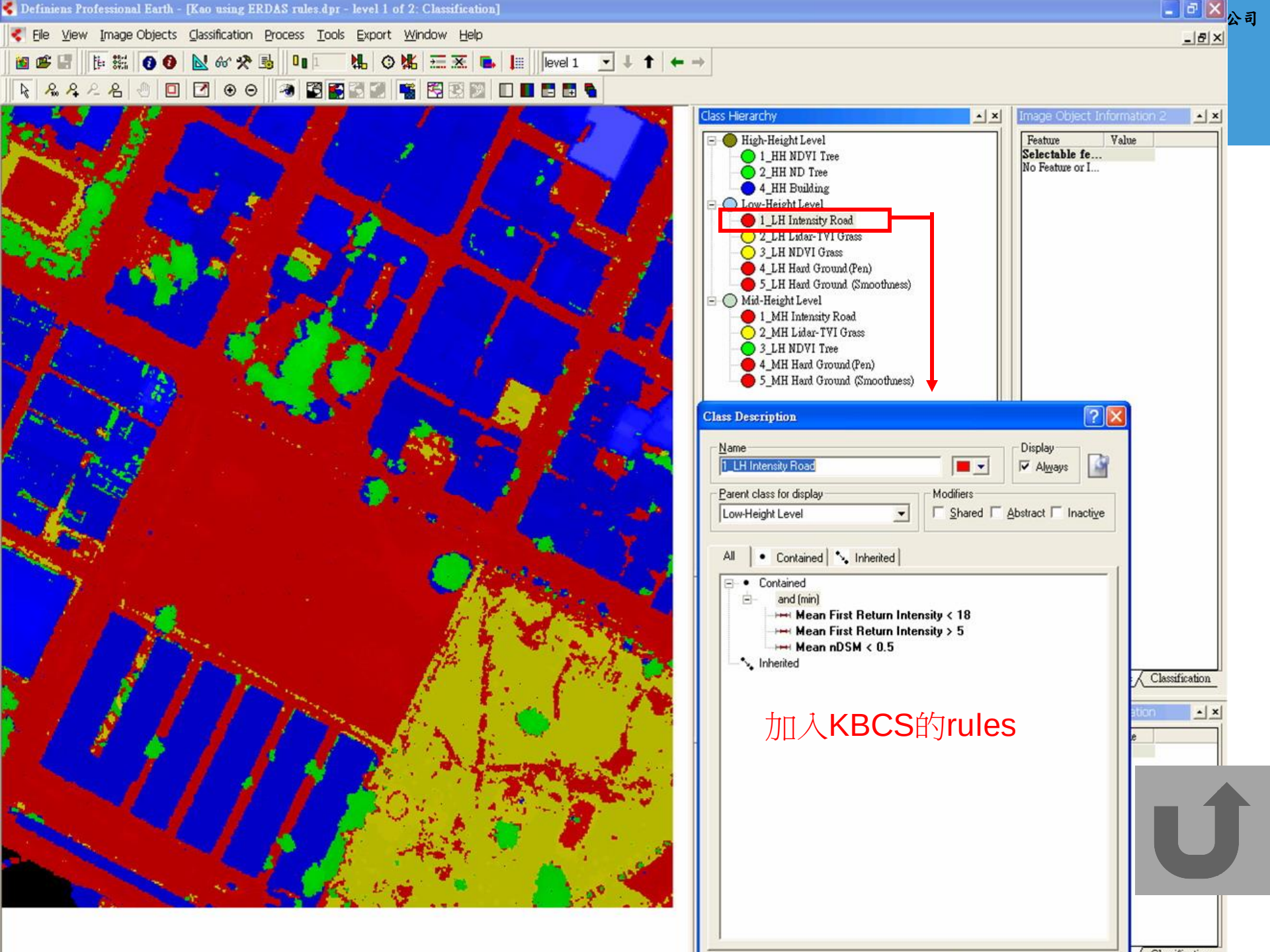
Image Segmentation and Training Samples



Object-Based Classification



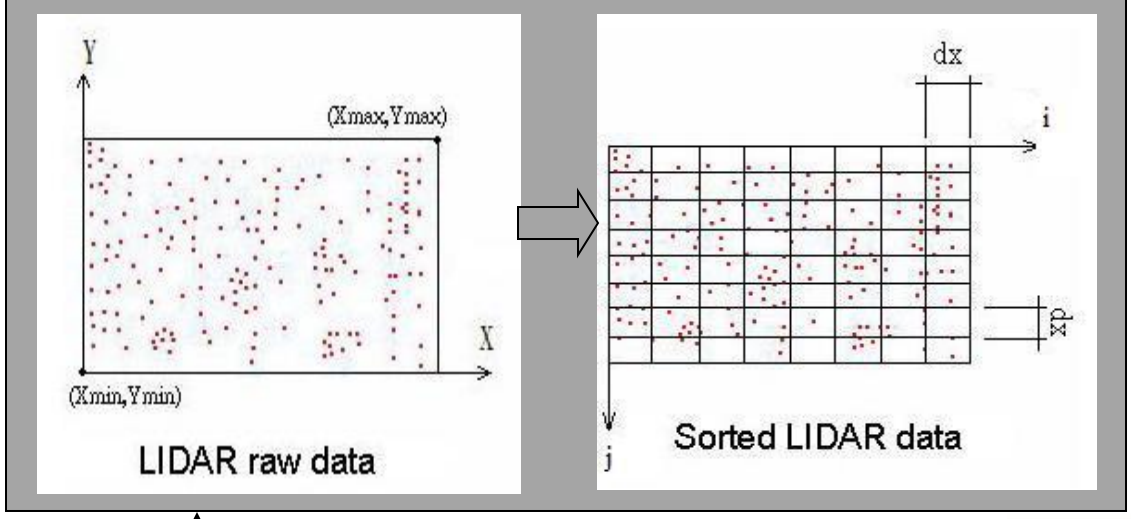

Definiens Professional Earth - [Kao using ERDAS rules.dpr - level 1 of 2: Pixels]
File View Image Objects Classification Process Tools Export Window Help
level 1
Class Hierarch
High-Height
Low-Height
Mid-Height
Image Object Information 2
Feature Value
Selectable fe...
No Feature or I...
採用非常小的切割參數，將lidar高度影像切割成非常小的影像物件(image objects)
View Setting
Mode
Layer
Image Dat
Equalizing
First Retu
Sample Selec
Membership
Features
Classification
Image Object Information
Feature Value
Selectable fe...
No Feature or I...
Features
Classification

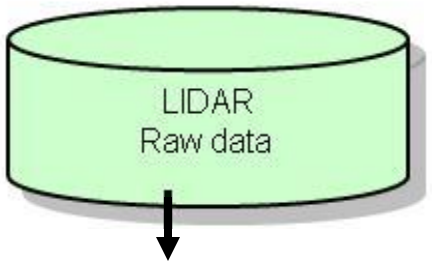

Definiens Professional Earth - [Kao using ERDAS rules.dpr - level 1 of 2: Classification]
File View Image Objects Classification Process Tools Export Window Help
level 1
Class Hierarchy
High-Height Level
1_HH NDVI Tree
2_HH ND Tree
4_HH Building
Low-Height Level
1_LH Intensity Road
2_LH Lidar-TVI Grass
3_LH NDVI Grass
4_LH Hard Ground (Pen)
5_LH Hard Ground (Smoothness)
Mid-Height Level
1_MH Intensity Road
2_MH Lidar-TVI Grass
3_LH NDVI Tree
4_MH Hard Ground (Pen)
5_MH Hard Ground (Smoothness)
Image Object Information 2
Feature
Value
Selectable fe...
No Feature or I...
Class Description
Name
1_LH Intensity Road
Display
Always
Parent class for display
Low-Height Level
Modifiers
Shared
Abstract
Inactive
All
Contained
Inherited
Contained
and (min)
Mean First Return Intensity < 18
Mean First Return Intensity > 5
Mean nDSM < 0.5
Inherited
加入KBCS的rules
Classification

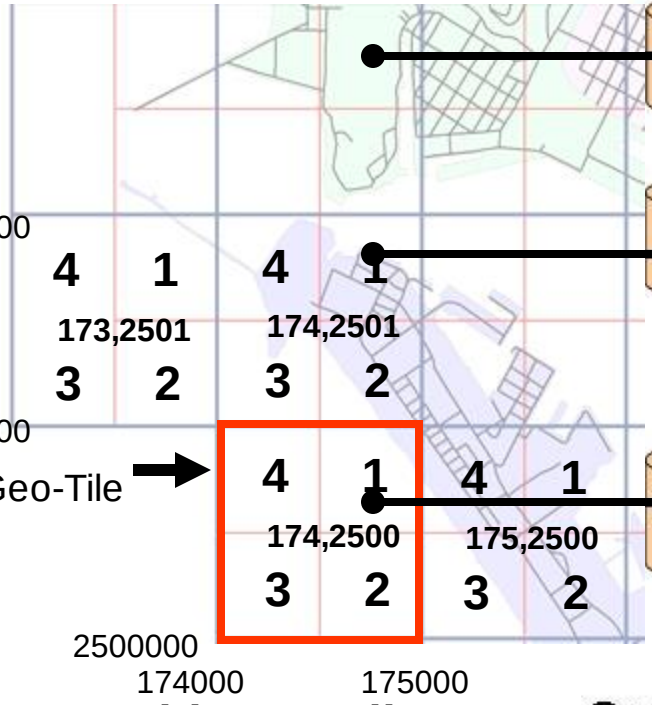
程式設計心法/處事方法

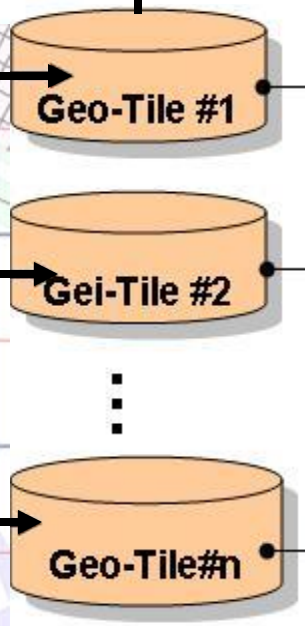
- Design Pattern
- Divide and conquer
  - 分進合擊，各個擊破
  - 大事化小，小事化無
- 五個分
  - 分析問題
  - 分割問題
  - 分配工作
  - 分散式作業
  - 分享資源與想法
- 簡單原則

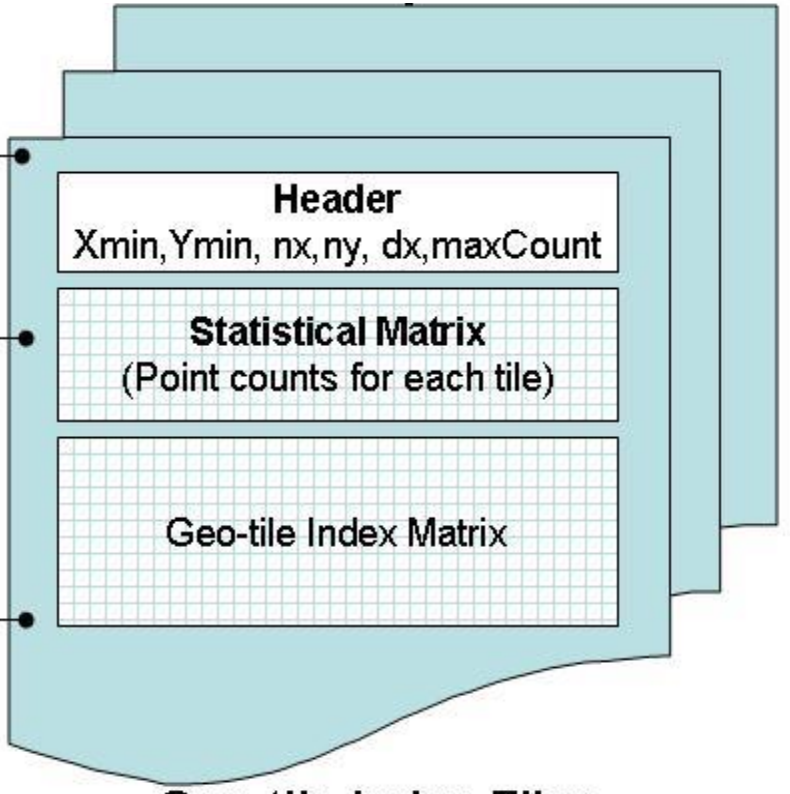
LiDAR資料索引







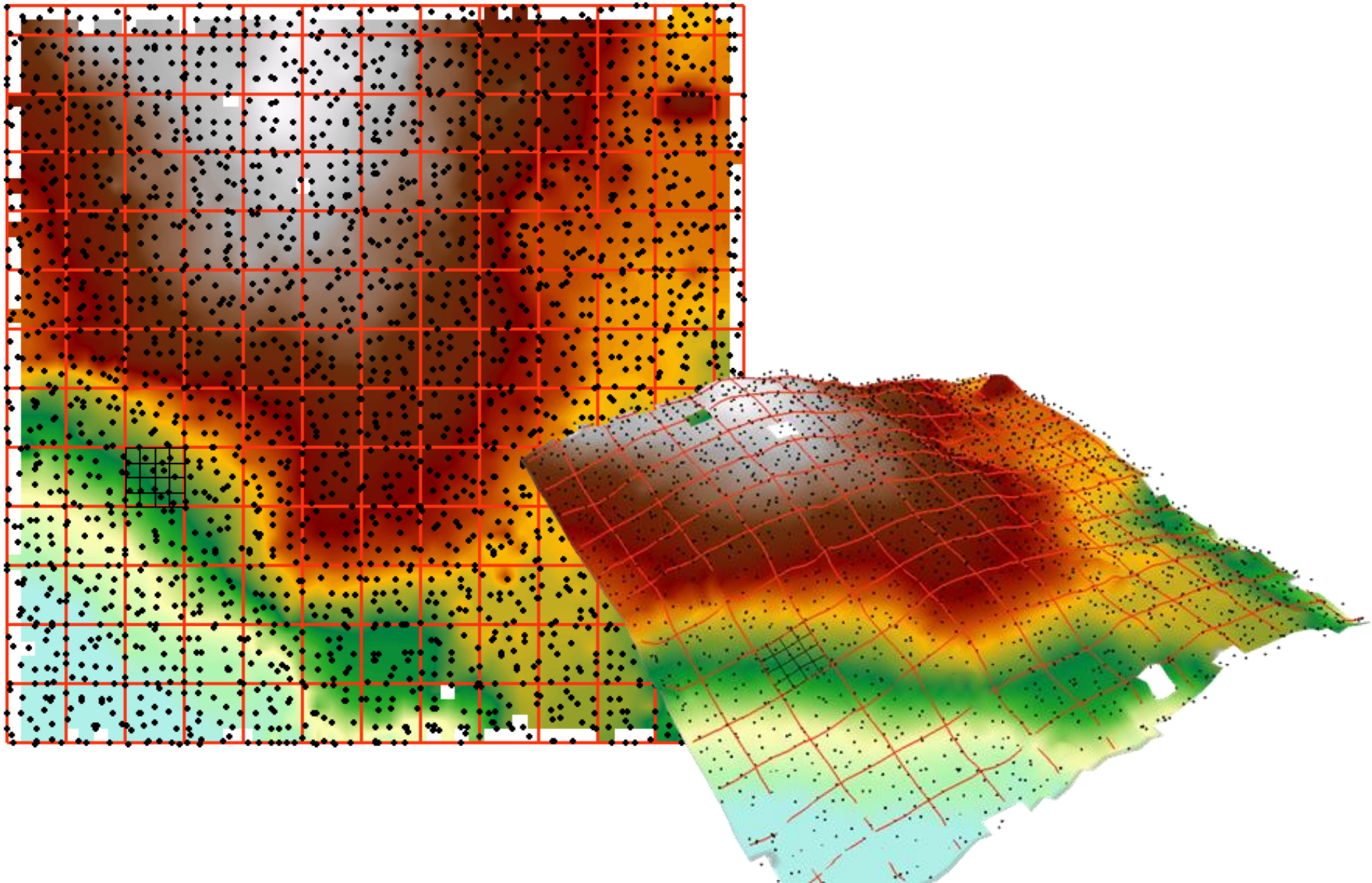




Geographic Coordinates **Geo-tile Data Files** **Geo-tile Index Files**

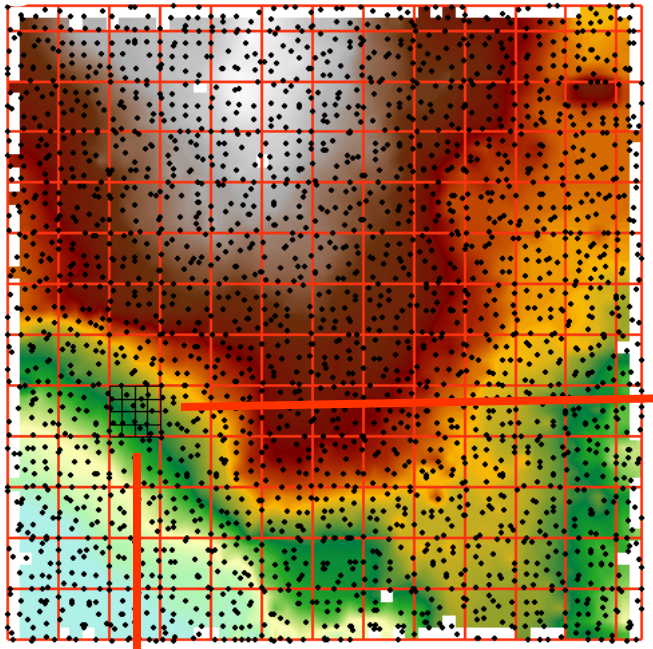
層次式逐區二階多項式曲面地物濾除演算法

HPSOFA: patchwise second-order polynomial surface filtering algorithm

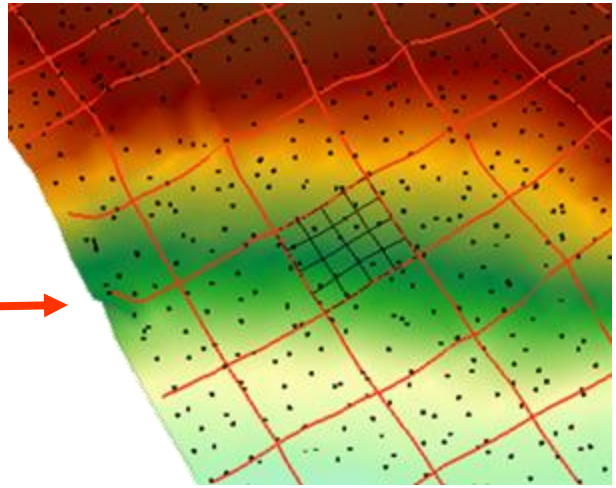


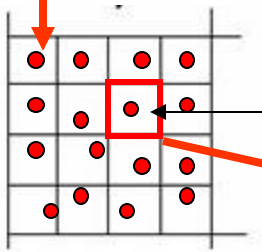
層次式逐區二階多項式曲面地物濾除演算法

HPSOFA: patchwise second-order polynomial surface filtering algorithm



$$Z = a_1 + a_2 X + a_3 Y + a_4 XY + a_5 X^2 + a_6 Y^2$$



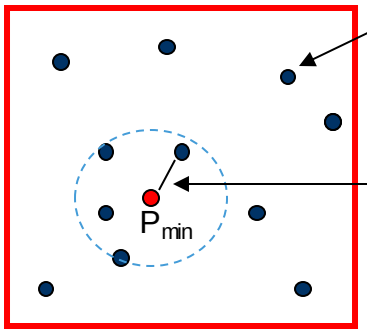


block(*i,j*)

Each tile is dived to 4 by 4 small blocks

Low point selection algorithm

block(*i,j*)



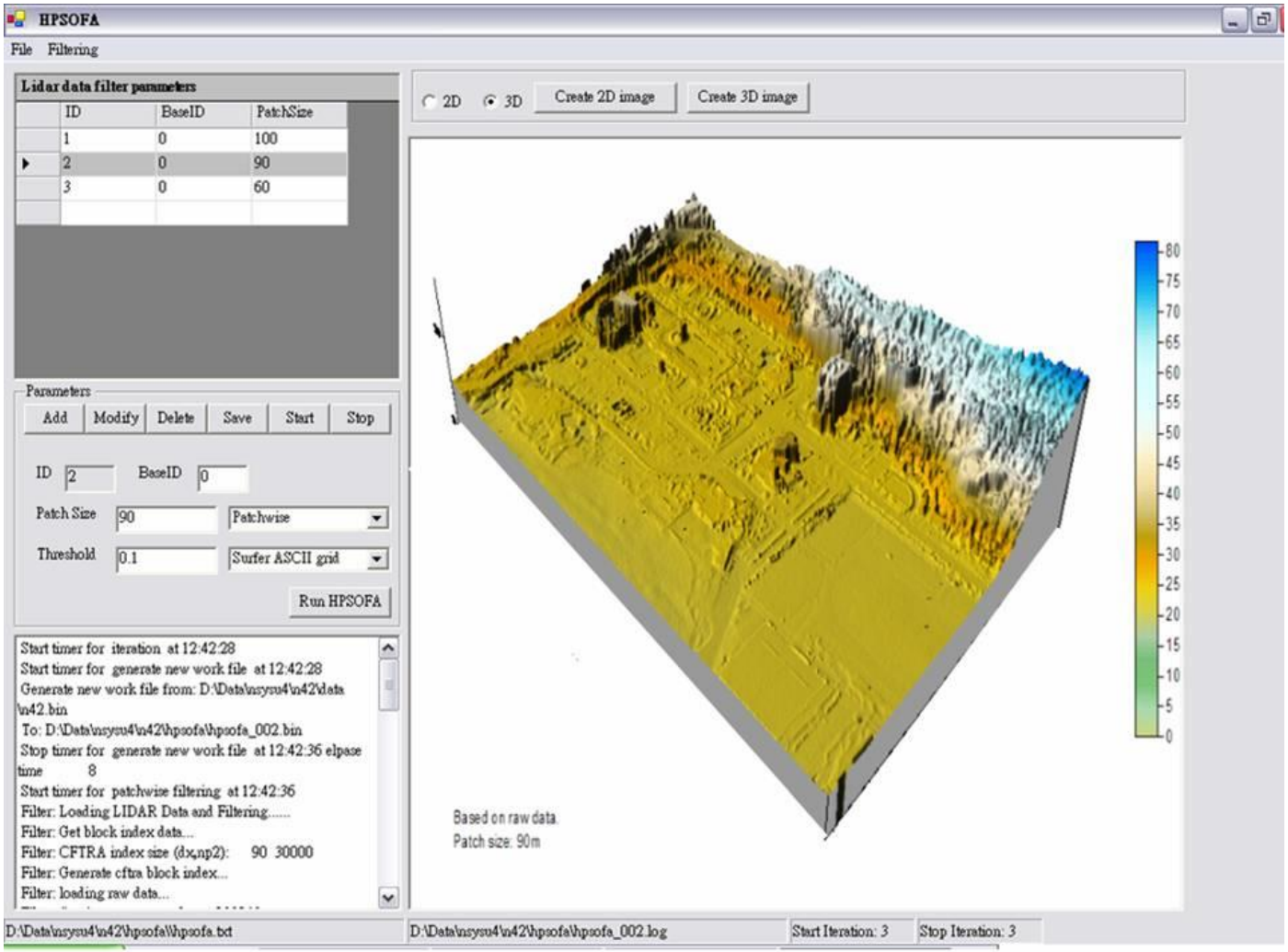
$P(i,j)_k$: *a point in block(i,j)*

$P(i,j)_{Hmin}$: *lowest point in block(i,j)*

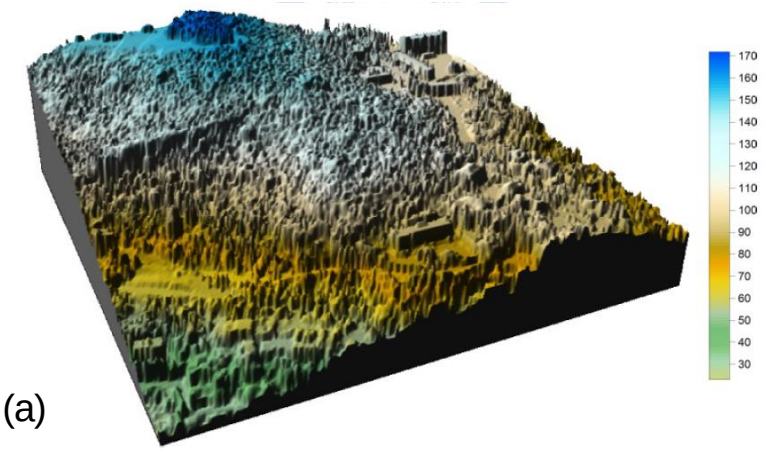
$D(i,j)_k$: *distance between* $P(i,j)_k$ *and* $P(i,j)_{Hmin}$

$N(i,j)_{low}$: total number of points with $D(i,j)_k < 1$m

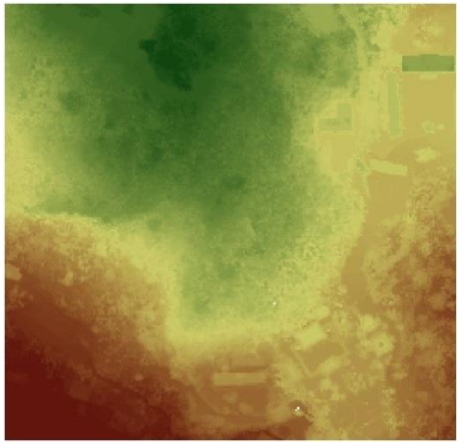
LiDAR資料地物濾除系統(3D)



Forest area LiDAR filtering result

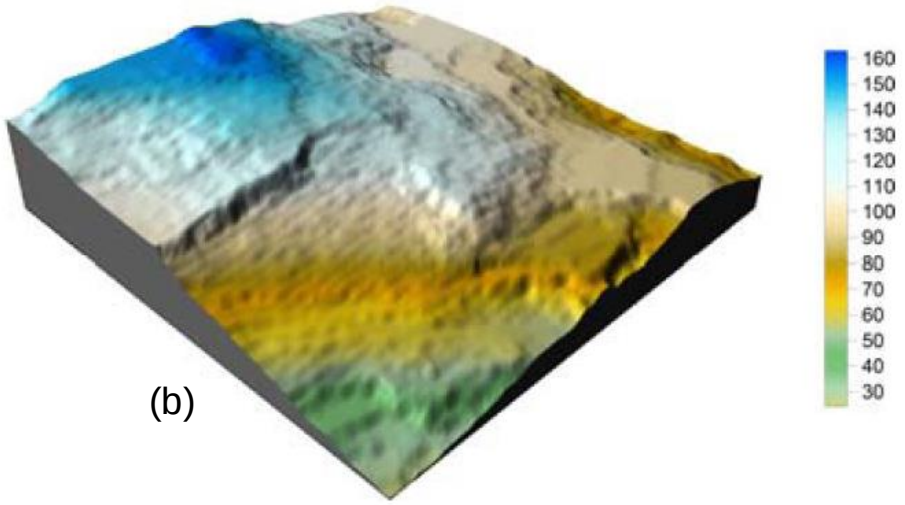


(a)



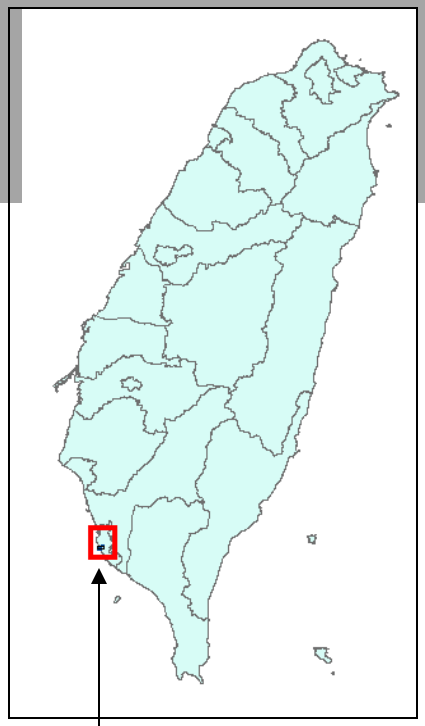
Forest Area

Points: 628740 (points)
Point Density: 2.515 (points/m2)
Patch Sizes: 40m, 30m, 20m, 10m

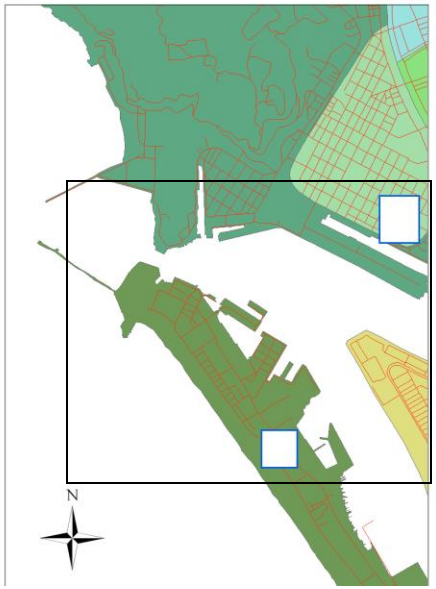


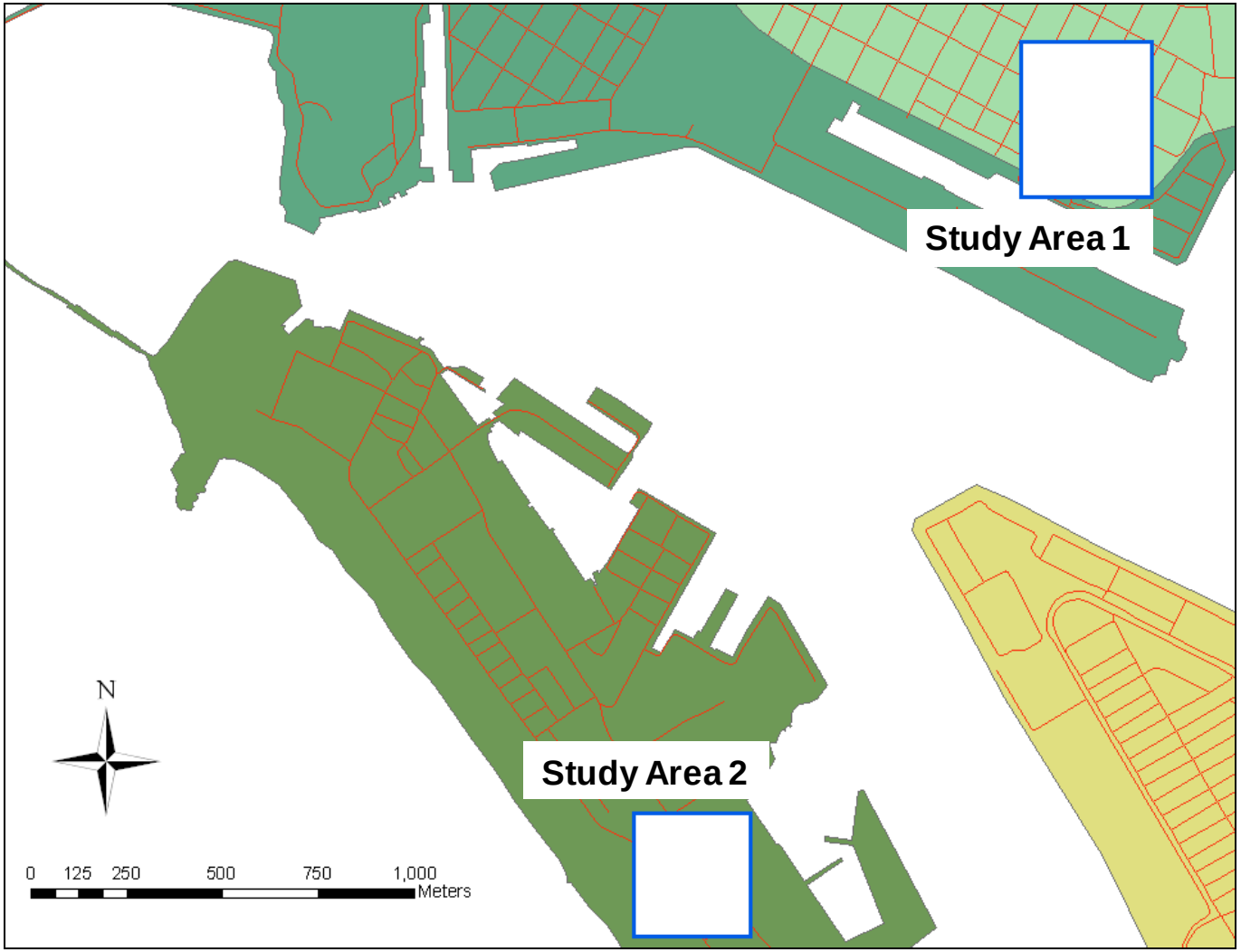
(b)

研究區域
Study Areas



Kaohsiung City





LiDAR
First return height

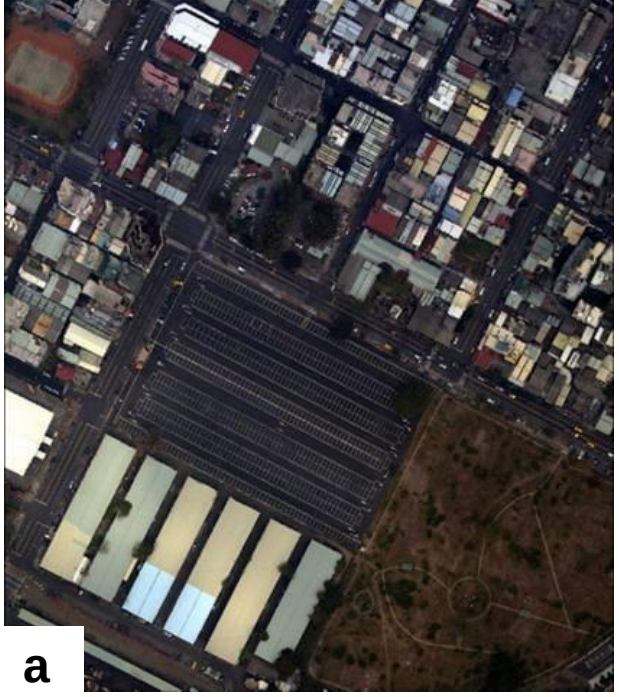
第一次脈衝高度
X:174000-177000
Y:2501000-2503000
繪圖軟體: VB .NET

高雄市LiDAR測量

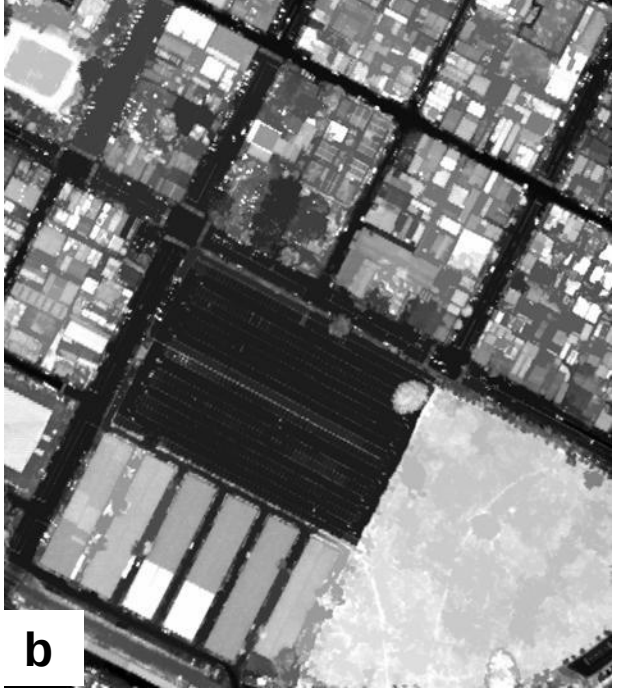
測量單位: 中興測量

測量期間:

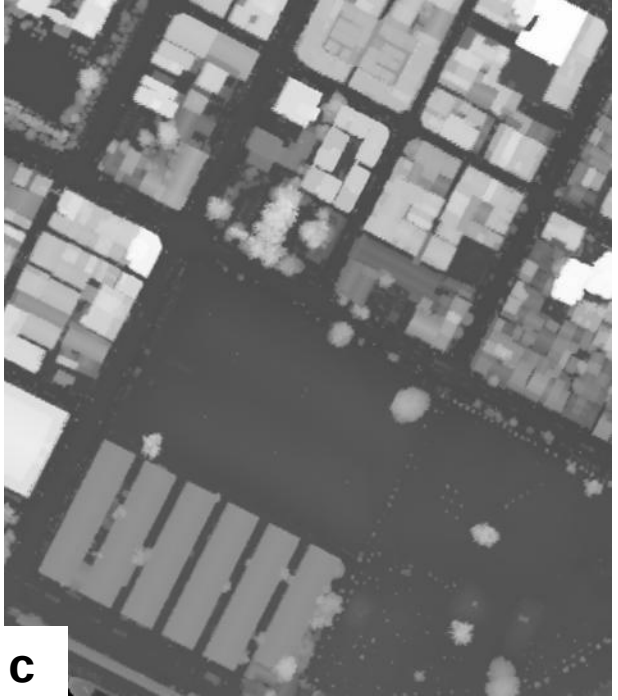
2005/02/01-2005/02/05



a



b



c

d

e

Study Area 1

a: 2005-Feb Color Aerial Imagery

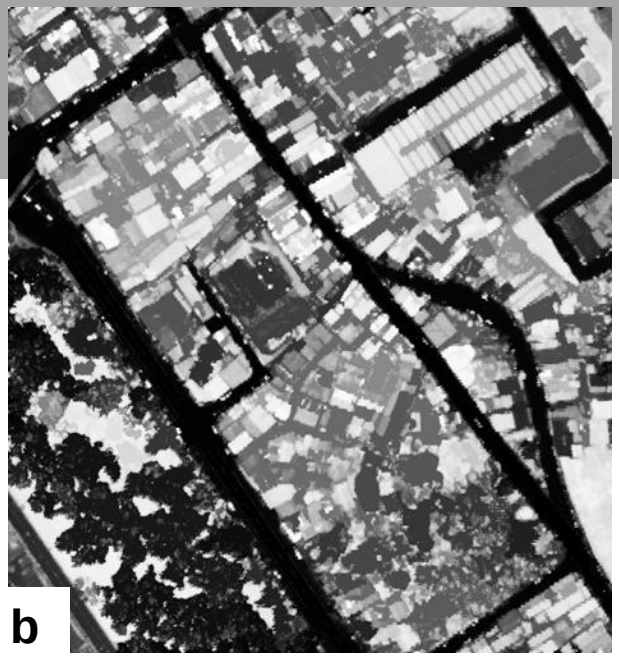
b: 2005-Feb lidar intensity

c: 2005-Feb lidar nDSM

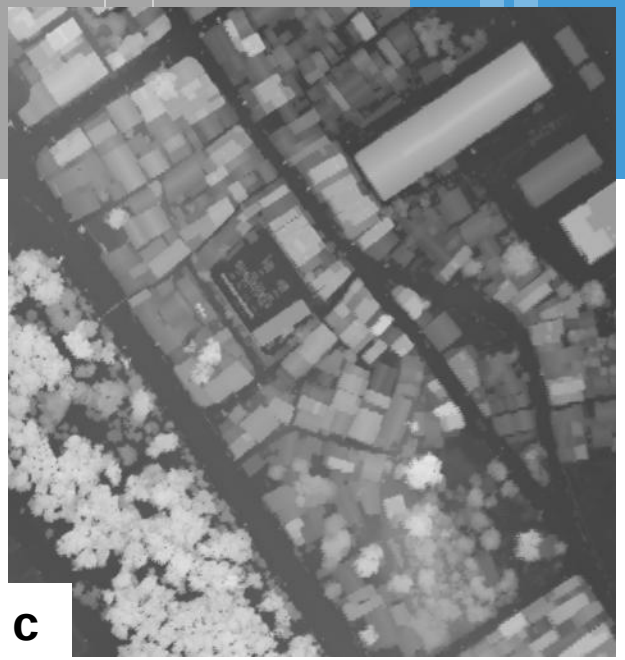
d: 2005-Dec Color Aerial Imagery

e: 2005-Dec CIR Aerial Imagery

a



b



c

d

e

Study Area 2

a: 2005-Feb Color Aerial Imagery

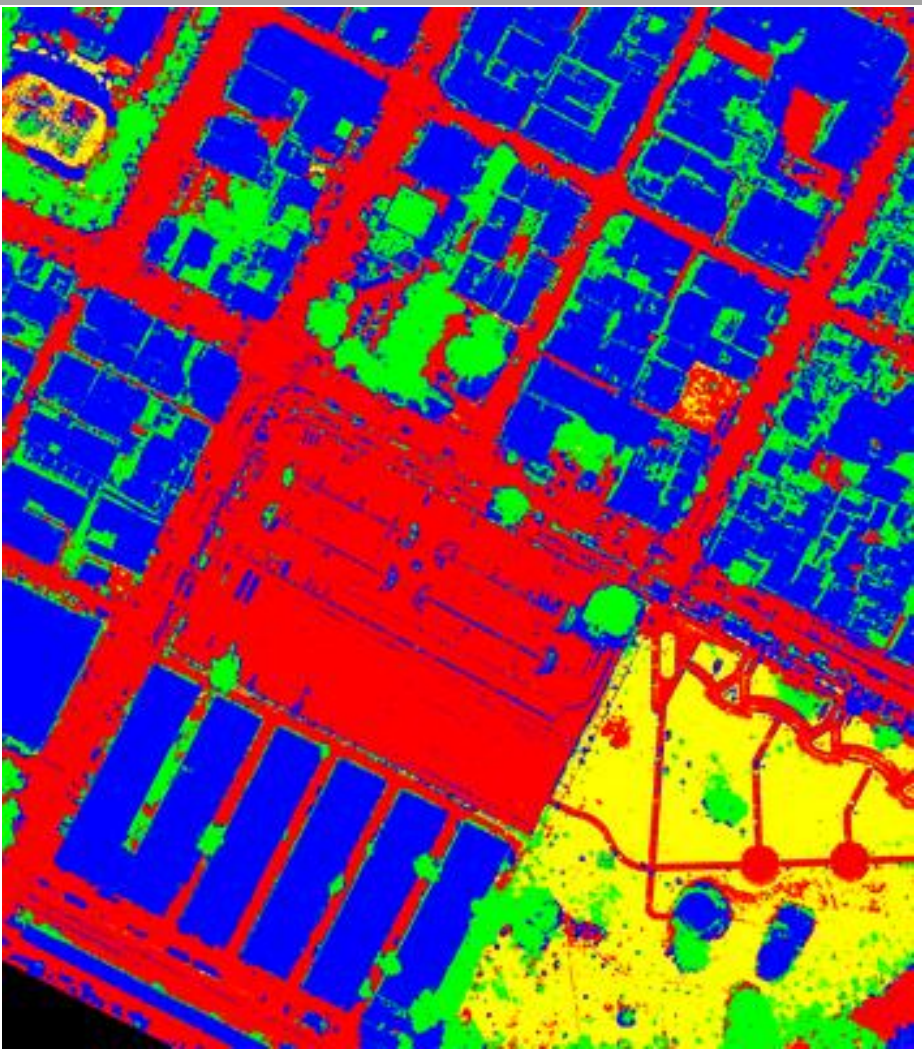
b: 2005-Feb lidar intensity

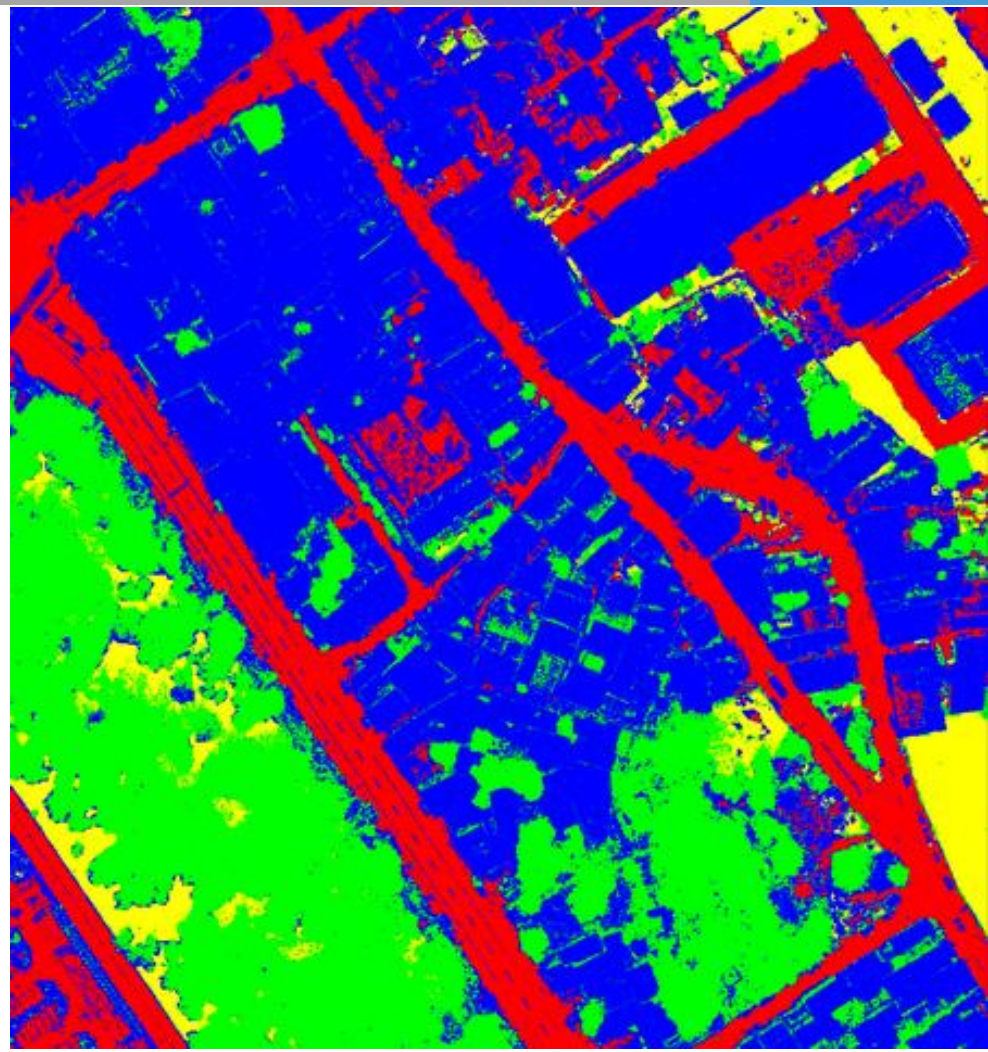
c: 2005-Feb lidar nDSM

d: 2005-Dec Color Aerial Imagery

e: 2005-Dec CIR Aerial Imagery

Maximum likelihood Classification



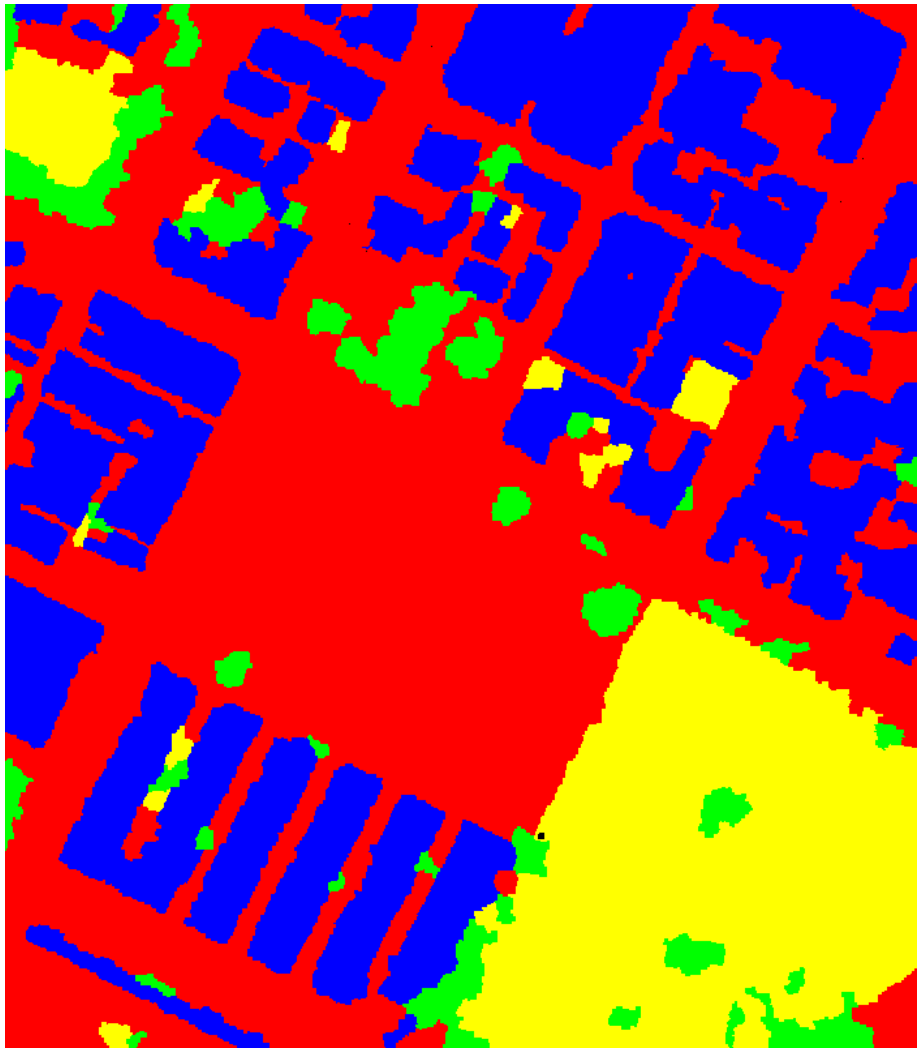


77.4%

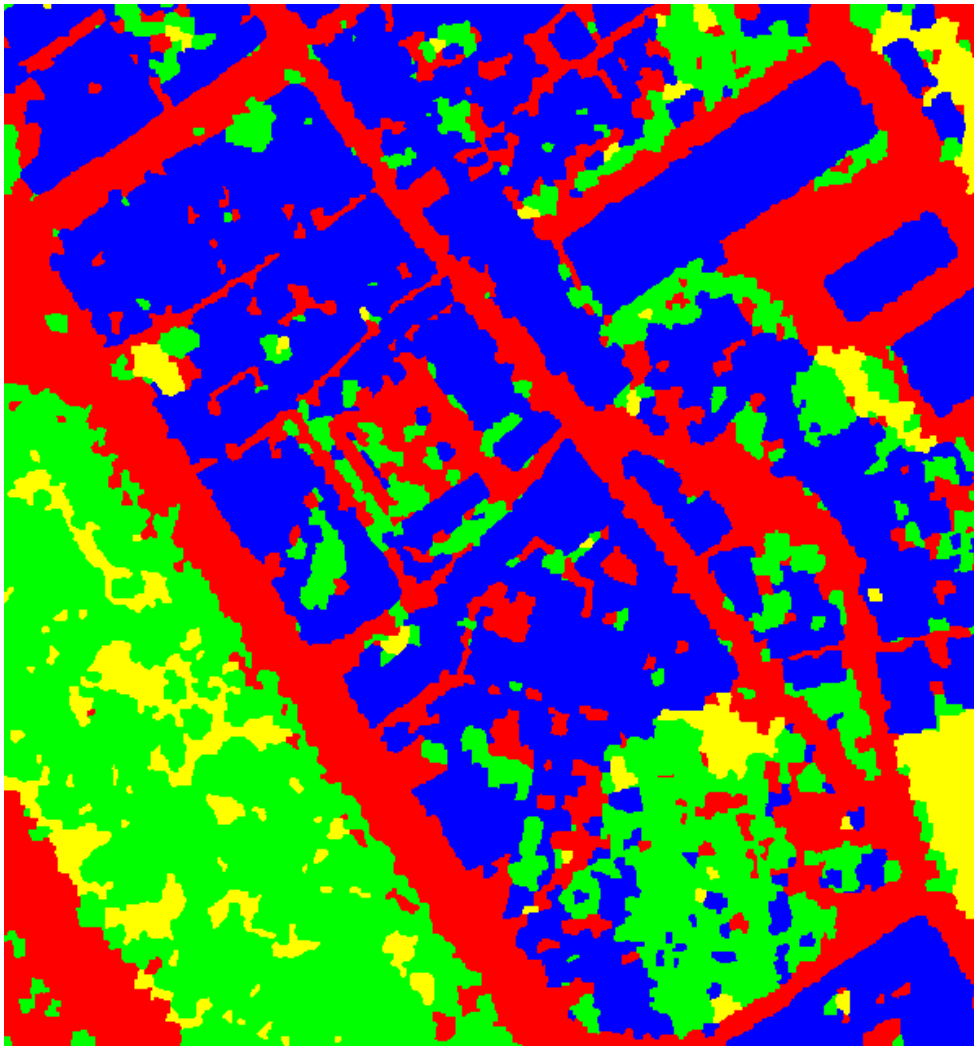
RGB + nDSM + Lidar intensity

84.3%

Object-Based Nearest Neighbor Classification

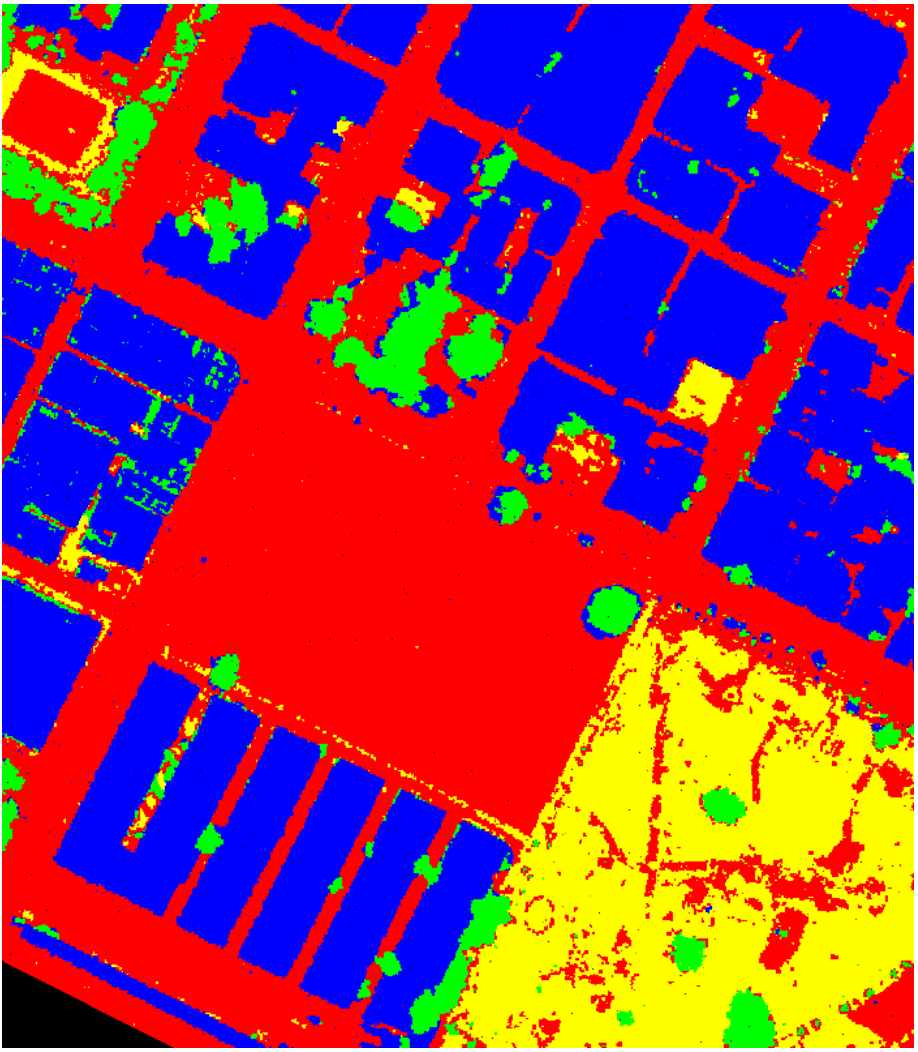


88.1%

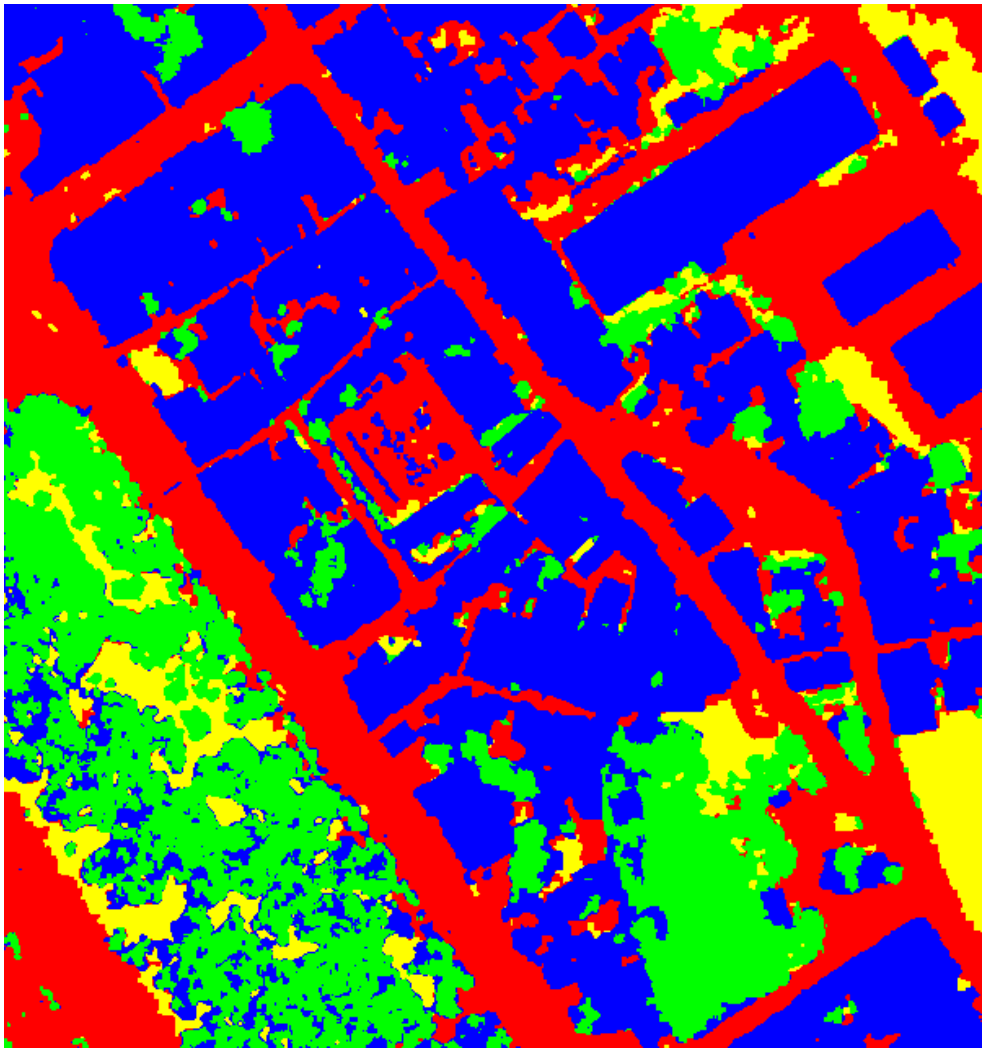


86.4%

Object-Based + KBCS Classification

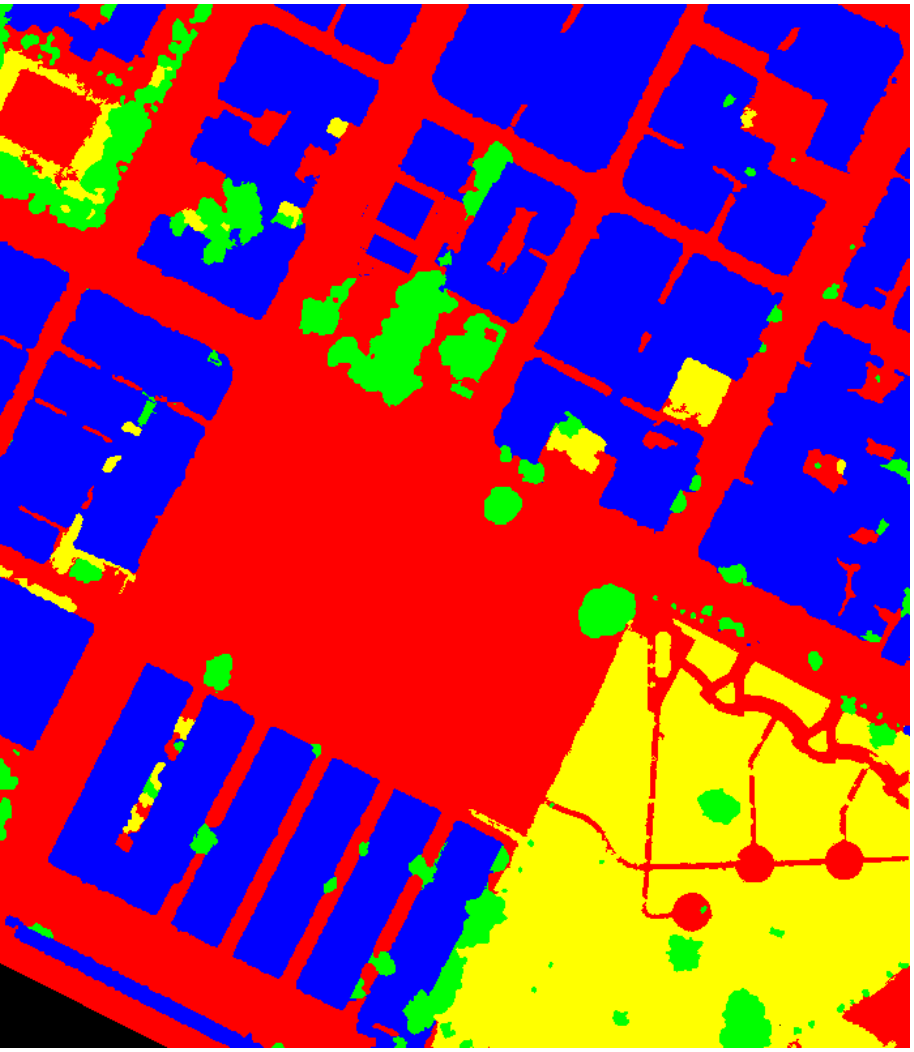


90.4%

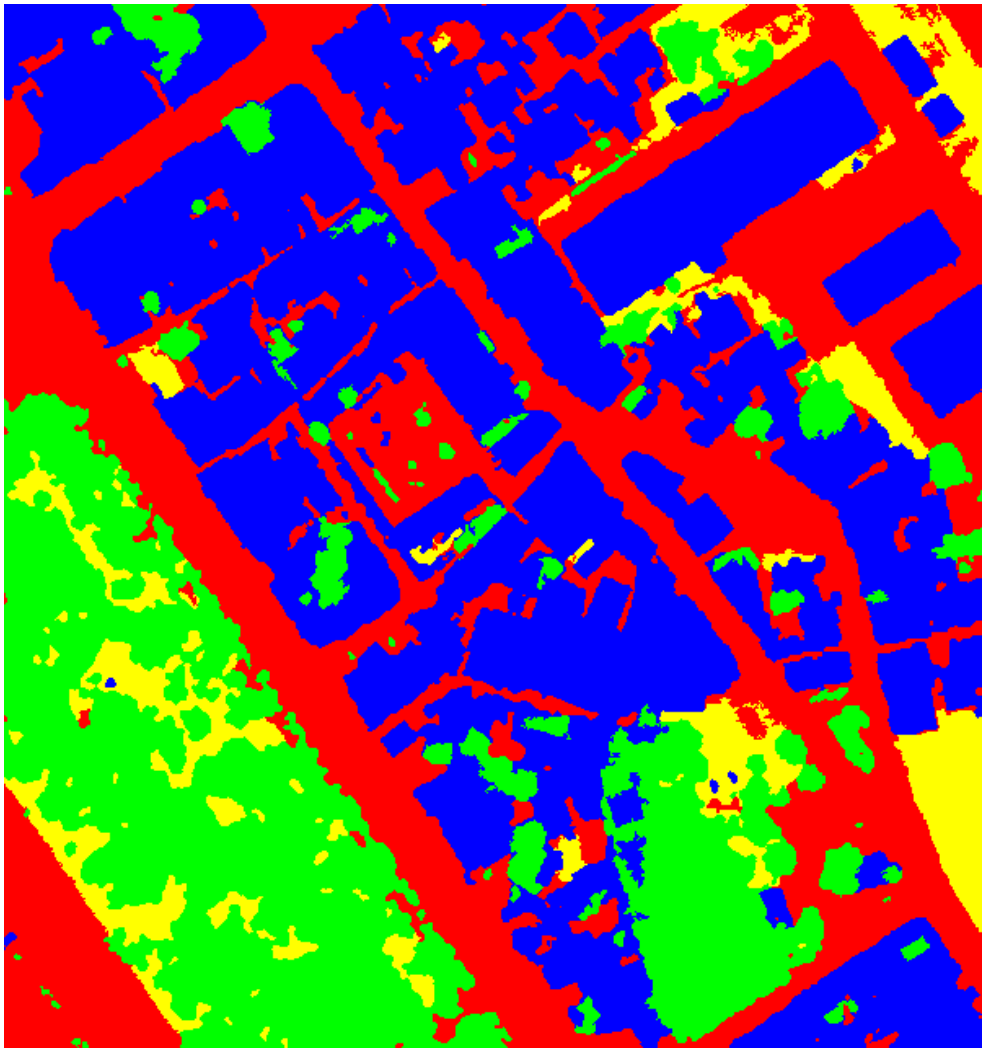


89.2%

KBCS Classification

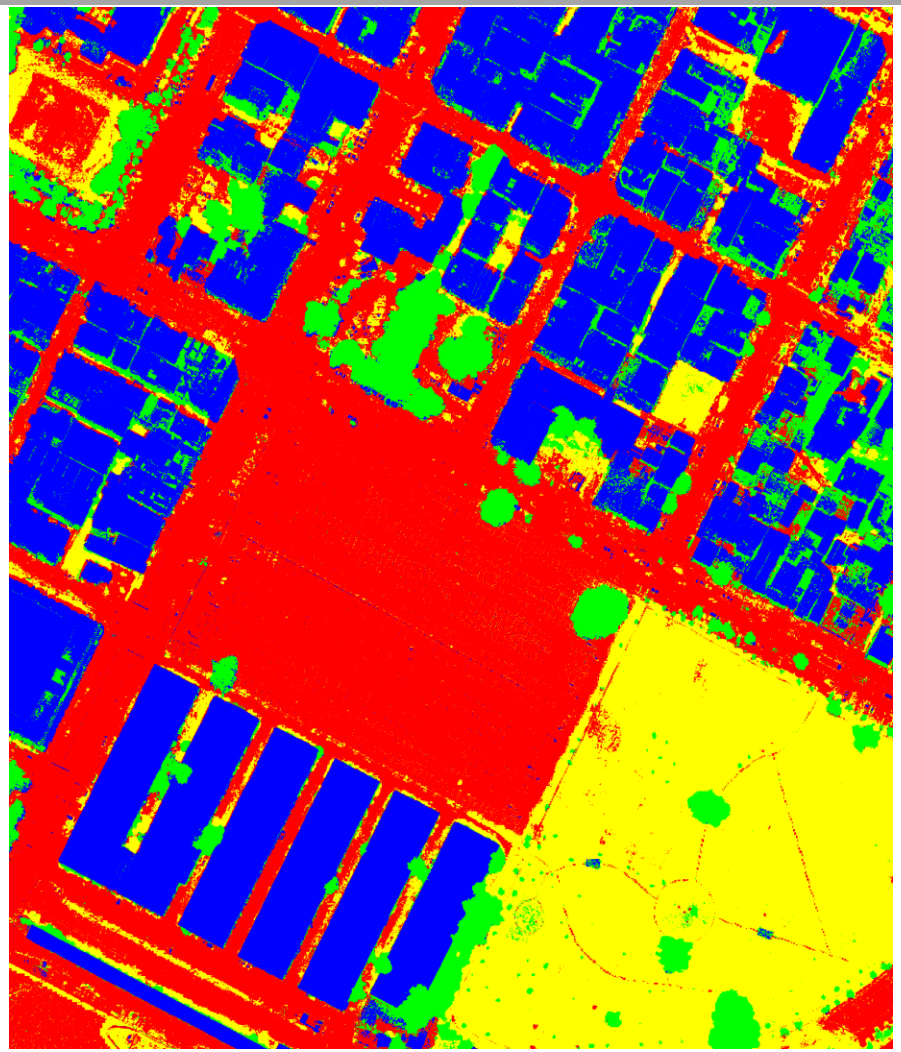


93.9%

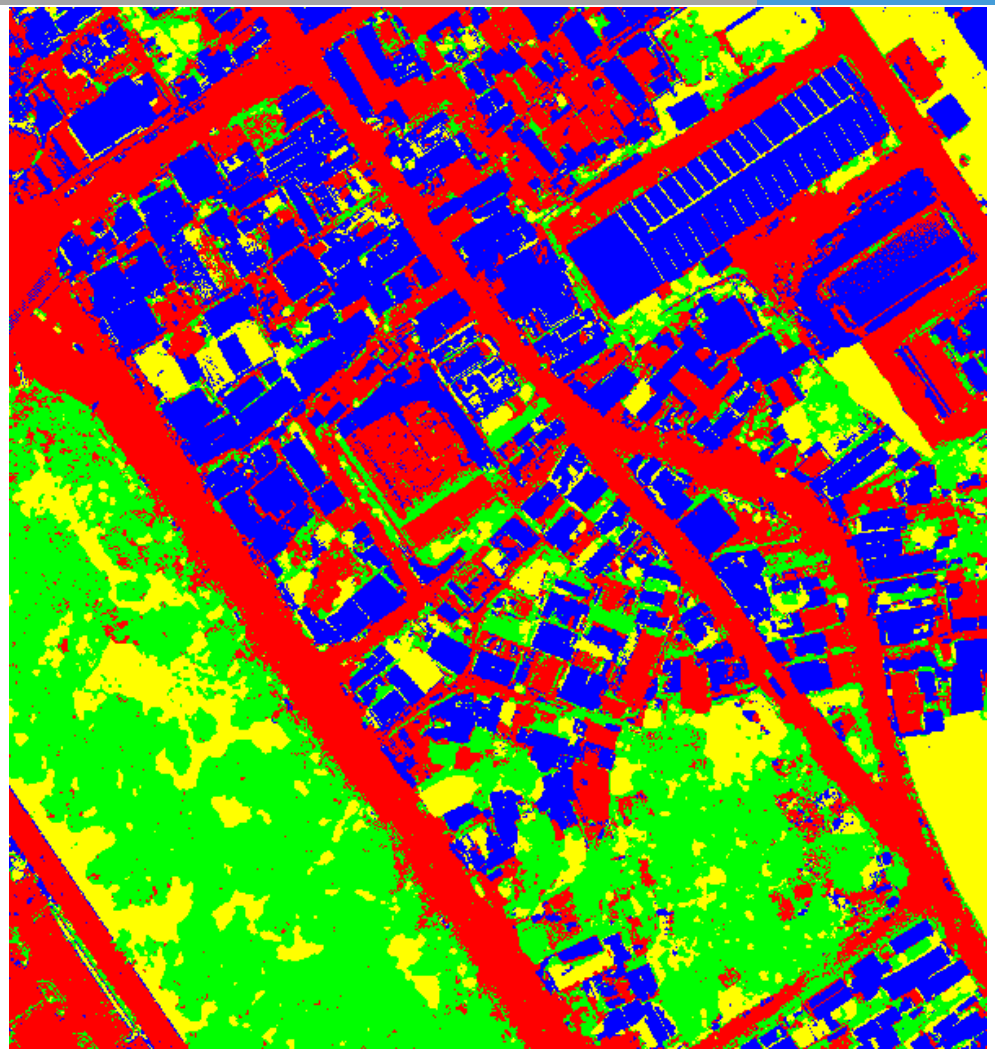


93.87%

ANN: Artificial Neural Network

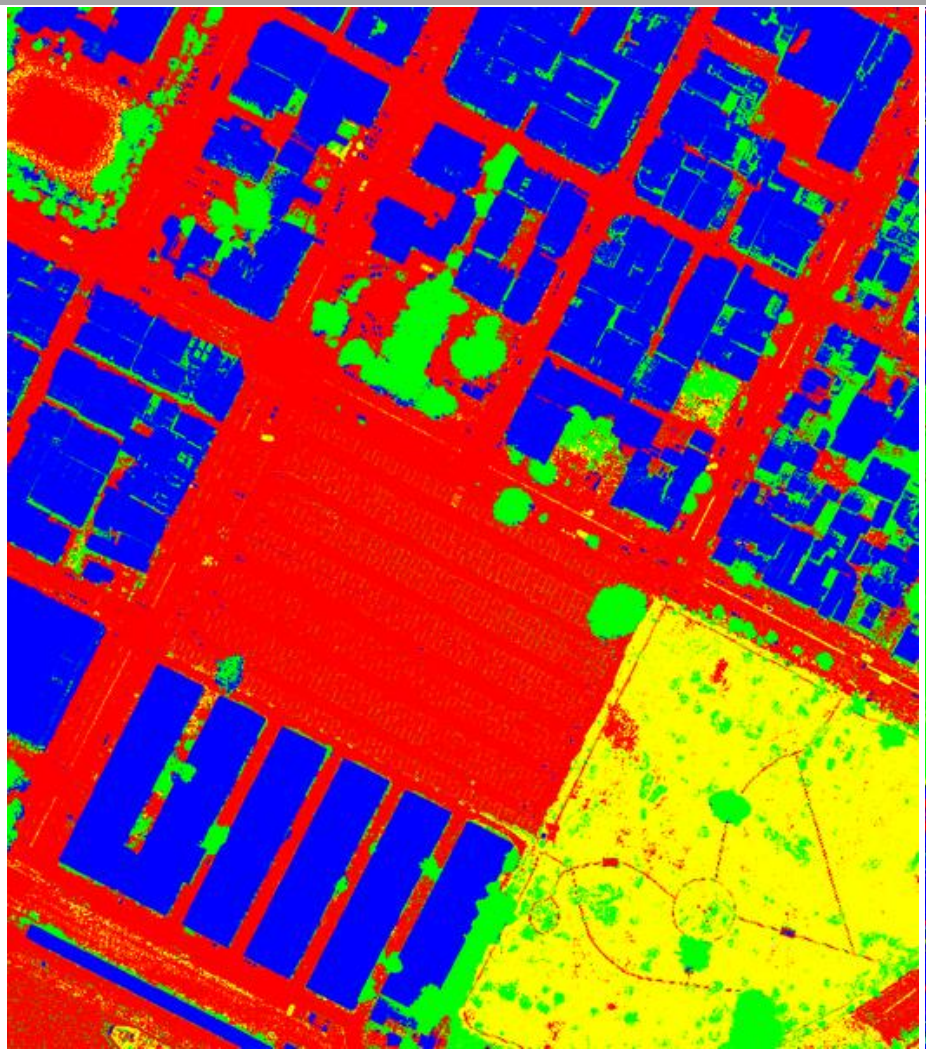


85.8%

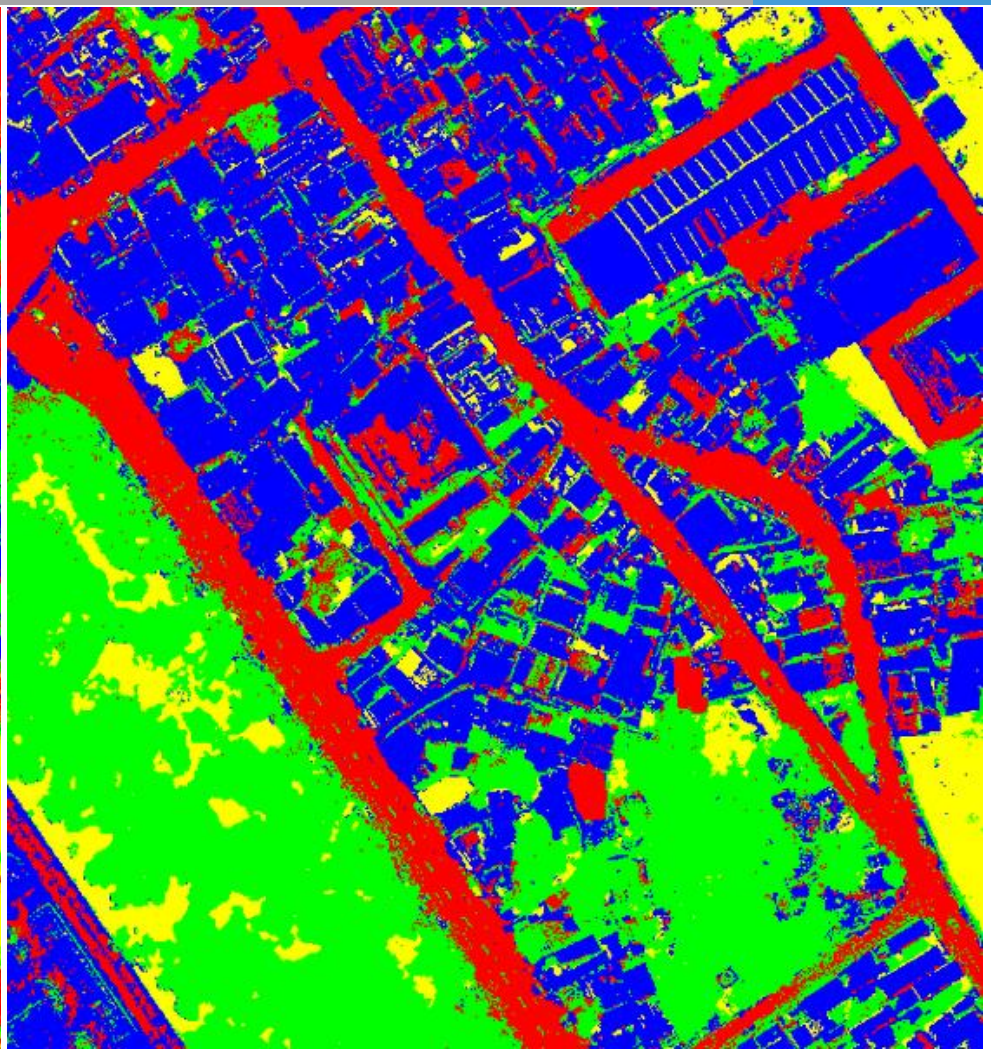


90.2%

SVM: Support Vector Machine



86.62%

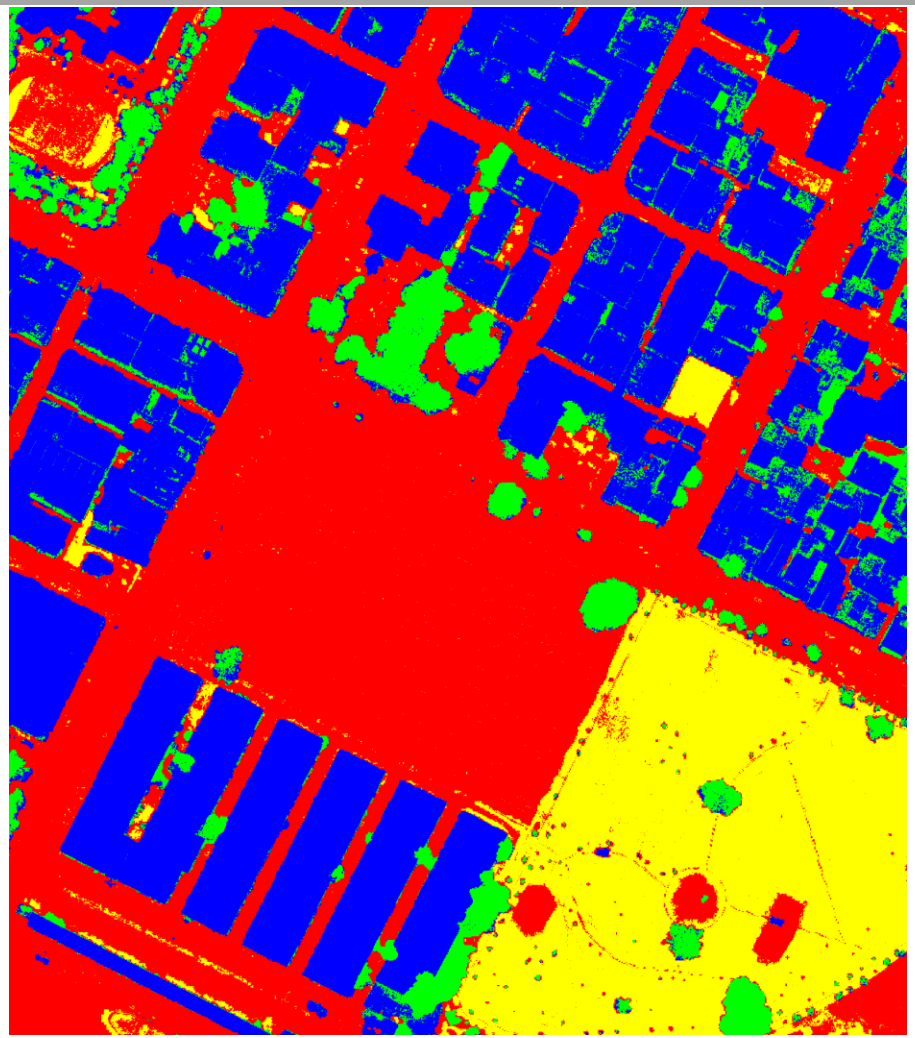


86.27%

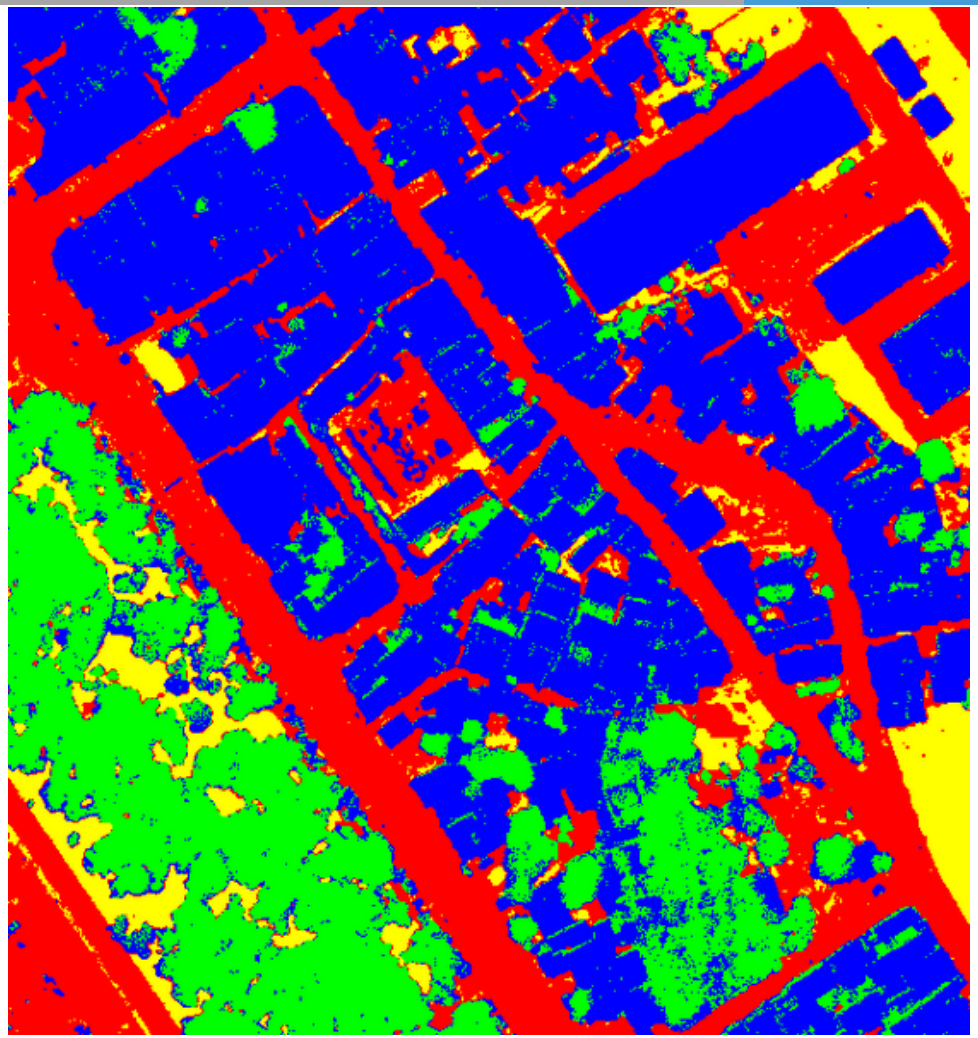
結論
Conclusions

- LiDAR之nDSM資料與都市航測影像二者之結合，縱使資料間具有時間之差異亦可明顯提高影像之分類精度，也顯示高度資訊可以替代NIR影像而成為提高分類精度之關鍵因素。
- 適合都市區分類資料來源的選擇
- 巨量LiDAR資料管理與地物濾除演算法
- 提出適用於都市區分類新的分類器
  - 分類結果統計精度上與視覺感知上較MLC, OBC為佳
  - 在設計之KBCS分類規則中，提供了將知識轉化為分類規則之程序與組織
  - 可自行設計程式獨立執行或載入如ERDAS IMAGNE具有專家系統功能的商用軟體，皆可獲得預期的分類結果
  - 同時也保留增加更多類別知識之空間

Hybrid Classification Method
KBCS+MLC

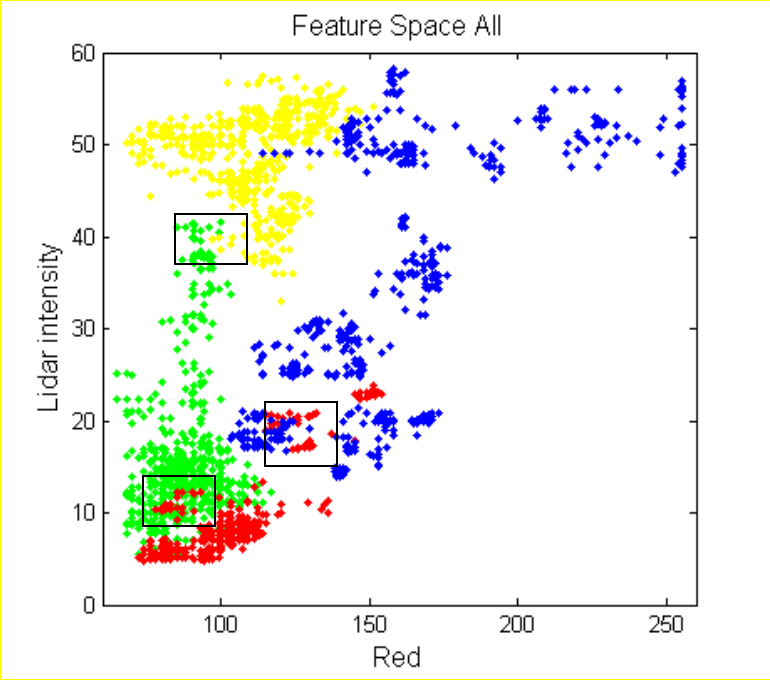


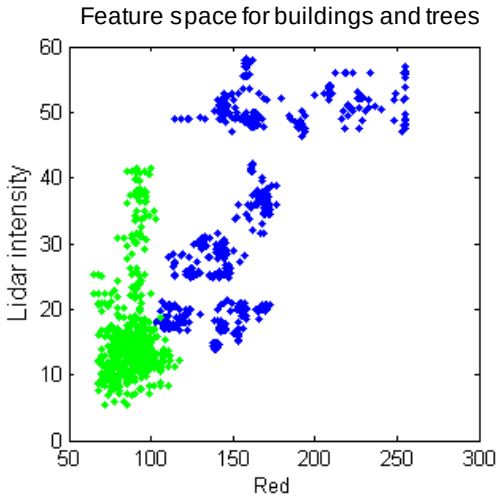
91.91%

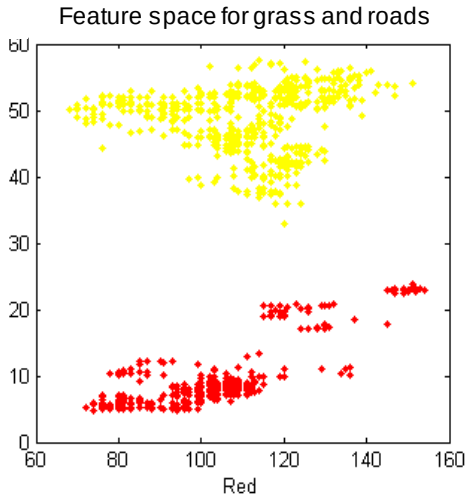


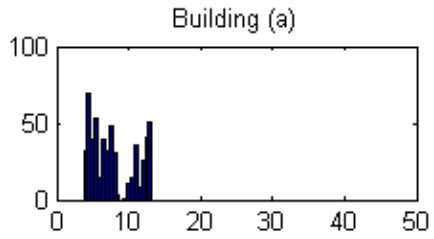
89.58%

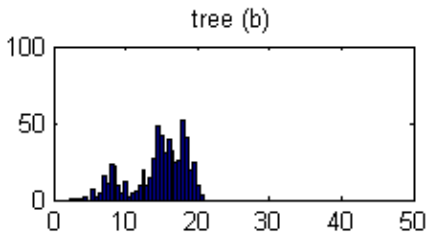
Hybrid Classification Method



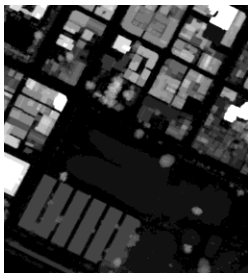








Hybrid Classification Method



Lidar nDSM

Lidar Intensity

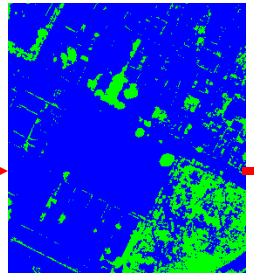
Aerial Imagery

High-Height rule

Low-Height rule

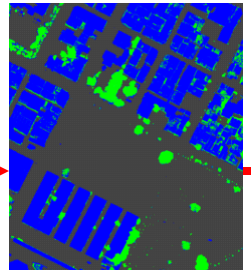
MLC

Hybrid classification method

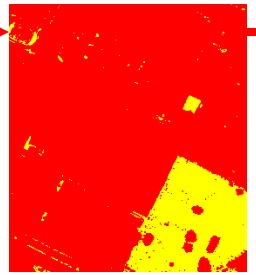


MLC result (High-Height)

High-Height mask

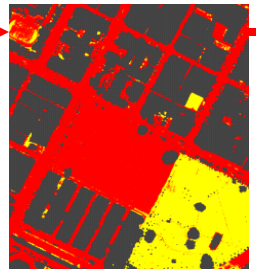


Masked MLC (High)



MLC result (Low-Height)

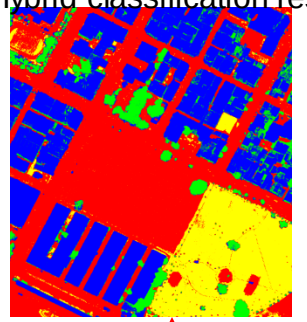
Low-Height mask



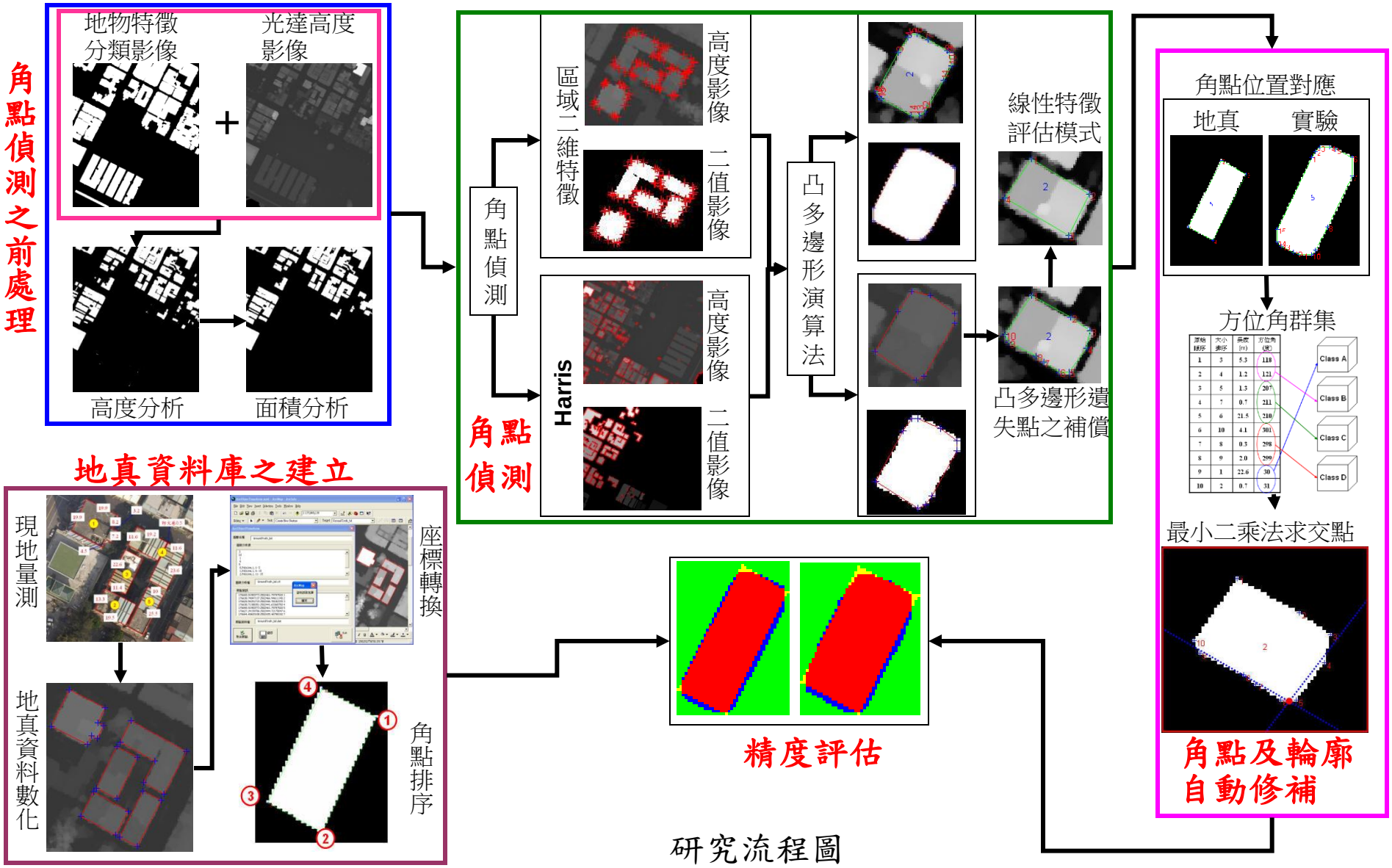
Masked MLC (Low)

Merge

Hybrid classification result



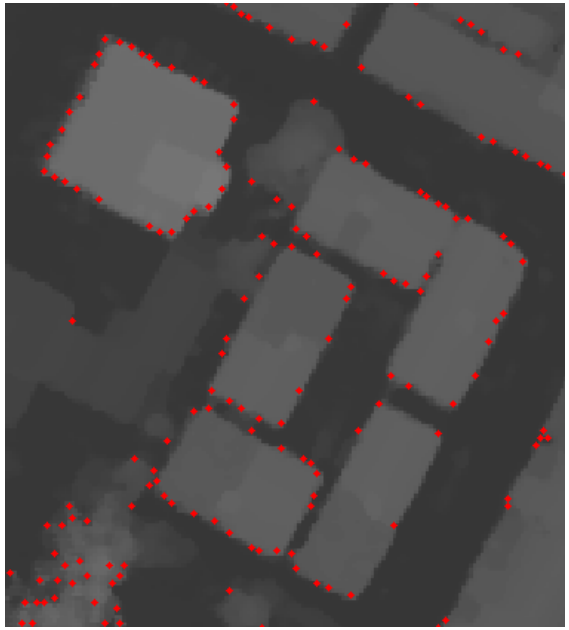
研究流程

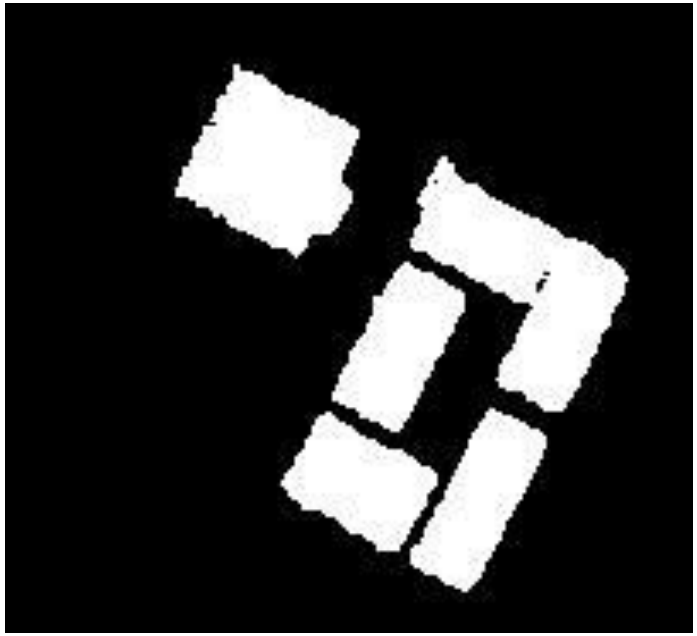

角點偵測之前處理
地物特徵分類影像
光達高度影像
高度分析
面積分析
角點偵測
區域二維特徵
高度影像
二值影像
Harris
高度影像
二值影像
凸多邊形演算法
線性特徵評估模式
凸多邊形遺失點之補償
角點位置對應
地真
實驗
方位角群集
Class A
Class B
Class C
Class D
最小二乘法求交點
角點及輪廓自動修補
地真資料庫之建立
現地量測
地真資料數化
座標轉換
角點排序
精度評估

研究流程圖

角點偵測資料

傳統建物提取的資料來源常見的有「高解析航照影像、光達高度影像、地物特徵之分類影像」等三種，由於航照影像灰階度變化很大，許多不屬於建物的角點也會一併被偵測出。圖8.為平面精度20cm之航照影像以Harris角點偵測法進行偵測結果。





Harris角點偵測法於航照影像、光達高程影像與地物特徵之分類影像之偵測結果

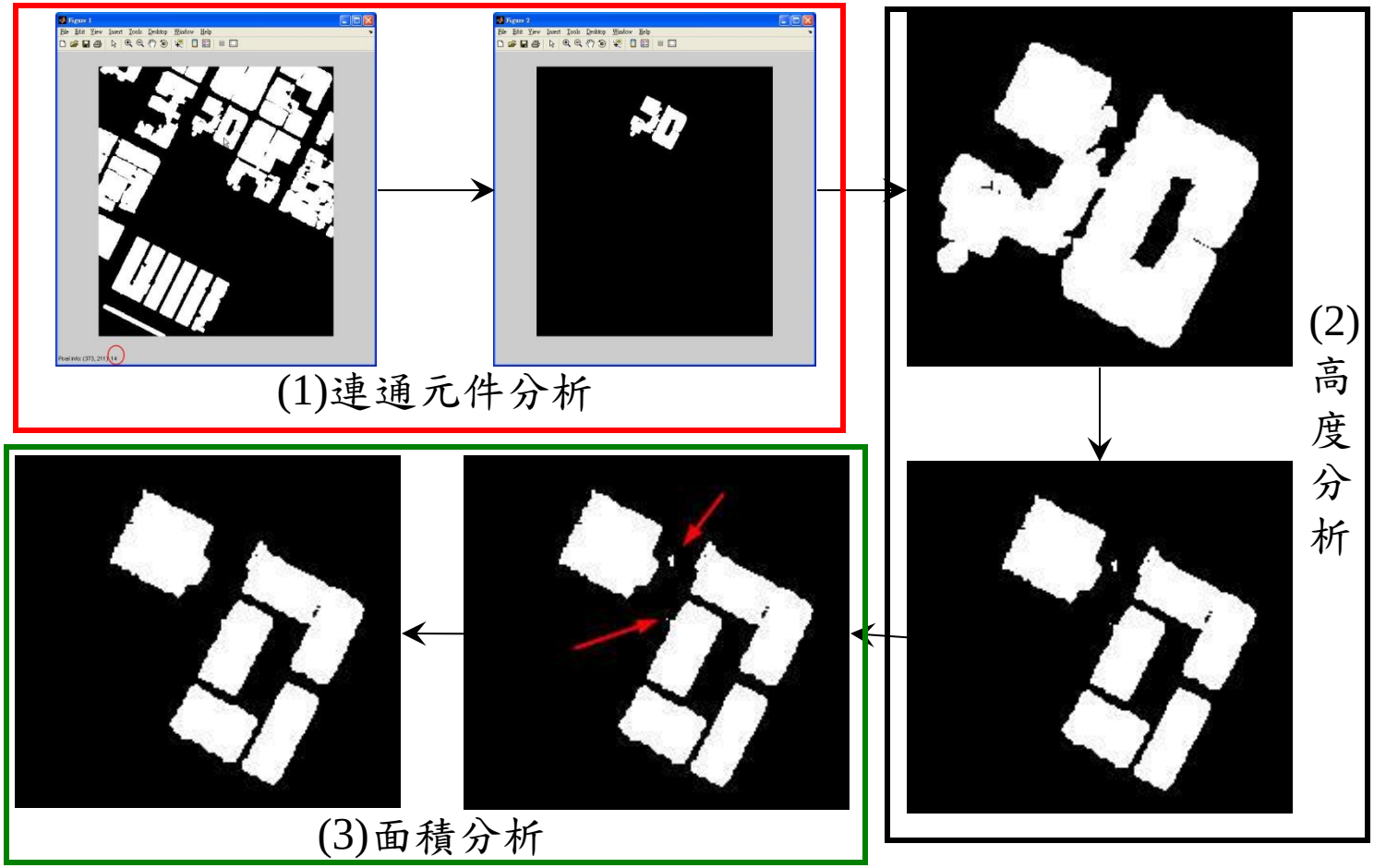
角點偵測之前處理

(1)連通元件分析：利用像元與像元間連通性判別物體邊界及區域組成，並給予編號。

(2)高　度　分　析：利用光達高程影像設定一高度門檻值，濾除低於門檻值以下區塊。

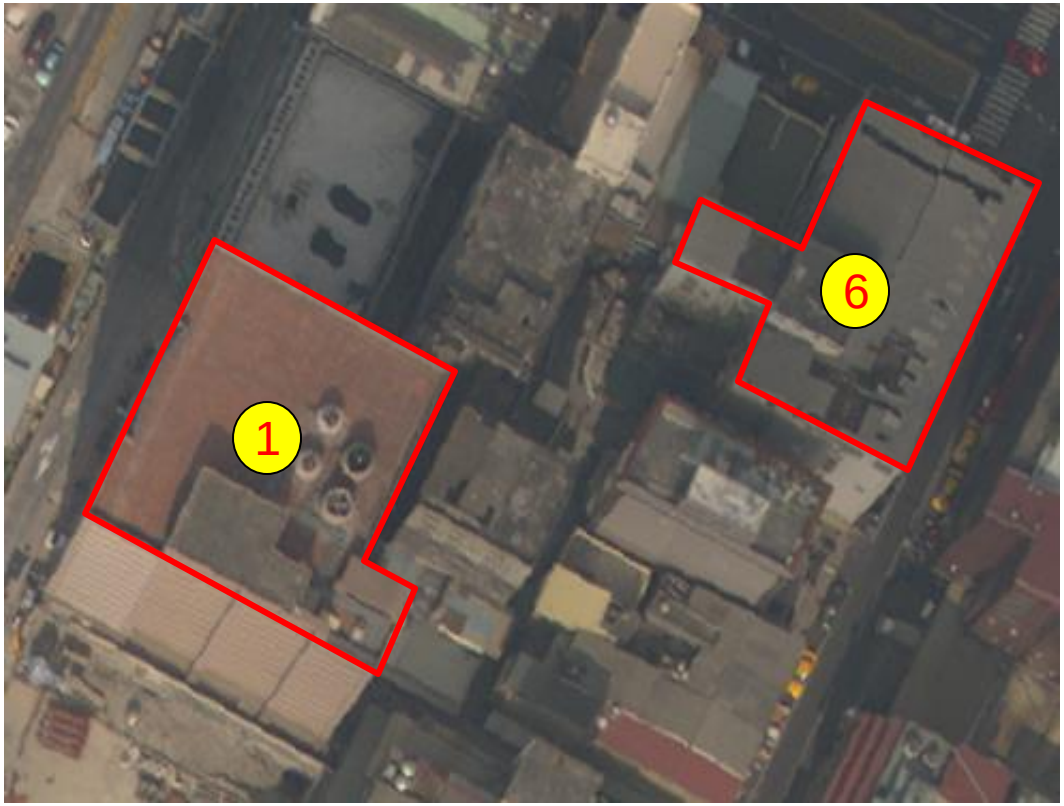
(3)面　積　分　析：建物具有一定大小，設立一面積門檻值，濾除低於門檻值以下區塊。

二值分類影像之角點偵測前處理



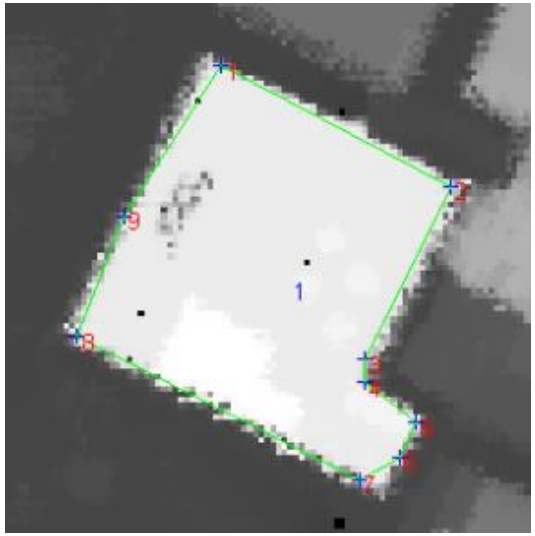
實驗區

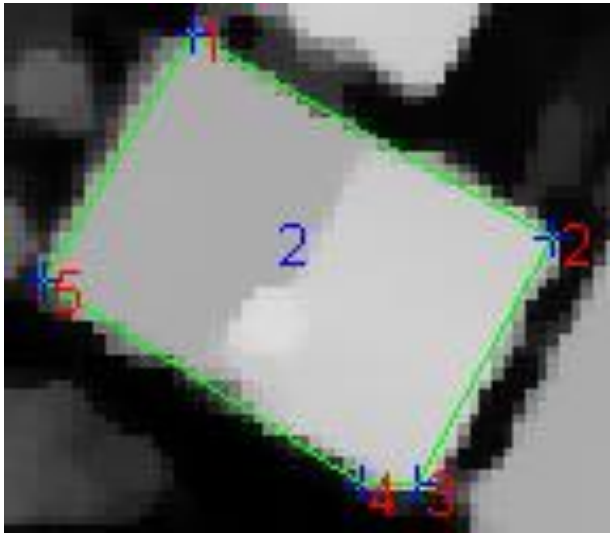
實驗區塊一

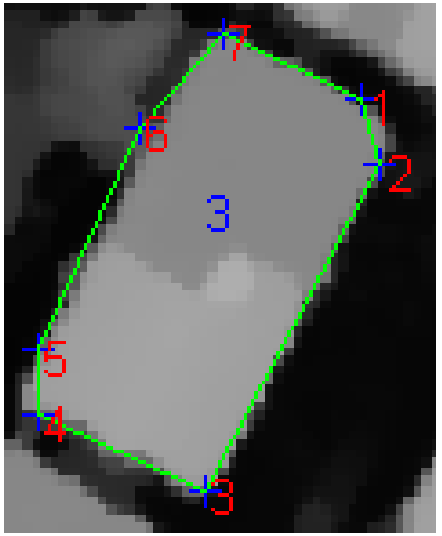


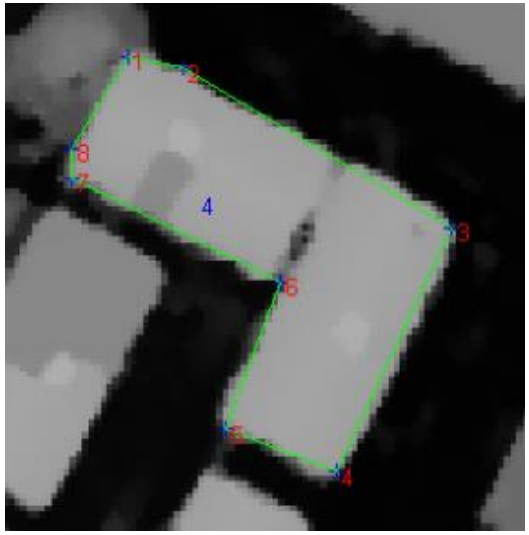
實驗區塊二

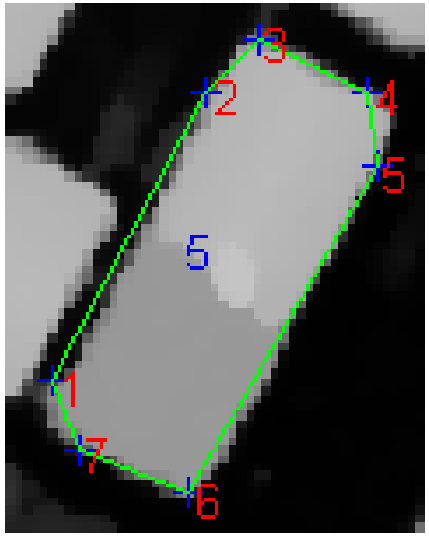
角點偵測—邊緣偵測+向量化+簡約化成果

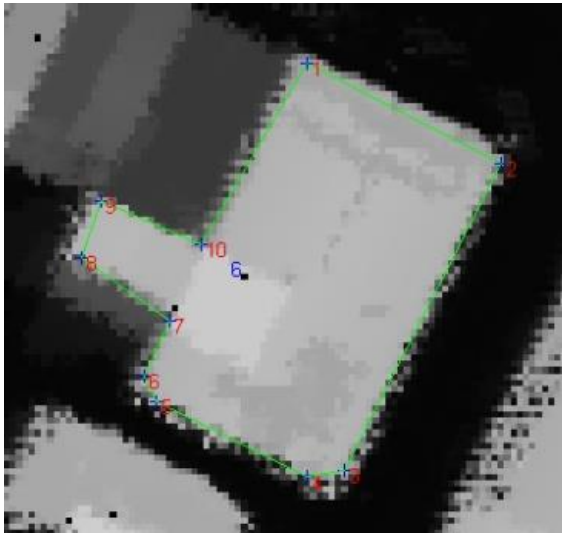










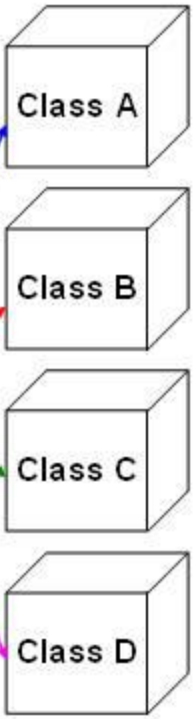


邊緣偵測加凸向量化及簡約化之成果圖

角點及輪廓自動修補方式

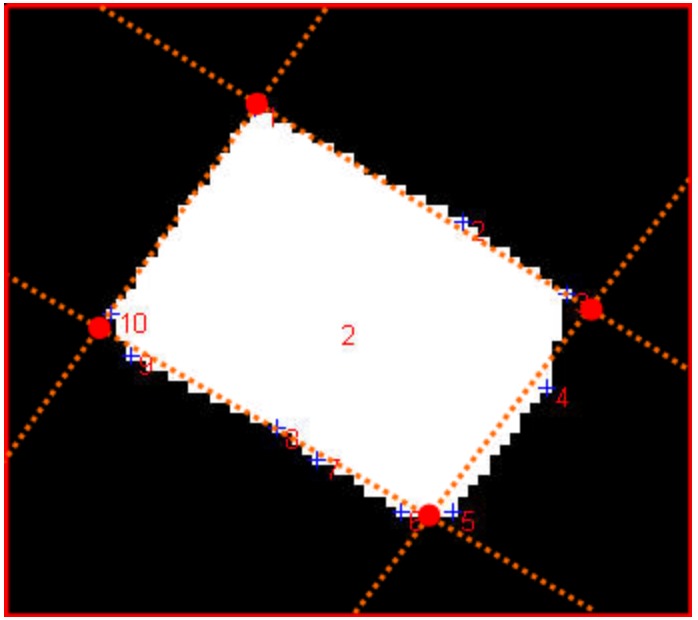
矩形建物依Clustering的概念將方位角分成四個群組，並計算各群組之平均方位角。

原始順序	大小排序	長度(m)	方位角(度)
1	3	5.3	118
2	4	1.2	121
3	5	1.3	207
4	7	0.7	211
5	6	21.5	210
6	10	4.1	301
7	8	0.3	298
8	9	2.0	299
9	1	22.6	30
10	2	0.7	31



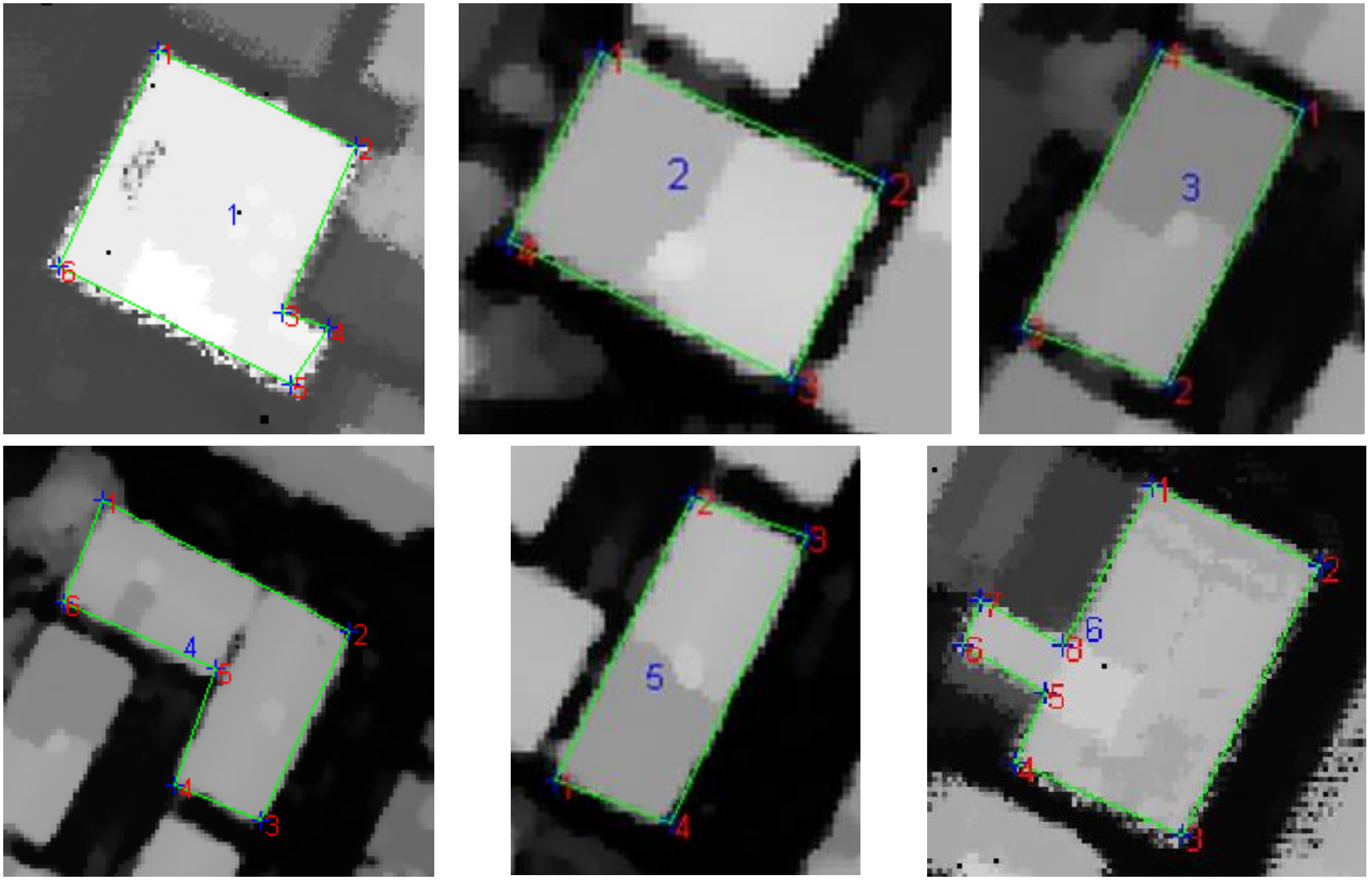
Clustering分配示意圖

將同一群組的邊上的角點以最小二乘法求出該直線方程式，同理，在鄰近的邊上也可求出直線方程式，並計算交角，圖22所示即可產生新的四個主要角點。



最小二乘法求直線及交點示意圖

角點及輪廓自動修補
LBP (二值)偵測結果經修正後成果

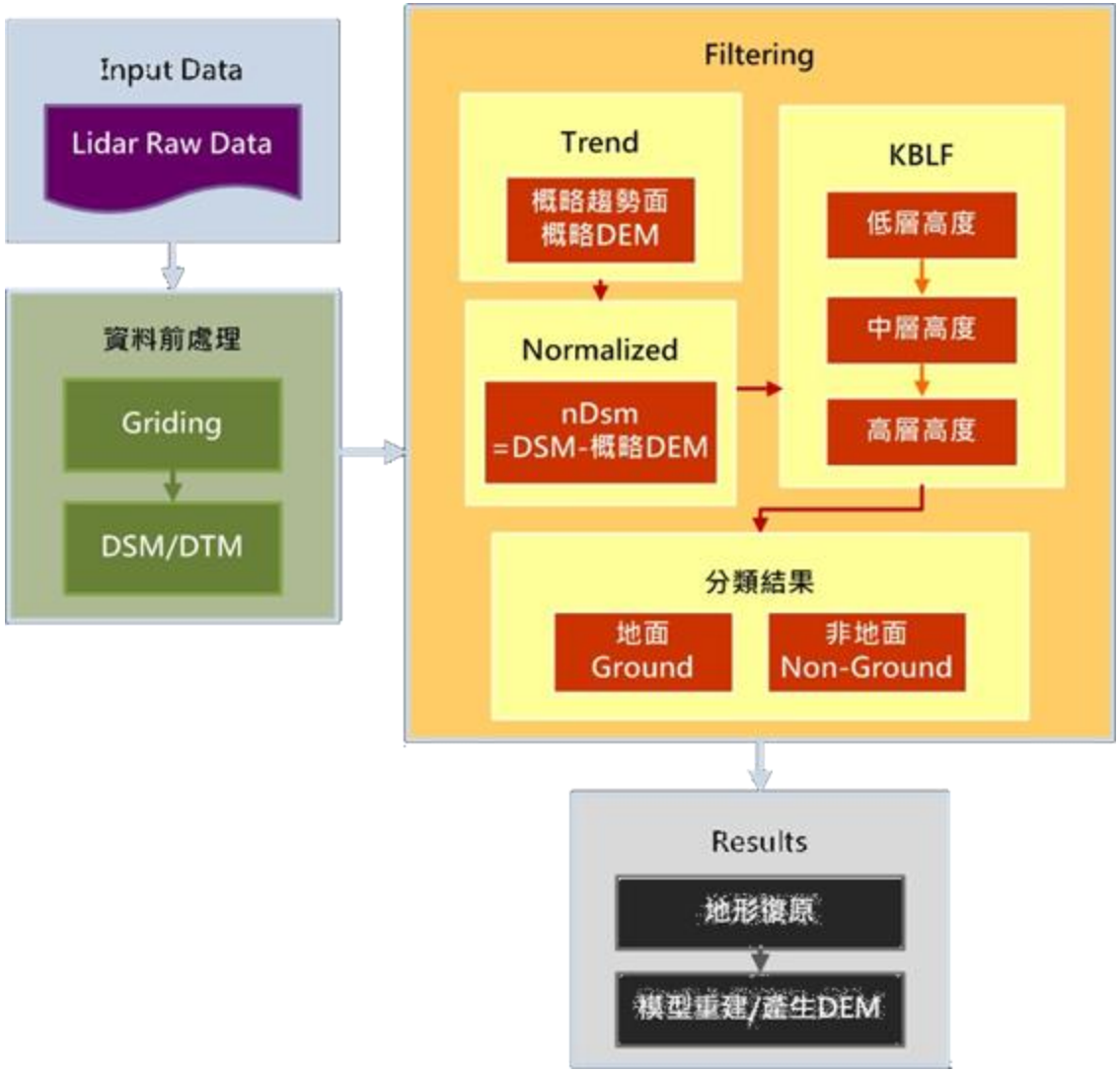


LBP角點偵測法於二值分類影像經修正法修正後成果展示

後續研究

Knowledge-Based Lidar Data Filtering and Terrain Recovery

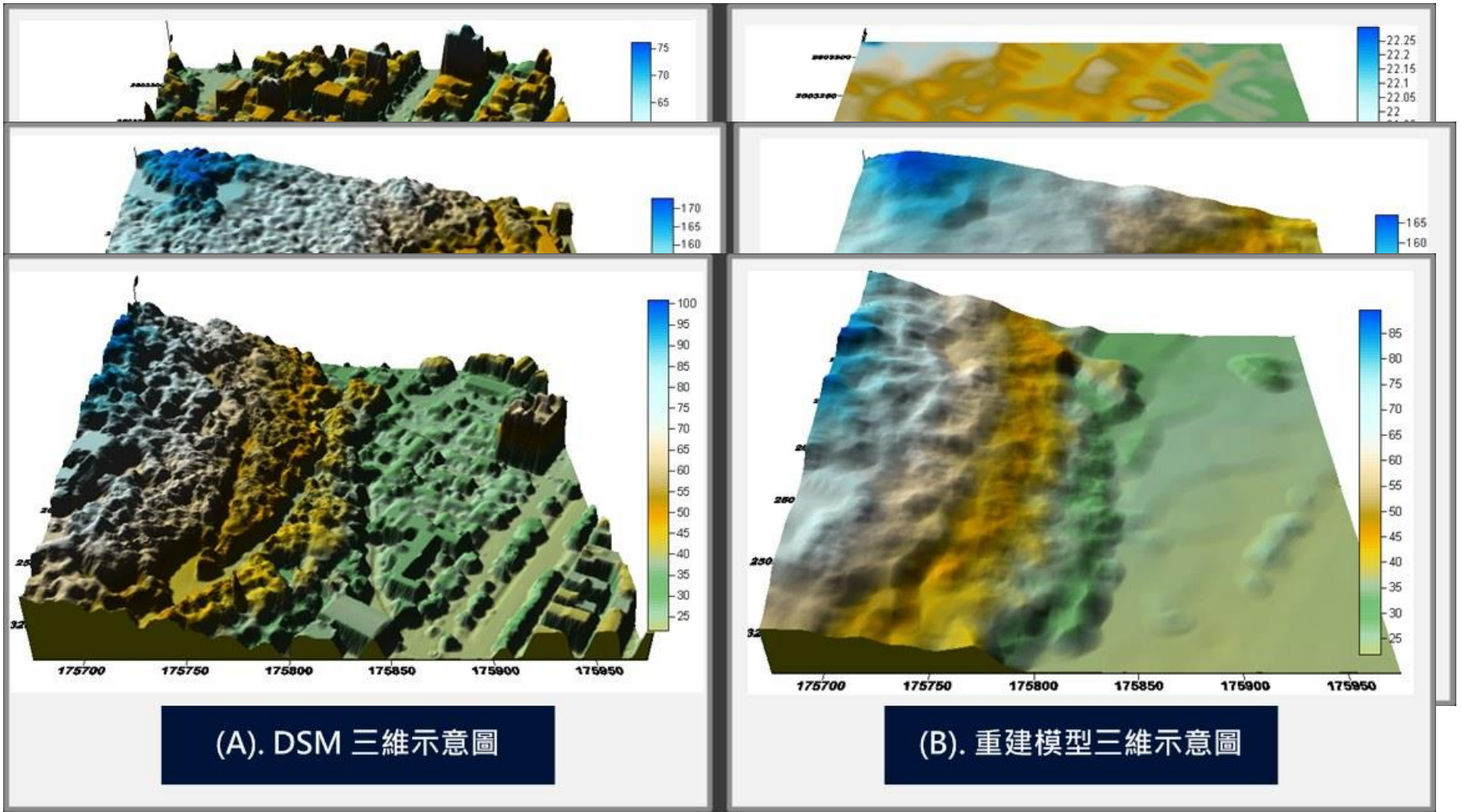
- 資料前處理
- Filtering
  - 概略趨勢面
  - 正規化高度
  - 知識庫建置
  - 分類結果過濾
- Results
  - 地形復原
  - 模型重建



KBLF結果

•都會區分類：

•山區分類：

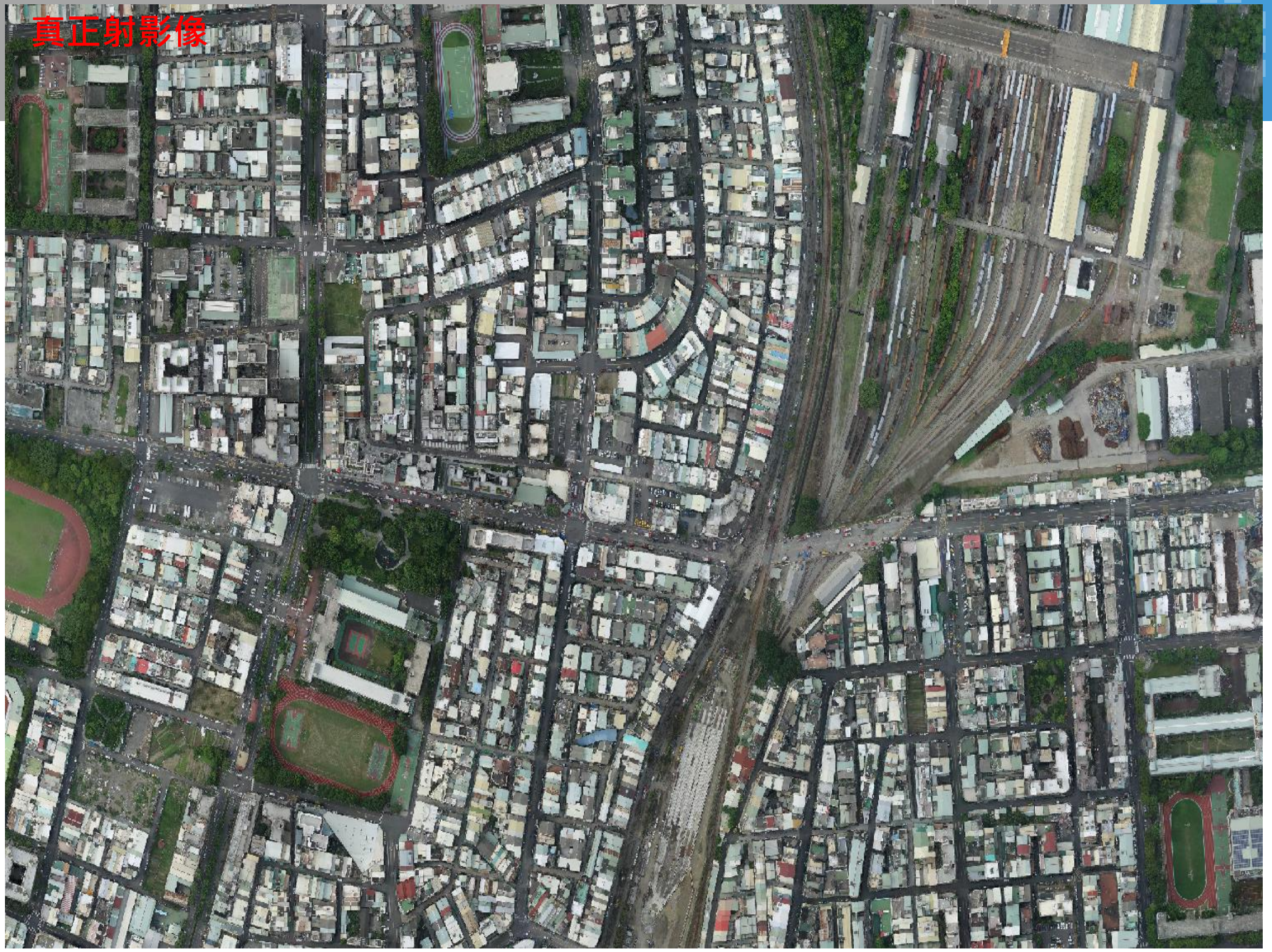



1030731高雄氣爆線上點雲 - Google Chrome
192.168.0.99/PointViewer/1030731ks_h/
39 FPS (6-53)
點雲三維重建
1030731高雄氣爆線上點雲(Hight)
Power By potree.org
Pointcloud provided by KUAS Geospatical Lab.
LOD 9
PointSize 0.5
FOV 60
Close Controls
visible nodes: 36
visible points: 20,786,463
Position : -678.000,320.000,790.000
高雄氣爆事件(2014.08.01)
影片

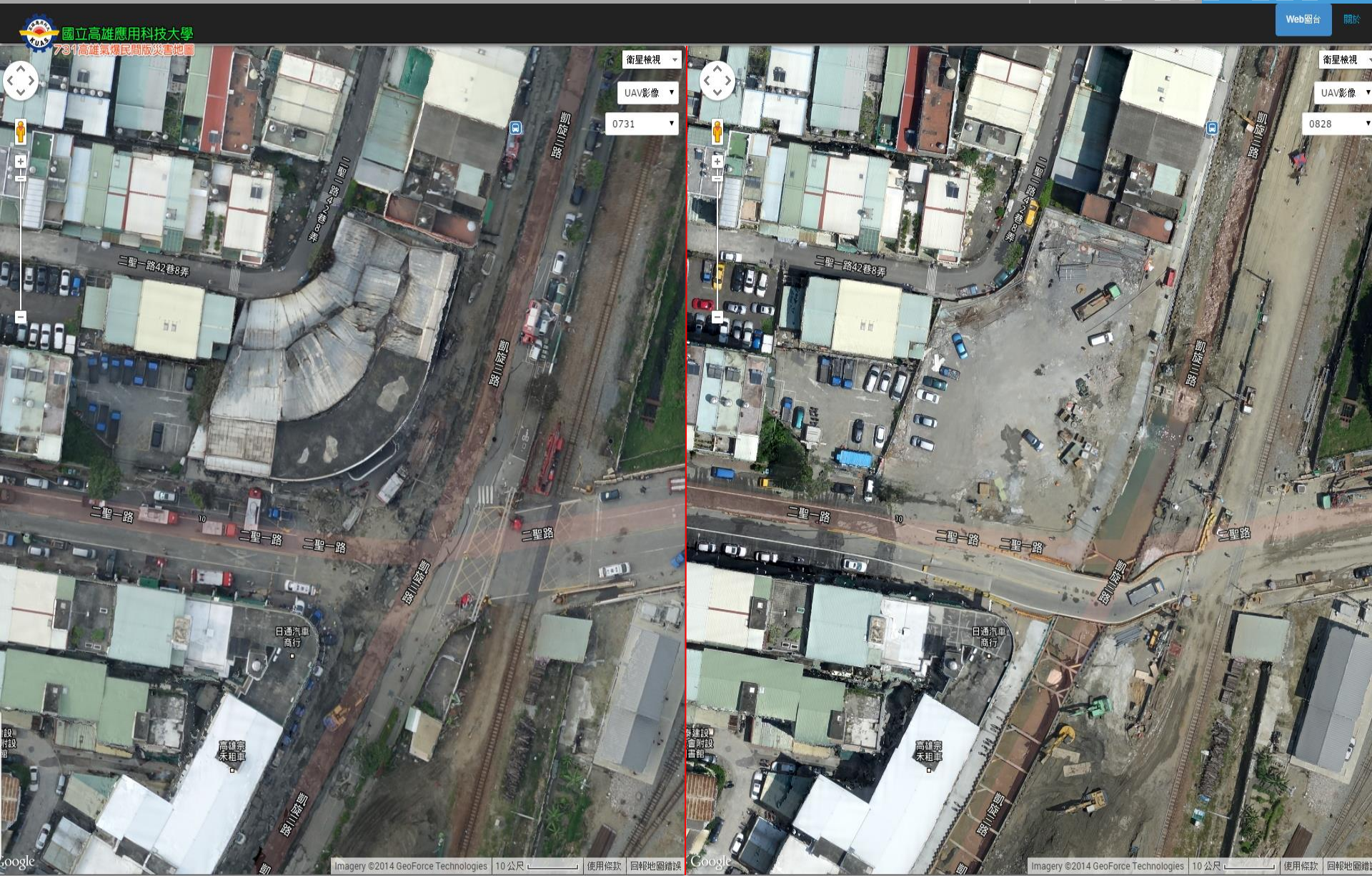
點雲三維重建


1030731高雄氣爆線上點雲 - Google Chrome
59 FPS (6-60)
1030731高雄氣爆線上點雲(Hight)
Power By potree.org
Pointcloud provided by KUAS Geospatical Lab.
LOD
9
PointSize
0.5
FOV
60
Close Controls
visible nodes: 20
visible points: 21,491,062
Position : 2,940,210,591,504,373

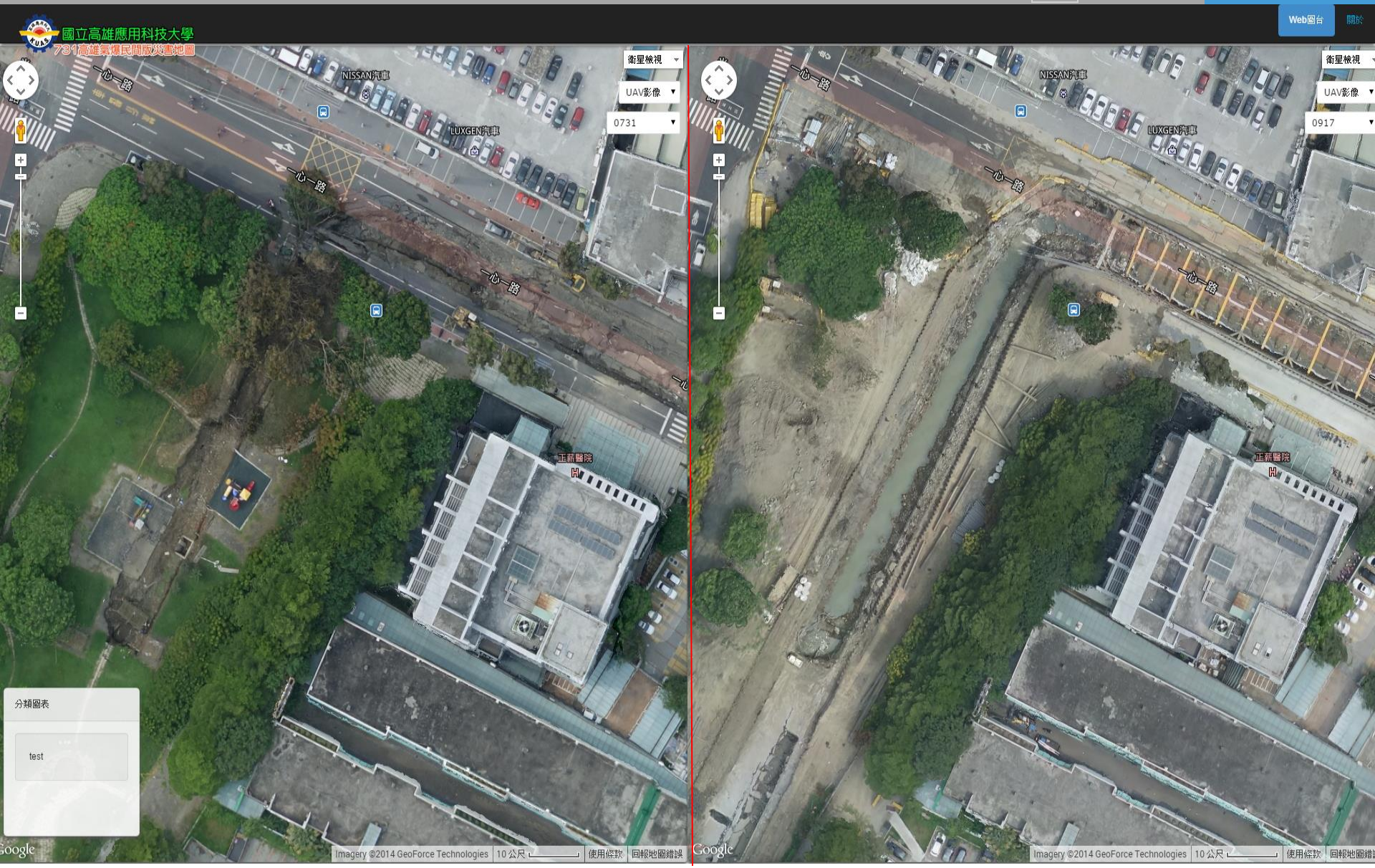
真正射影像



高雄氣爆比較(08/01 : 08/28)二聖凱旋路口



高雄氣爆比較(08/01 : 09/17)一心路



TEMPORAL AND SPATIAL VARIABILITY OF THE BLACK SEA HYDRODYNAMICS AND CHLOROPHYLL-A CONCENTRATION WITH CONNECTION TO WIND FORCING

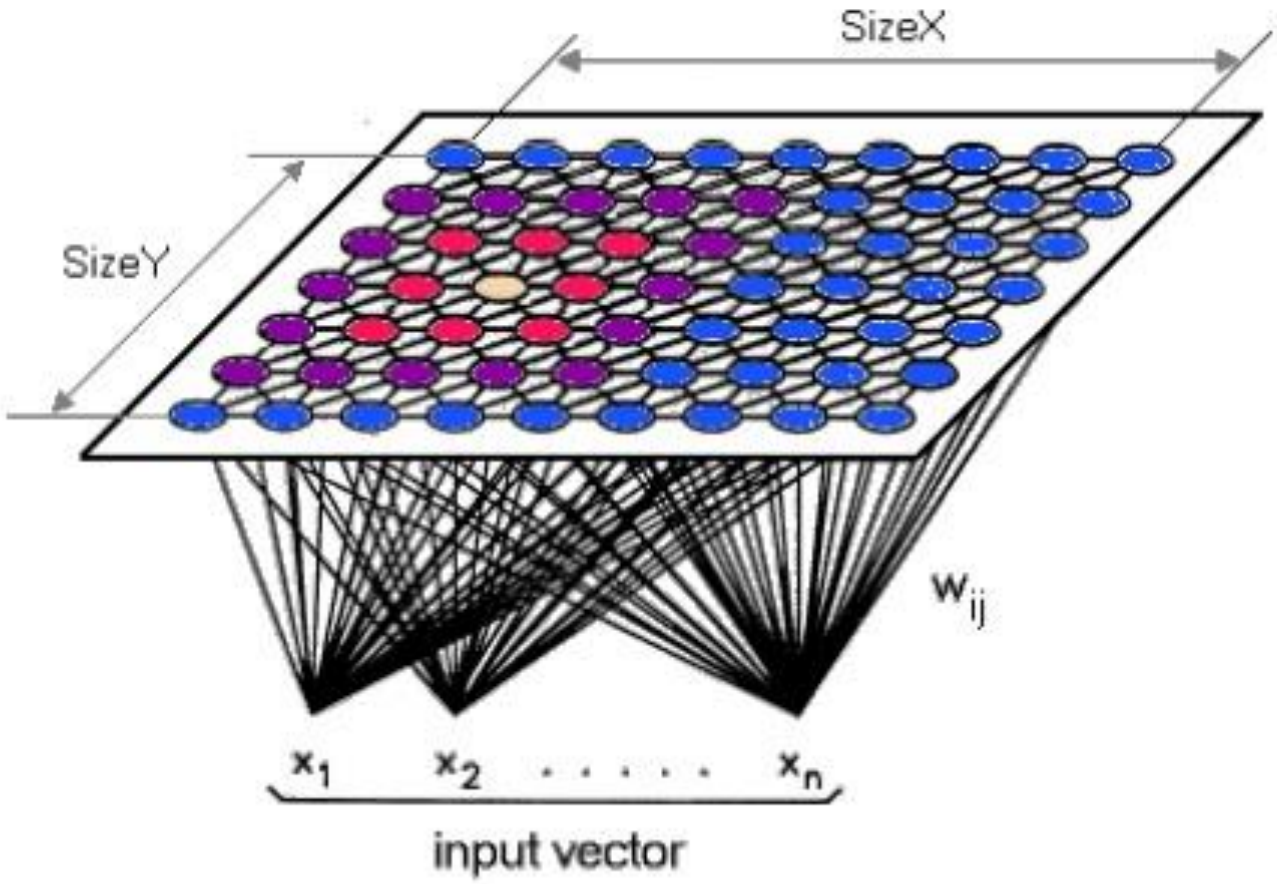
by Emre GULHER
(LTJG, Turkish NAVY)

Thesis Advisor .: Prof. Peter C. Chu

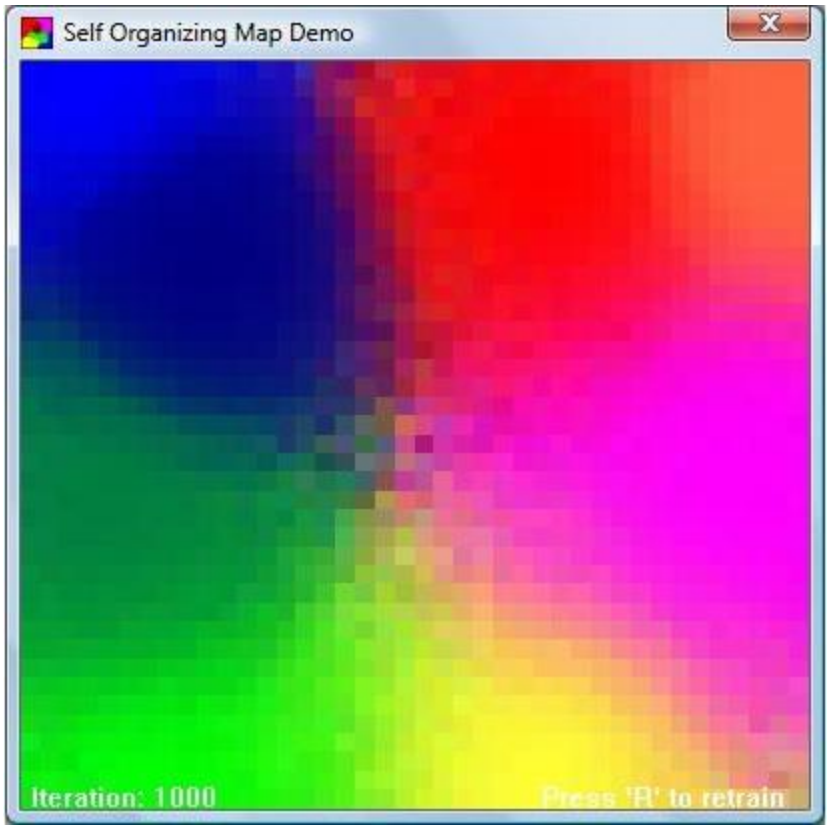
Thesis Second Reader .: Dr. Ming-Jer Huang

15 March 2013

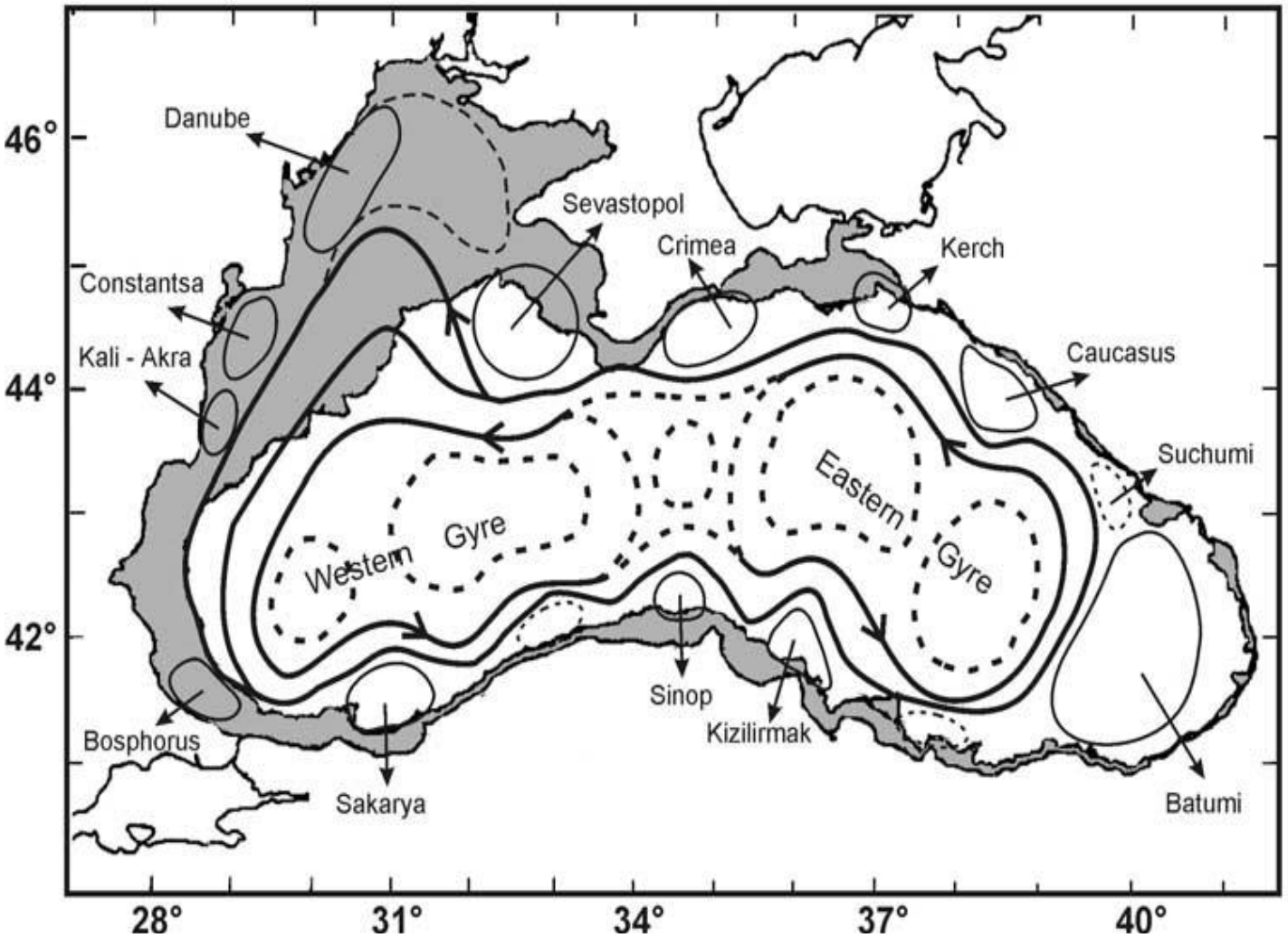
Self Organizing Map (SOM) Neural Network



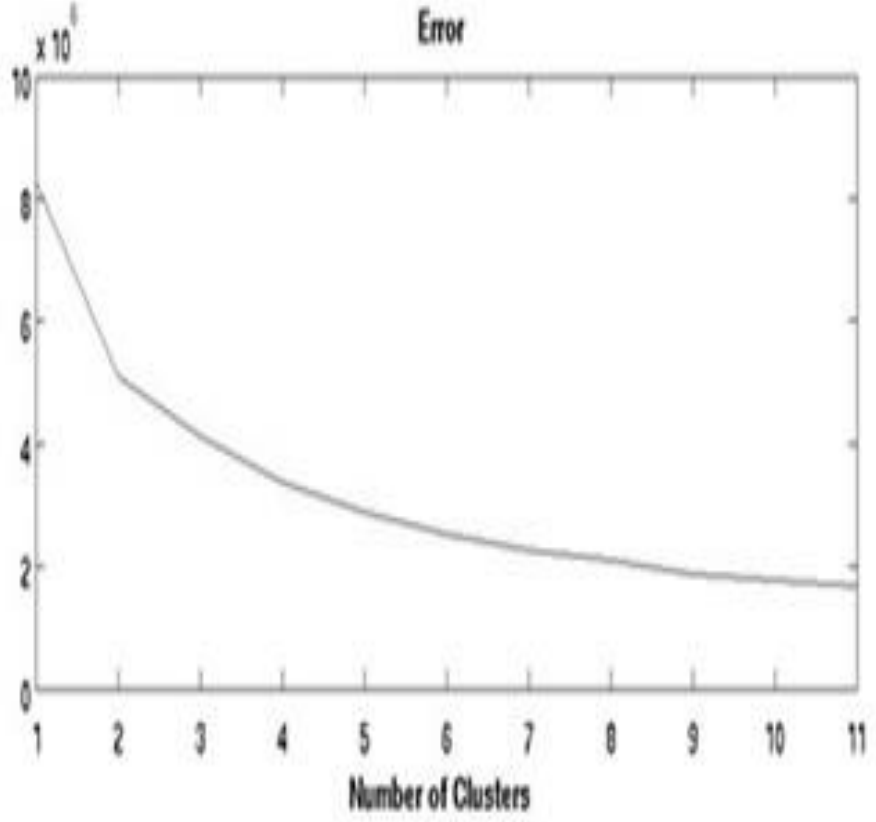
EXAMPLE OF SOM

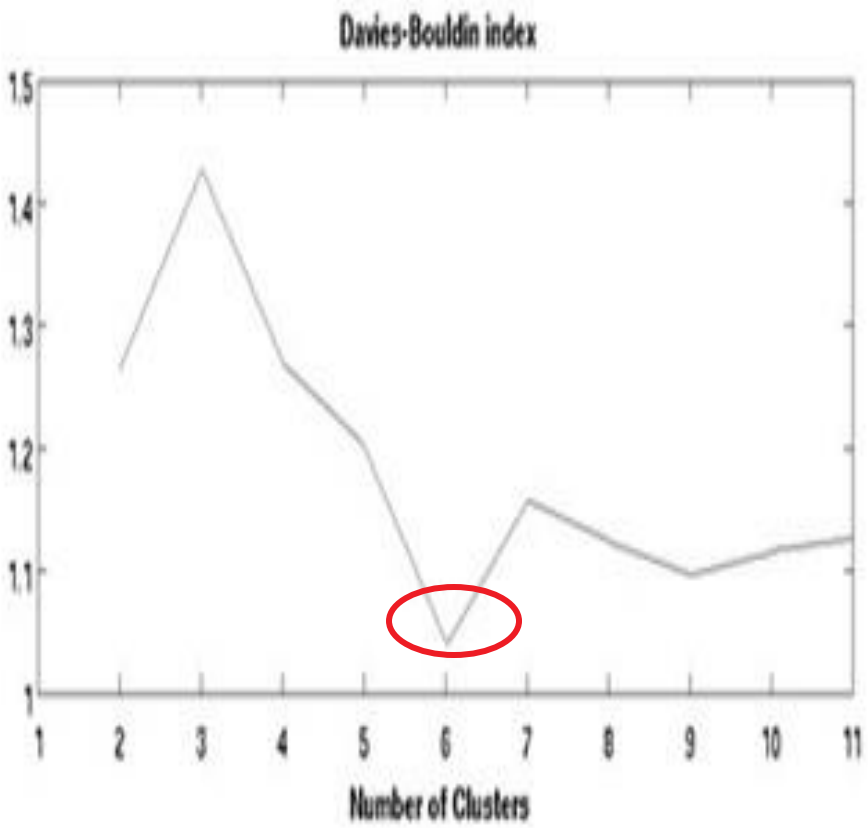


MAJOR FEATURES OF THE BLACK SEA SURFACE DYNAMICS

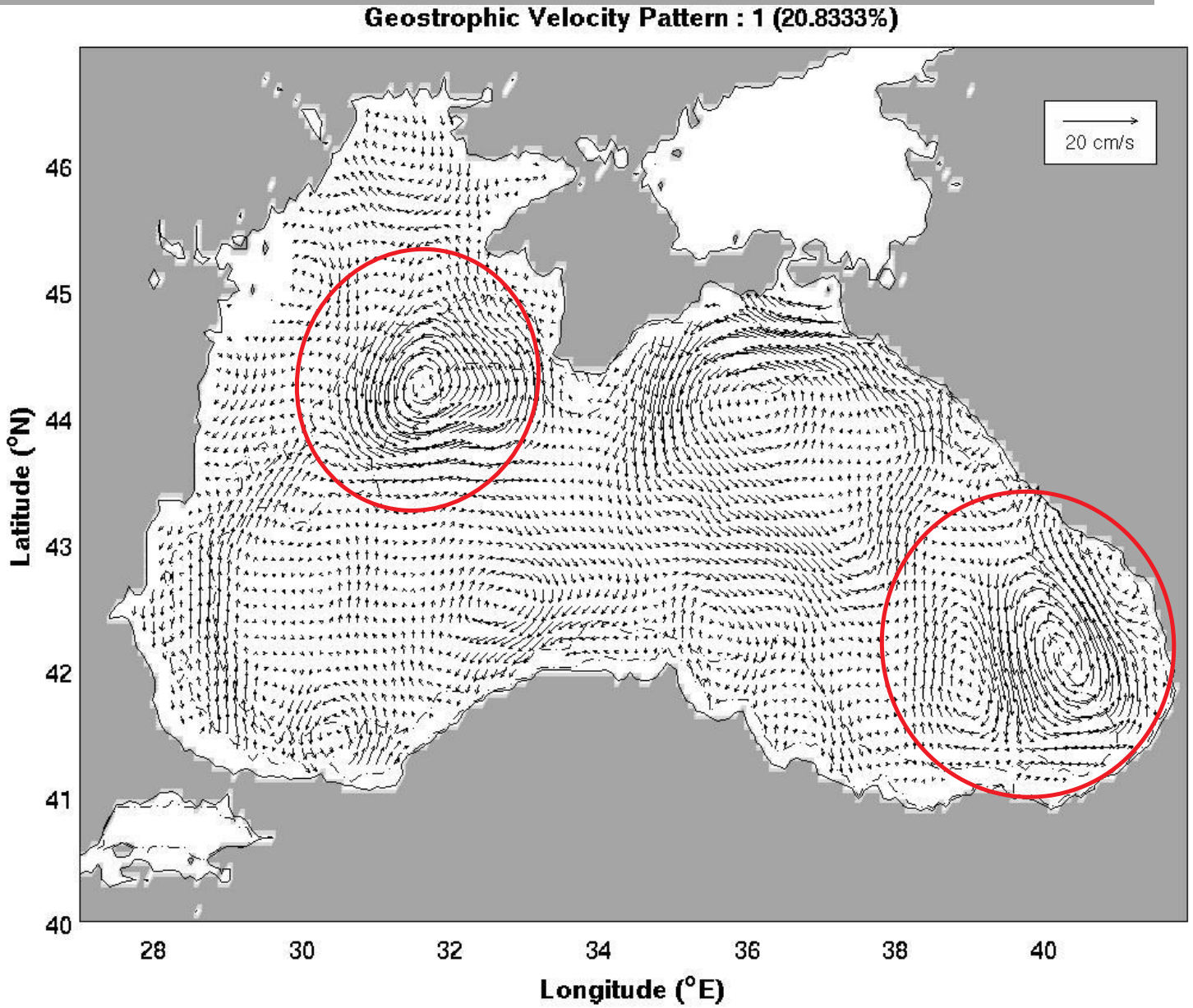


THE DBI FOR SURFACE CURRENTS

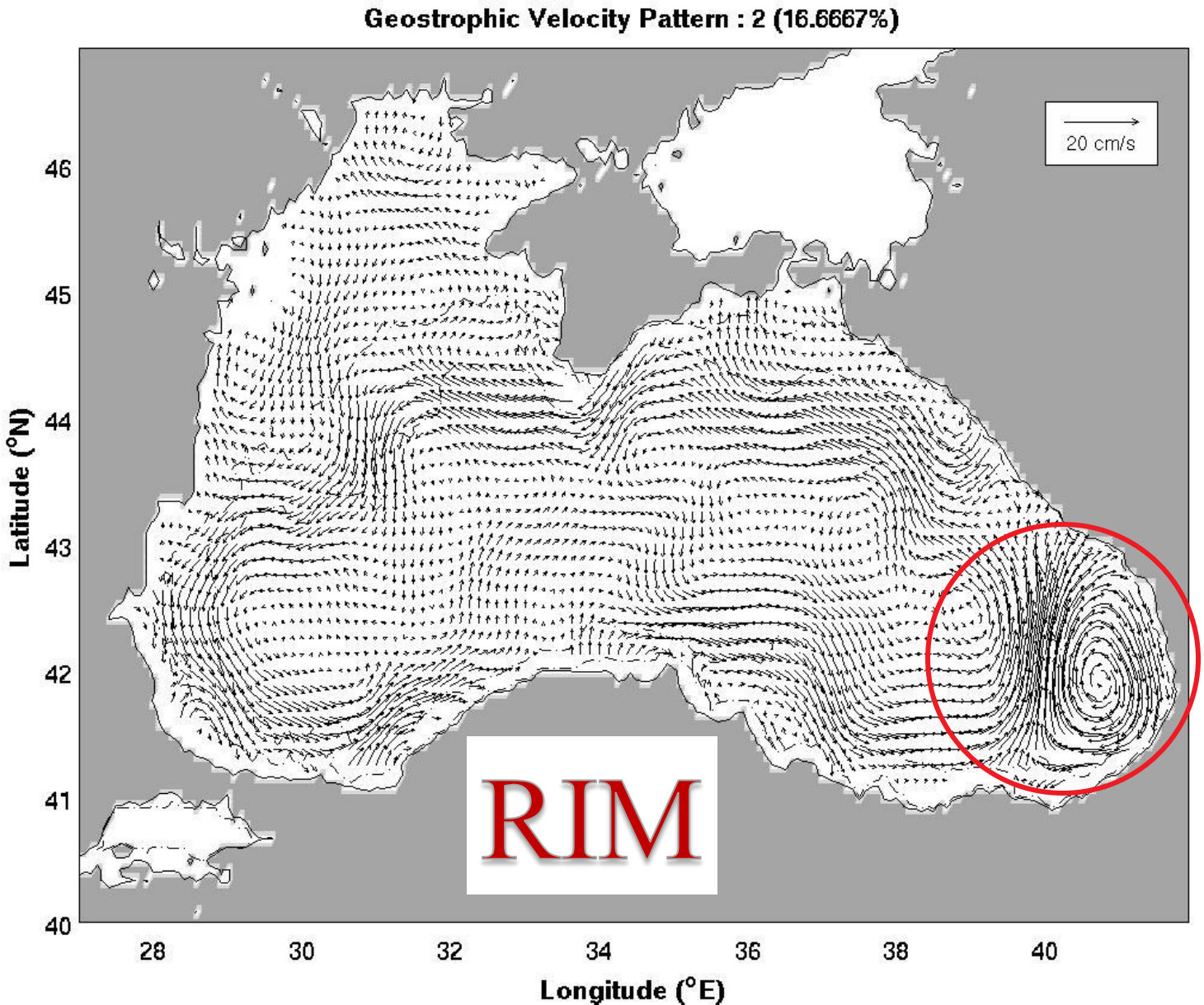




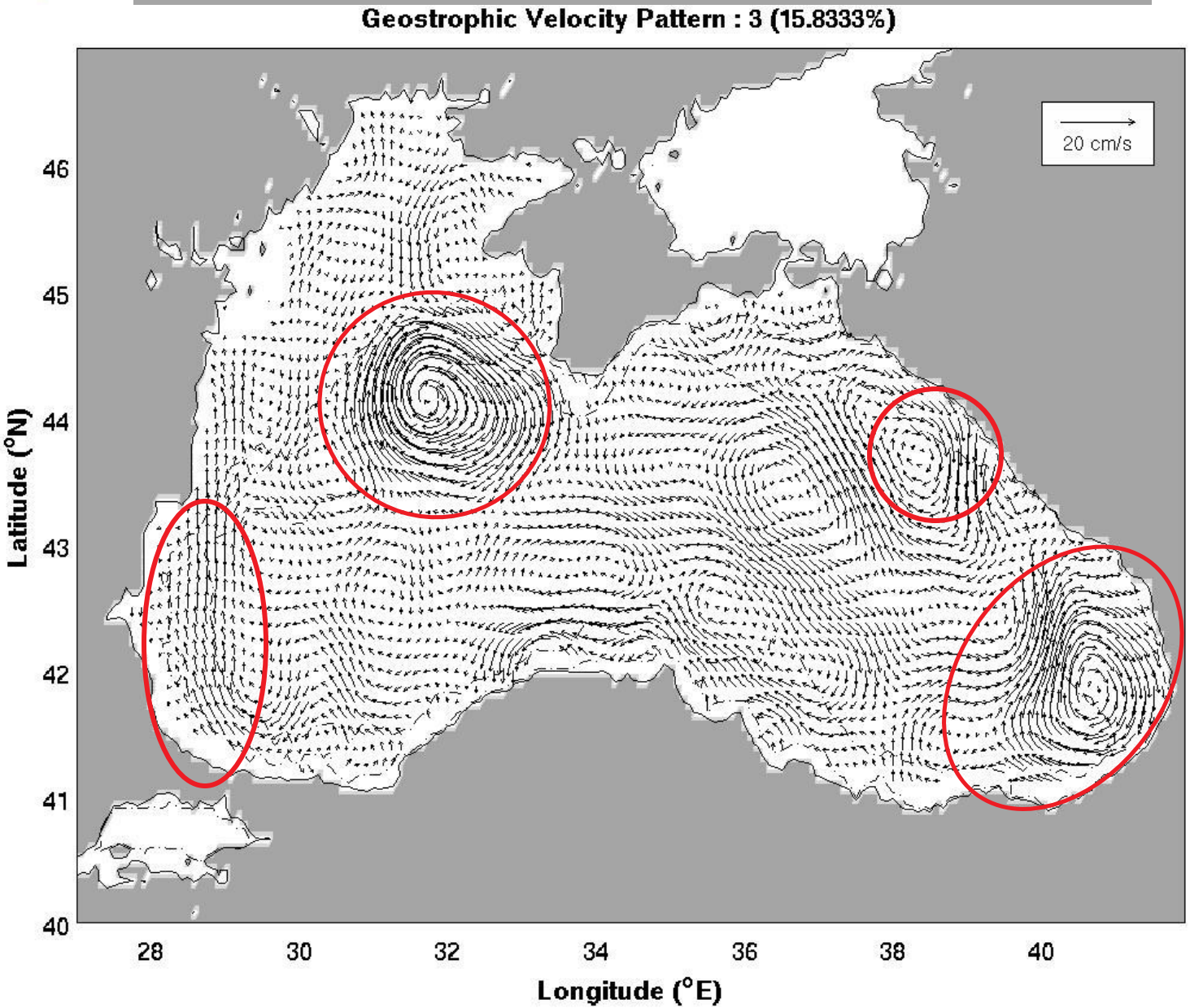
PATTERN 1


Geostrophic Velocity Pattern : 1 (20.8333%)
20 cm/s
Latitude (°N)
Longitude (°E)
46
45
44
43
42
41
40
28
30
32
34
36
38
40

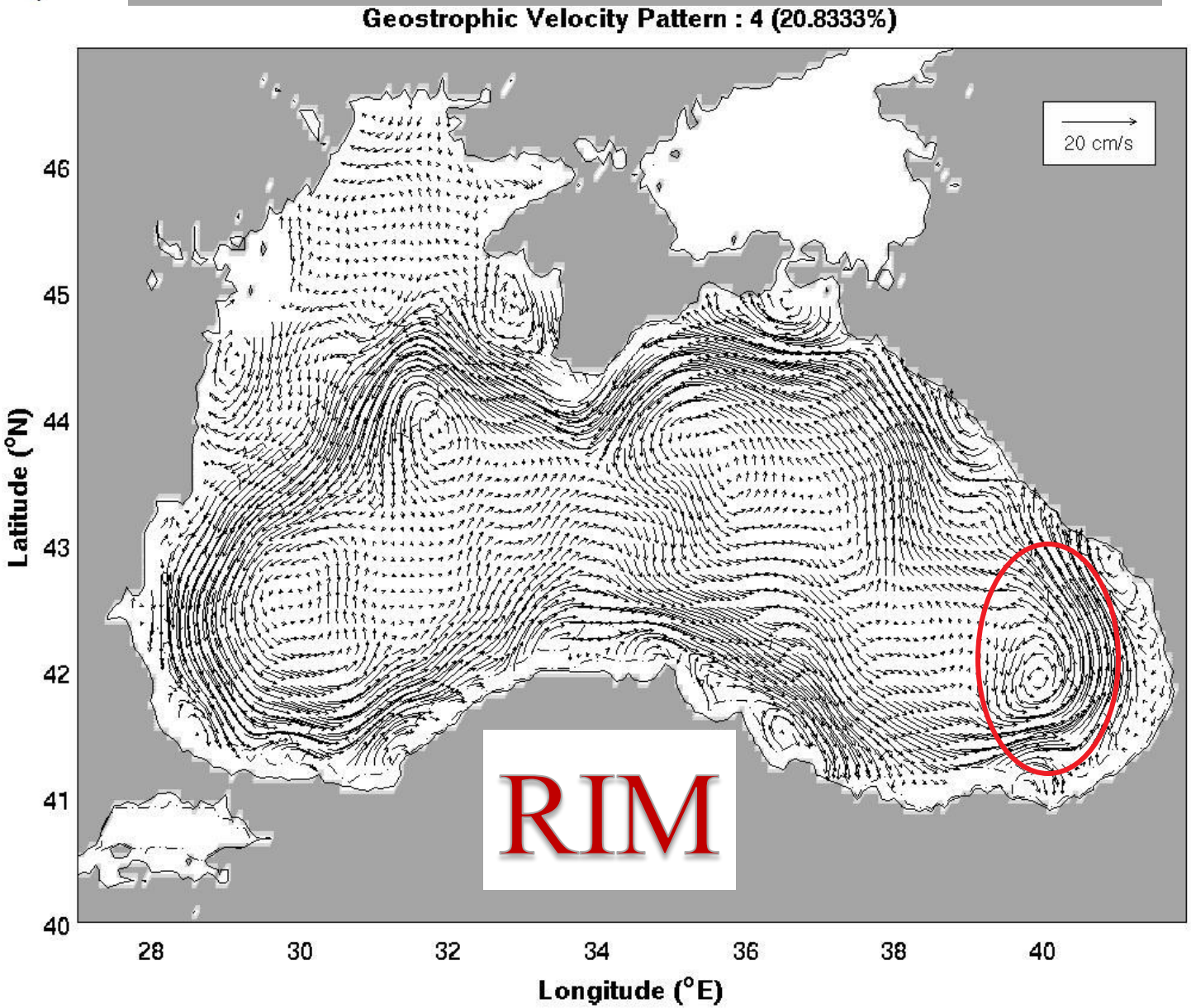
PATTERN 2


Geostrophic Velocity Pattern : 2 (16.6667%)
20 cm/s
RIM
Latitude (°N)
Longitude (°E)
46
45
44
43
42
41
40
28
30
32
34
36
38
40

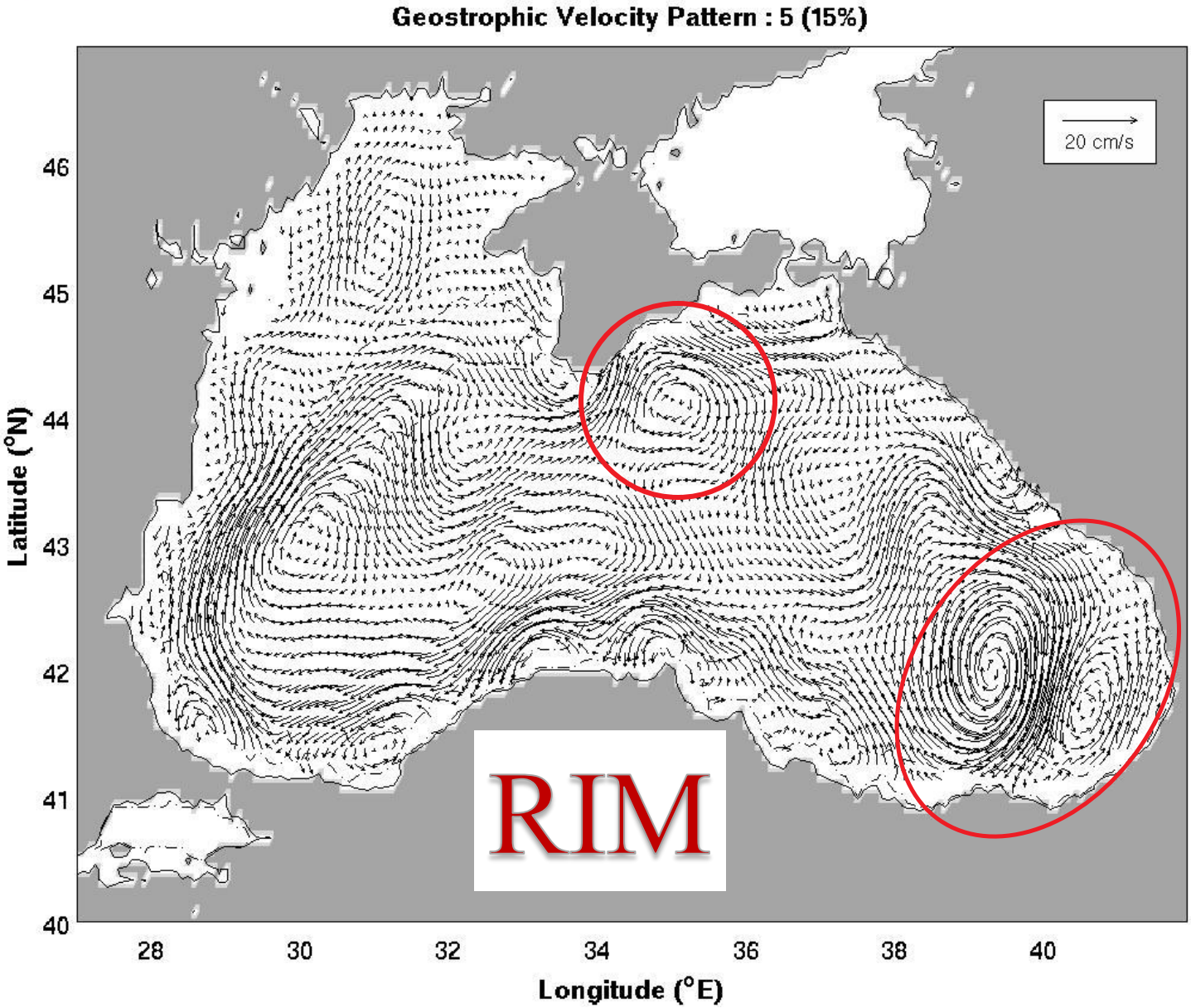
PATTERN 3


Geostrophic Velocity Pattern : 3 (15.8333%)
20 cm/s
Latitude (°N)
Longitude (°E)
46
45
44
43
42
41
40
28
30
32
34
36
38
40

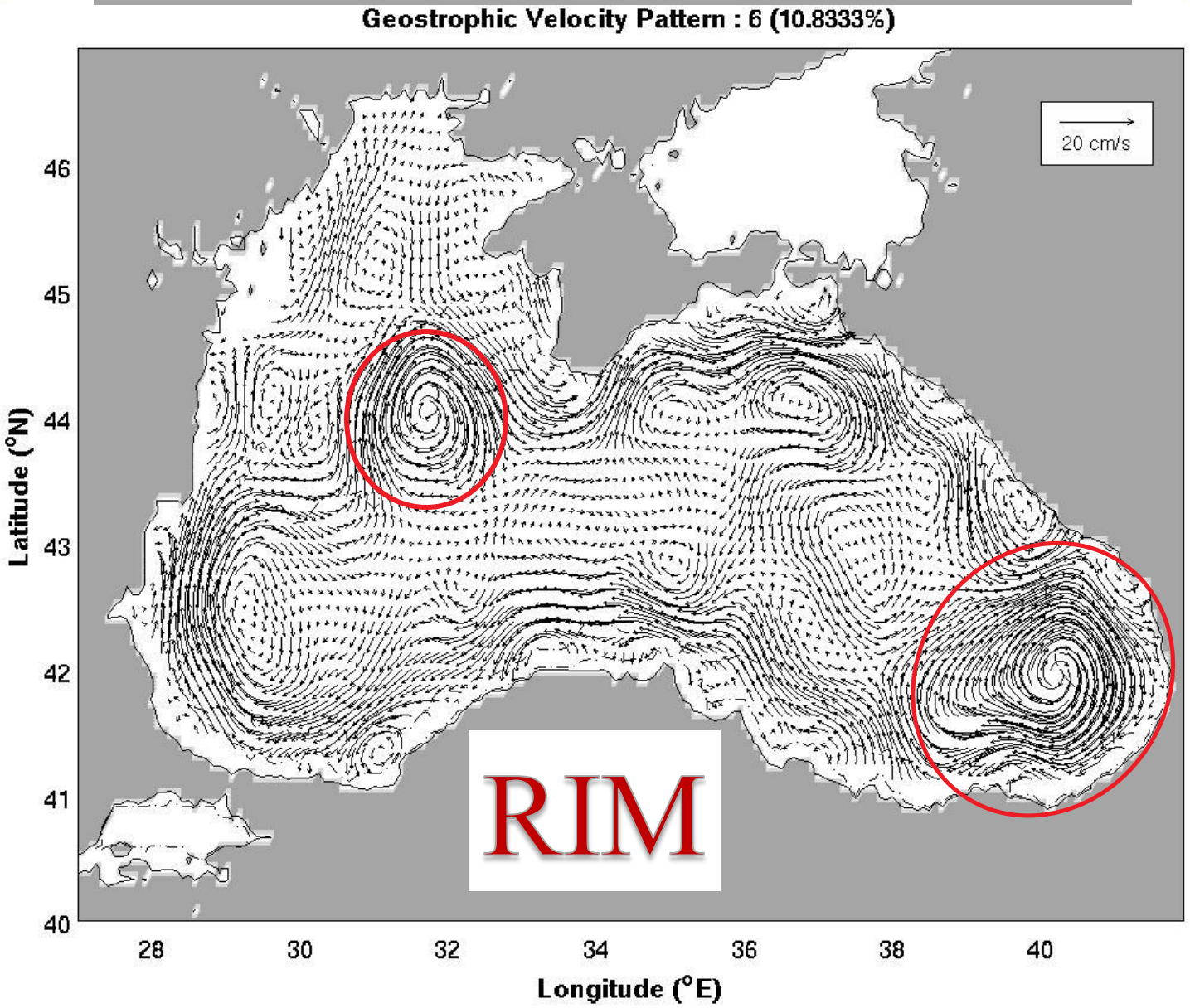
PATTERN 4


Geostrophic Velocity Pattern : 4 (20.8333%)
20 cm/s
RIM
Latitude (°N)
Longitude (°E)
40
41
42
43
44
45
46
28
30
32
34
36
38
40

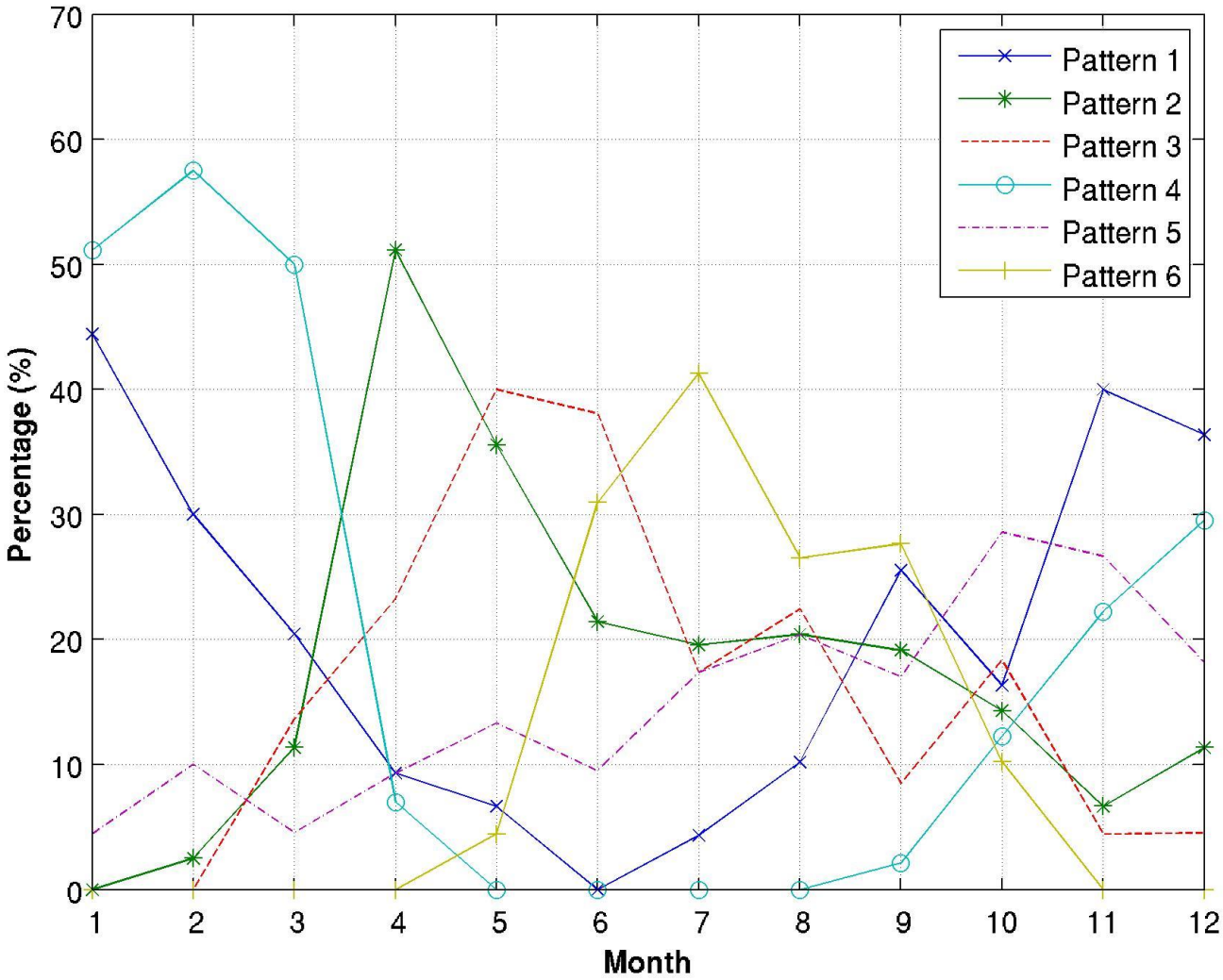
PATTERN 5


Geostrophic Velocity Pattern : 5 (15%)
20 cm/s
RIM
Latitude (°N)
Longitude (°E)
46
45
44
43
42
41
40
28
30
32
34
36
38
40

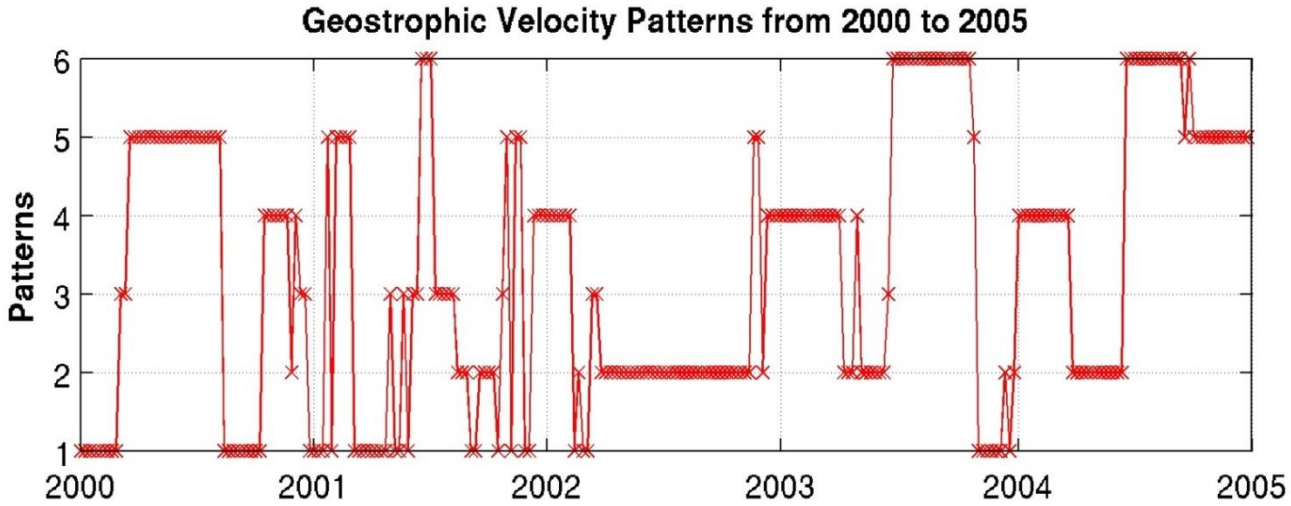
PATTERN 6

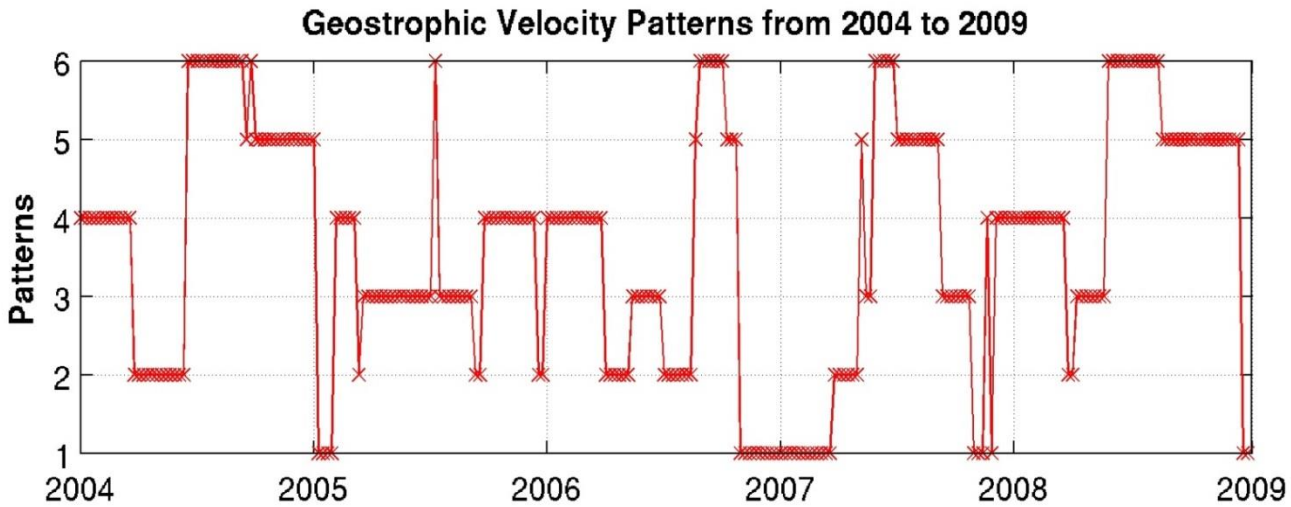

Geostrophic Velocity Pattern : 6 (10.8333%)
20 cm/s
RIM
Latitude (°N)
Longitude (°E)
46
45
44
43
42
41
40
28
30
32
34
36
38
40

MONTHLY VARIABILITY



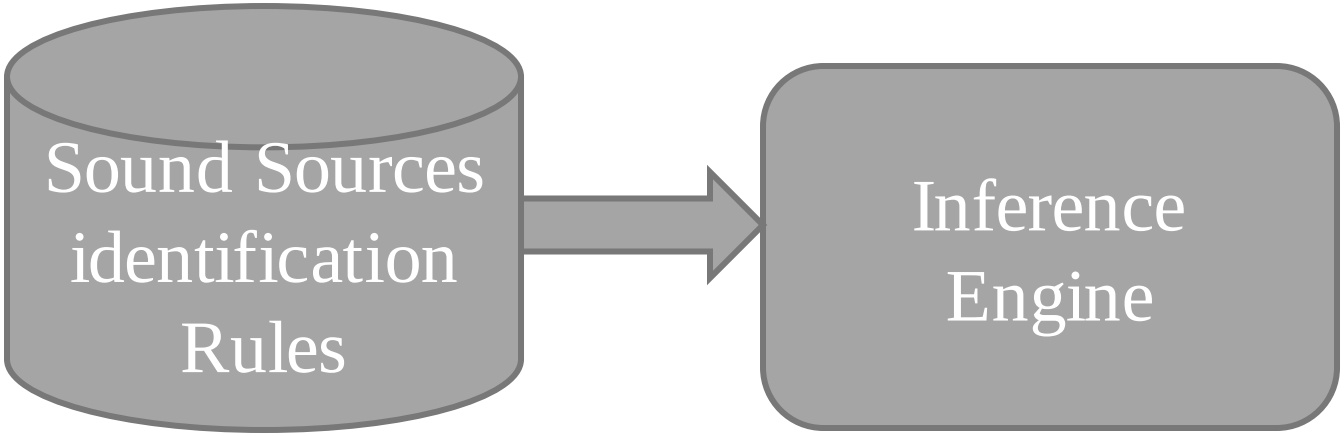
The inter-annual variability





Knowledge-based Blue Whale Recognition

http://cetus.ucsd.edu/voicesinthesea_org/species/baleenWhales/blue.html



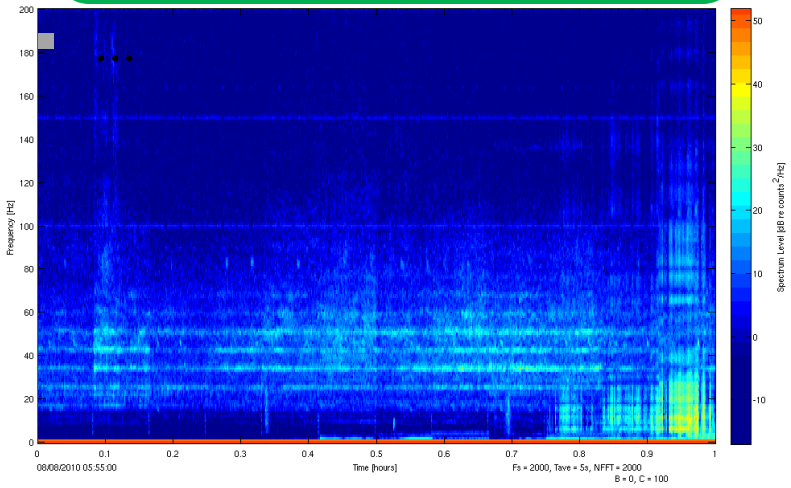
Knowledge base from experts

https://www.youtube.com/watch?v=wgDoNYYL5hU

Knowledge-based Recognition implementation (1)

- Expert's knowledge
  - Long duration - ~ 15-20 s --- can be seen in LTSA
  - Pulsed
  - "identifiable" overtone ~85 - 90 Hz with slight downshift in frequency

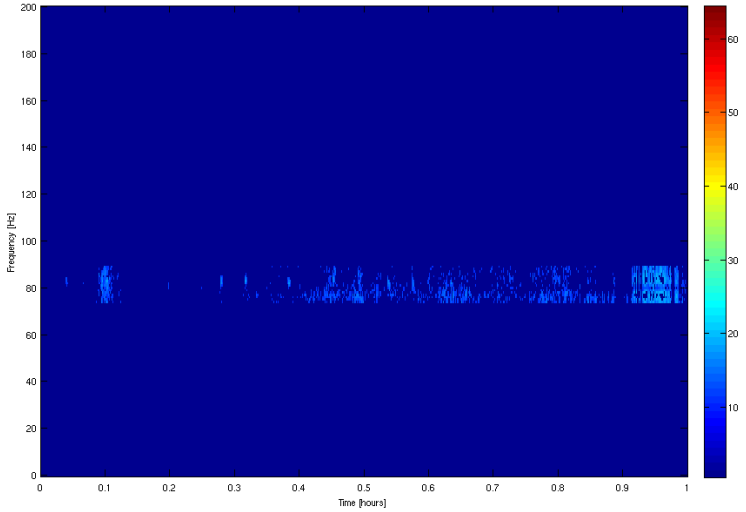
1



Long-term spectral average (LTSA) plot

- Rules
  - If [LTSA(f > 80)] then true
  - If [LTSA(f < 95)] then true
  - If [LTSA(pwr > 10)] then true
  - If [LTSA(pwr > 20)] then true

1



Rule 1 result.

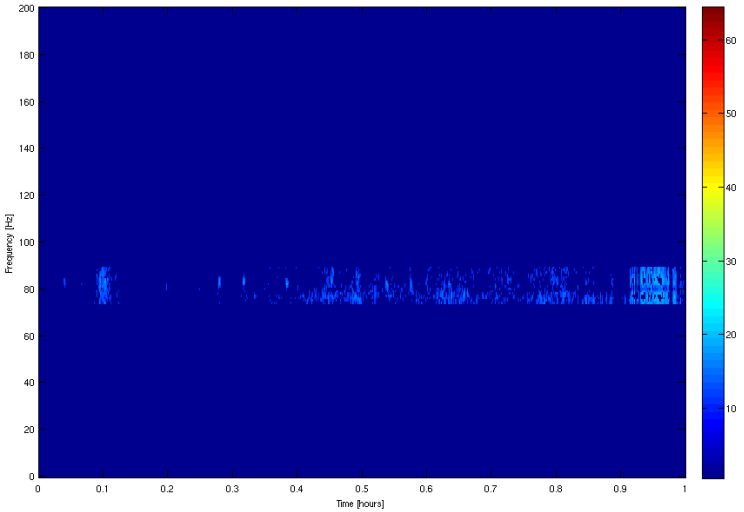
Knowledge-based Recognition implementation (2)

- Expert’ s knowledge
  - Long duration - ~ 15-20 s --- can be seen in LTSA
  - Pulsed
  - “identifiable” overtone ~85 - 90 Hz with slight

2

- Rules
  - If [LTSA(f > 80)] then true
  - If [LTSA(f < 95)] then true
  - If [LTSA(pwr >10)] then true
  - If [LTSA(pwr >20)] then true

2

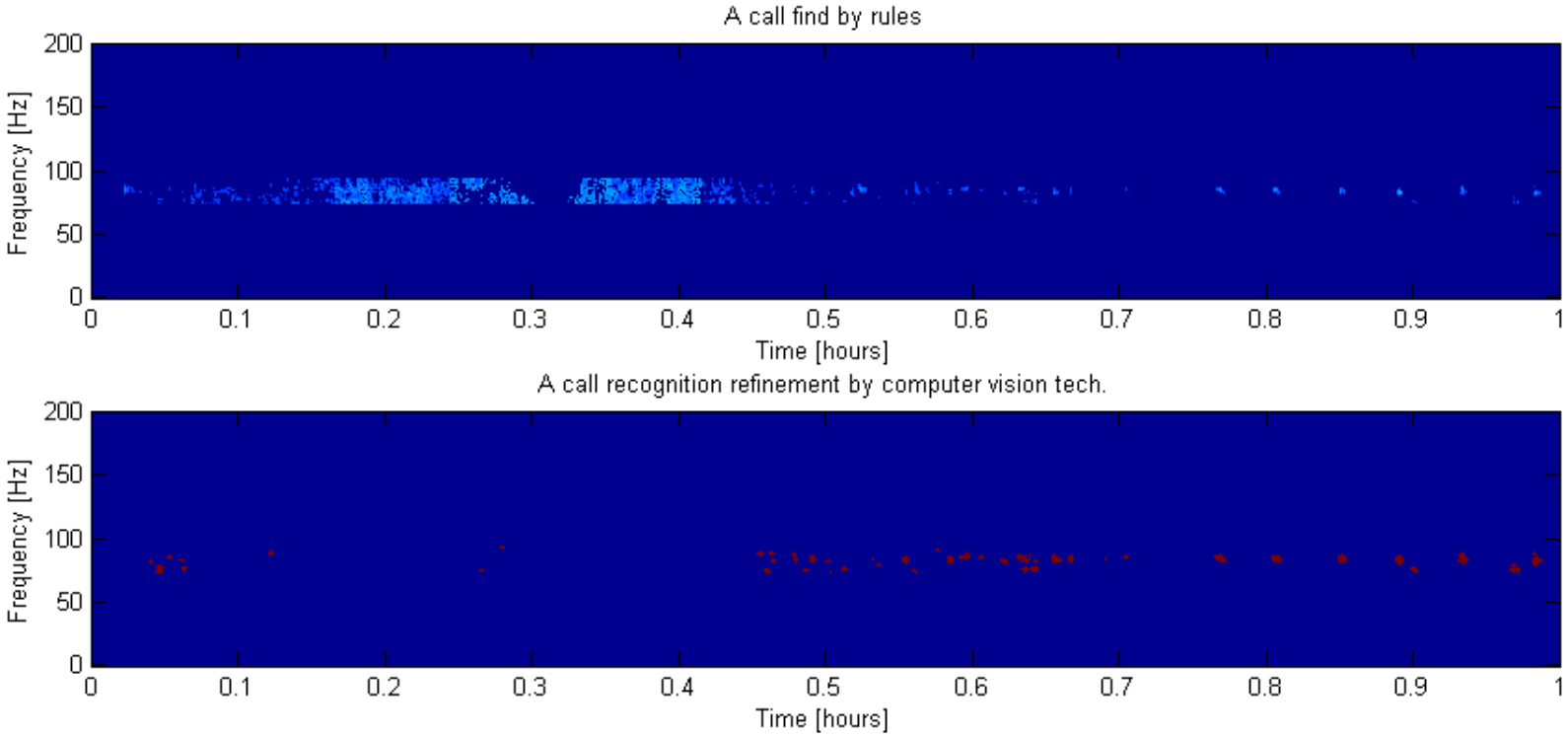


Rule 1 result.

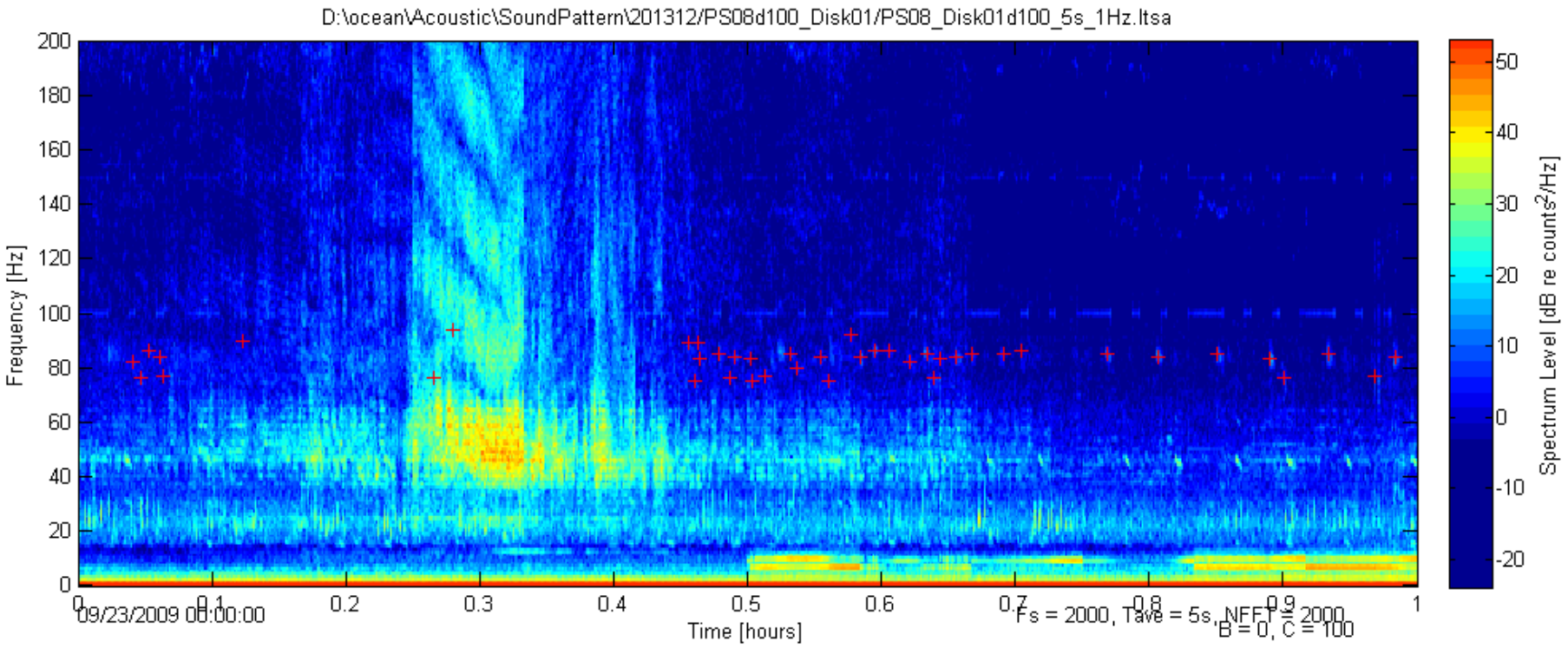
Rule 2 result.

Knowledge-based Recognition implementation (3)

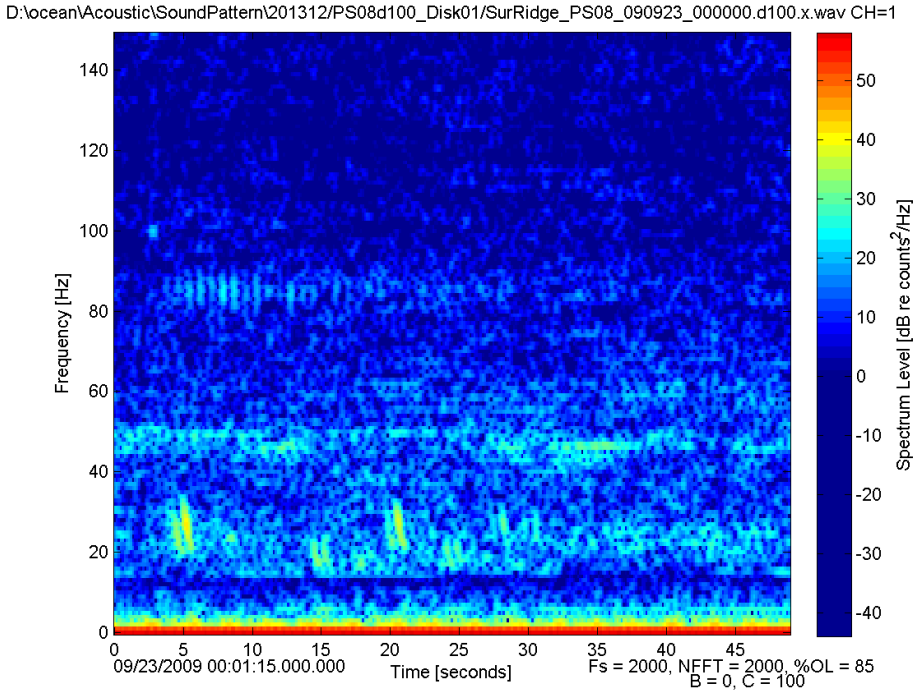
- The rules not always give us "perfect" result as it should be (noise masked by fish).
- Further **computer vision** technique to extract information we are looking for.



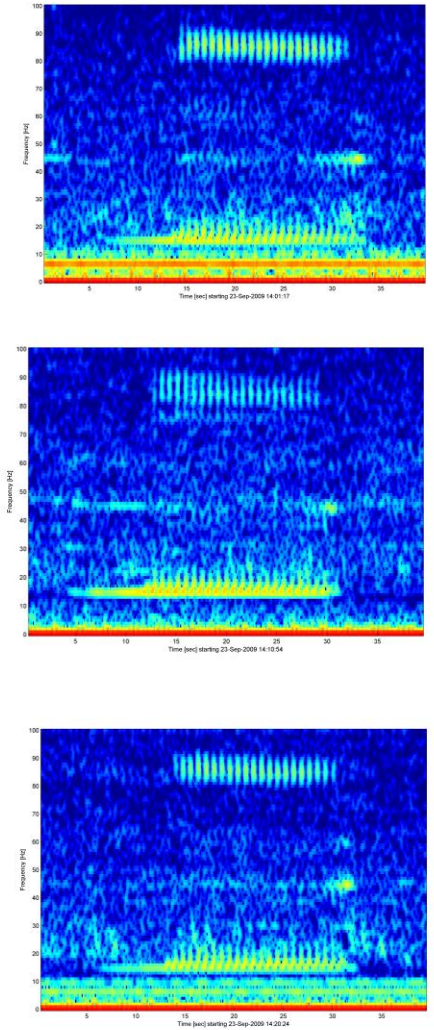
Layer 1 recognition



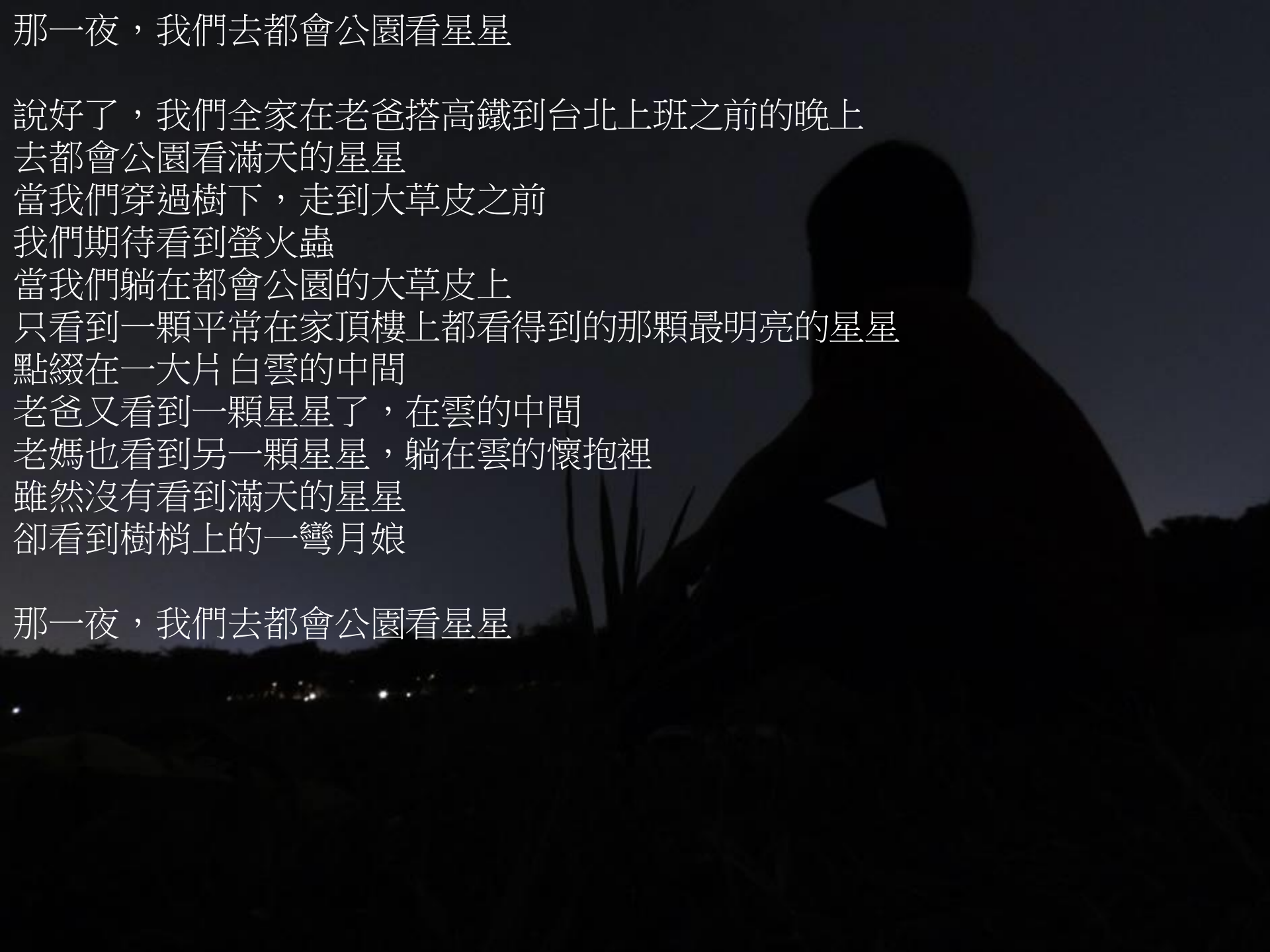
Layer 2 recognition: Spectrogram correlation



Spectrogram found in layer 1 recognition



Spectrogram database



那一夜，我們去都會公園看星星

說好了，我們全家在老爸搭高鐵到台北上班之前的晚上
去都會公園看滿天的星星
當我們穿過樹下，走到大草皮之前
我們期待看到螢火蟲
當我們躺在都會公園的大草皮上
只看到一顆平常在家頂樓上都看得到的那顆最明亮的星星
點綴在一大片白雲的中間
老爸又看到一顆星星了，在雲的中間
老媽也看到另一顆星星，躺在雲的懷抱裡
雖然沒有看到滿天的星星
卻看到樹梢上的一彎月娘

那一夜，我們去都會公園看星星

Thank you for your attention!