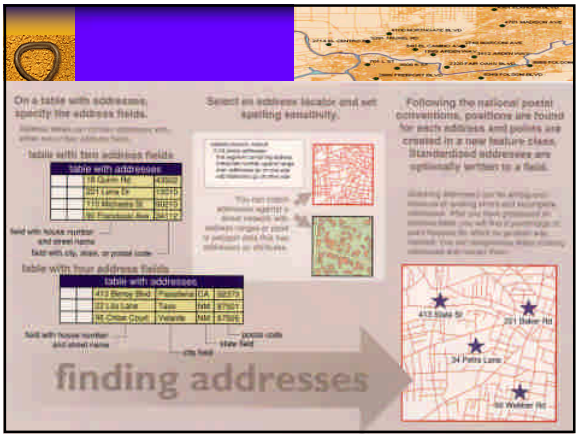
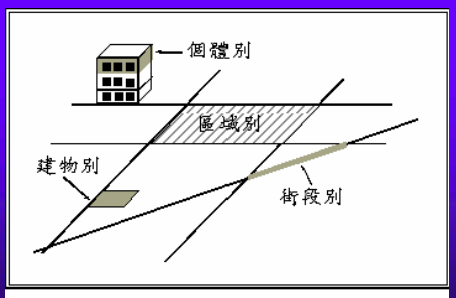
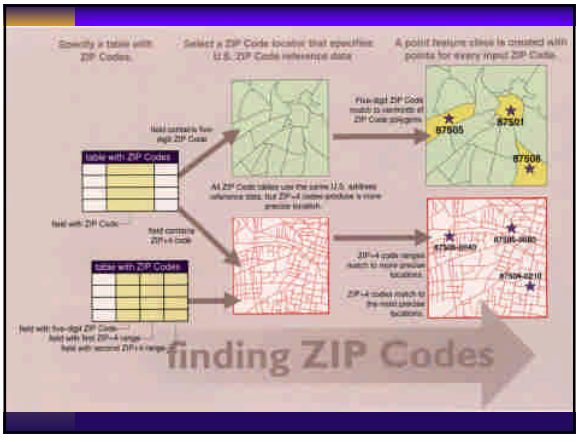
地理資料分析與應用

- 屬性資料分析
  - 適用一般MIS的處理程序與技術（如DBMS）
  - 分析上適合採用其他之統計或分析軟體（如SPSS、SAS、S-PLUS等）
  - 查詢、運算或彙整（summarize）處理
  - 地理編碼（geo-coding）與地址對位（address matching）
- 空間分析

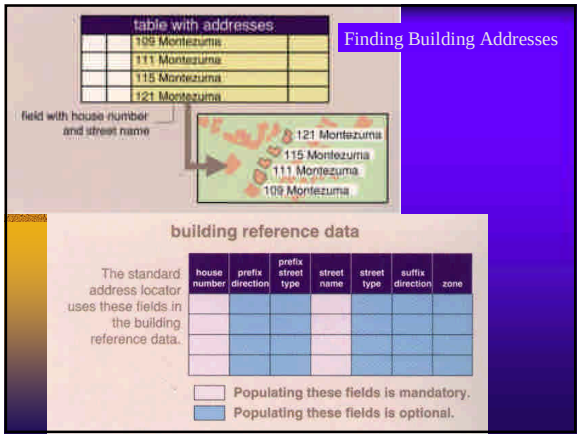




圖二 地址對位的四種方式



Matching Addresses to Streets



Finding Building Addresses

空間分析
（Spatial Analysis，SA）
The Heart of the GIS

Geometric Analysis

- Buffer環域分析: create an equidistant polygon around geographic features using a constant or attribute value
- Overlay疊合分析: create a new data set by combining two or more data sets
- Query空間查詢: perform graphic or tablular selection
- Proximity近鄰分析: determine distance between features of distinct data sets

Raster Analysis

Neighborhood Analysis近鄰分析: examine the effect of proximity of cells to their neighbors

Surface Paths路徑分析: calculate optimal path across a surface of "movement" costs

Hydrological Functions水文分析: calculate flow across surfaces and determine watersheds, delineate and order streams, or model subsurface flow

Network Analysis

Optimal Path最適路徑分析: calculate optimal path through a linear network modeling costs and present written directions

Nearest Facility設施區位分析: locate nearest facility to a defined address or point

Linear Allocations服務分區分派: determine "service areas" by allocating lines to facilities

Routing Solutions路徑排程分析: solve linear transportation problems such as best order routing ("traveling salesman")

Cartographic Output

Thematic Shading主題標示: shade polygons based on attributes using vector or raster fill patterns including transparent backgrounds

Automatic Text自動文字標示: intelligent text labeling and text overposting

Hybrid Display and Plot混合資料展示: presentation of vector and raster data

Visualization

3D Display 3D 展示: display data in three dimensional space with control over user viewpoint

Surface Drape資料疊合: drape raster or vector data over a 3D surface

View Calculation視域分析: determine line-of-sight or viewshed from any vantage point and elevation

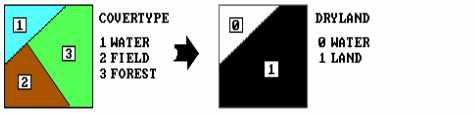
空間查詢

- 空間查詢
  - 空間關係查詢
  - 屬性查詢
- 多數所需求的GIS功能，大多屬於查詢的功能
- 單一圖層
- 多圖層

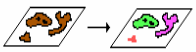
分類(classification)

- 所謂分類(classification)，乃是由圖徵中，辨識出具有共同性質(或是屬性)的部份，加以歸類成一組的運算
- 外部資料之屬性分類，不能完全適合分析工作時，需進行重分類(reclassification)
- 重分類的結果，有些不同的區域可能因而對應至相同的類別而需要加以聚合(aggregation)

RECLASSIFYING MAPS -- 'Recoloring Maps'



Newmap values a function of values on a single existing map; no new spatial information is created.



- Position -- Scale, Projection, Rotation, Coordinates
- Initial Value -- Relabeling, Aggregating, Weighting, Constant Math, Contouring
- Size -- Number, Length, Perimeter, Area, Volume
- Shape -- Spatial Integrity, Boundary Configuration
- Contiguity -- Clumps

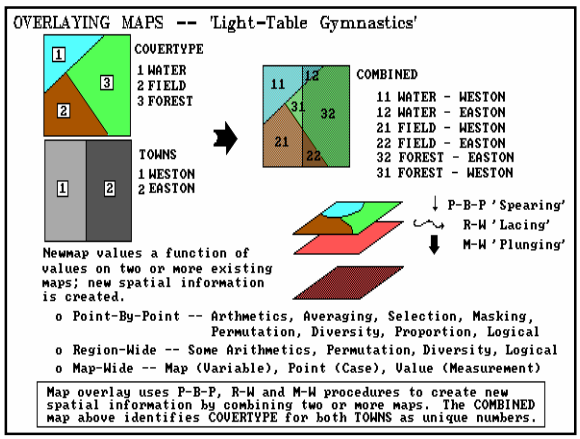
Reclassify operations merely 'repackage' existing map information such as generating a binary land/water map from a covertype map.

環域分析(Buffering)

- 距離空間物件某一指定距離內的區域，我們稱之爲環域(Buffer)
- GIS所提供的環域功能，包括對點、線、面(面再分爲由面的邊緣向內與向外兩種)的環域運算
- 某一污染源對外的擴散區域(點環域)、捷運沿線的噪音污染情況(線環域)、某地區(如學校、醫院)應受隔離的範圍(面的向外環域)、部隊營區警戒區域之劃定(面的向內環域)
- 在進行環域處理時環域的寬度有時不見得要一致，對某些應用而言，環域的寬度可能會依圖徵的屬性而有所差異

兩張以上圖層空間分析處理

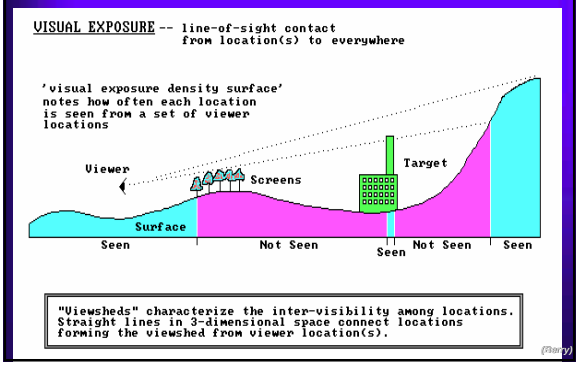
- 疊合分析Overlaying
- Map algebra
- Map calculator (in Arcview)
  - Arithmetic
  - Logical
  - trigonometric
  - Logarithmic
  - Power



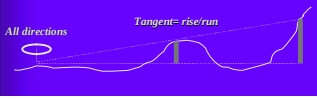
擴散分析

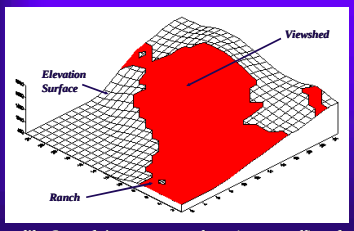
- 擴散分析，係由一個點出發，向外逐步擴張，並且逐步累積觀察的值。換言之，擴散分析是以某一參考點爲基準，就其鄰近範圍內，依指定的計算函數求出結果。
- 前述函數可運用在空間統計中，例如：求參考點近鄰範圍內目標物之總數、平均數、變異數、眾數、…等等。當我們所要觀察的值是行經的距離，且出發點和目的點中間沒有障礙物時，這種特殊的情形便稱爲鄰近度分析(proximity)
- 擴散分析在實作上，最大的困難點在於它必須處理相當多的網格資料點，在記憶體管理上是一項相當大的挑戰
- 結合尋徑分析與擴散分析，可以找到任一點和出發點之間的最佳路徑

視域分析



Calculating Visual Connectivity





Radiate *– visual exposure is calculated bay a series of "waves" that carry the tangent to beat.*

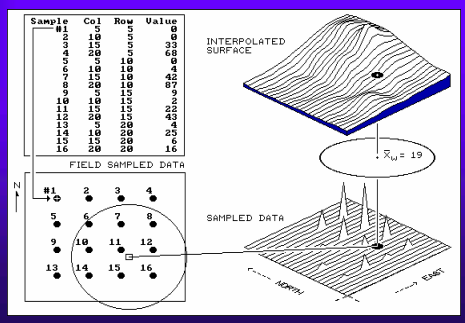
Simply – viewshed
Completely – number of "viewers" that see each location
Weighted – viewer cell value is added

…like Spread, it starts somewhere (starter cell) and moves through geographic space by steps (wave front)

(Berry)

空間（地形）內插分析

Interpolation Techniques (Inverse Distance, Kriging, MinCurve)



Sample	Col	Row	Value
#1	5	5	0
2	10	5	0
3	15	5	33
4	20	5	68
5	5	10	0
6	10	10	4
7	15	10	42
8	20	10	87
9	5	15	9
10	10	15	3
11	15	15	22
12	20	15	43
13	5	20	4
14	10	20	25
15	15	20	6
16	20	20	16