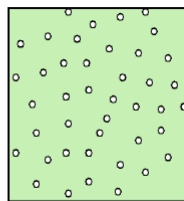
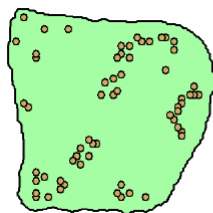


Nearest Neighbor Index Application

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GIS Programming
Fall 2007

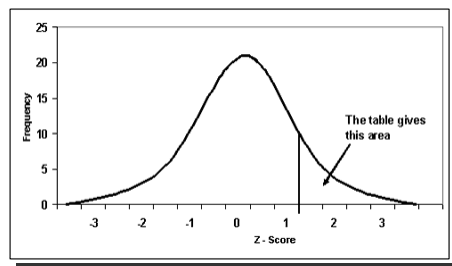
Definition:

- Nearest Neighbor Analysis – uses the distance between each point and its closest neighboring point in a layer to determine if the point pattern is random, regular or clustered



Basic Theory:

Null Hypothesis: Points are randomly distributed



Basic Formula:

- $R = \text{Observed Distances} / \text{Expected Distances}$

If $R < 1$ then: pattern exhibits clustering

If $R > 1$ then: pattern is ordered

Calculations:

- Average Nearest Neighbor = Distance / # Points
- Expected Avg Nearest Neighbor =
 $(1/2)(\text{Sqr Root}(\text{Area} / \# \text{ Points}))$
- Z score = (Avg NN – Expected) / Standard Deviation
- Nearest Neighbor Index = AvgNN/ Expected

Finding the Nearest Neighbor

- IProximityOperator:

Set pProximityOperator = pPointCollection
Distance = Distance + pProximityOperator.ReturnDistance(pPoint)

IProximityOperator : IUnknown

- ← QueryNearestPoint (in p: IPoint, in Extension: esriSegmentExtension, nearest: IPoint)
- ← ReturnDistance (in other: IGeometry) : Double
- ← ReturnNearestPoint (in p: IPoint, in Extension: esriSegmentExtension) : IPoint

Checking for Containment:

IRelational Operator:

```
Dim pGeometry As IGeometry
Set pGeometry = pPolygon
```

```
Dim pRelationalOperator As IRelationalOperator
Set pRelationalOperator = pPolygon
```

```
For i = 0 To ppoints - 1
Set Testpoints = pPointCollection.Point(i)
If pRelationalOperator.Contains(Testpoints) Then
SumPtsInPoly = SumPtsInPoly + 1
End If
If Not pRelationalOperator.Contains(Testpoints) Then
SumPtsNotInPoly = SumPtsNotInPoly + 1
End If
Next
```

IRelationalOperator : IUnknown

←	Contains (in other: IGeometry) : Boolean
←	Crosses (in other: IGeometry) : Boolean
←	Disjoint (in other: IGeometry) : Boolean
←	Equals (in other: IGeometry) : Boolean
←	Overlaps (in other: IGeometry) : Boolean
←	Relation (in other: IGeometry, in relationDescription: String) : Boolean
←	Touches (in other: IGeometry) : Boolean
←	Within (in other: IGeometry) : Boolean

Setbacks:

- **Failed Randomization:**
 - Tried to create a random point set within the bounds of the User's polygon
 - Used the IEnvelope interface to get the x min, y min, x max, and y max bounds for the Randomize function
 - If points passed the containment test then they were added to the point collection

Room for Improvement:

- More statistics options
- Calculate centroids of polygons for analysis
- Allow User to select a single polygon from a polygon feature class
- Clip point class to polygon boundary
- Employ a select case statement to describe to the user what various z-scores mean
- Correct for edge effects
- Calculate a convex hull

User's Guide

- Requirements: Point layer that is contained within a single polygon feature.
 - For an accurate Nearest Neighbor Index the spatial reference for the two feature classes must be the same
1. Browse for point feature class
 2. Browse for polygon feature class
 3. Decide whether or not use a polygon buffer
 4. Push the calculate button

ArcObject Interfaces

- IGxDialog
- IGxDataset
- IFeatureLayer
- IFeatureClass
- IMap
- IMxDocument
- IGeometry
- IEnvelope
- ICurve
- IPolygon
- IPoint
- ITopologicalOperator
- ISpatialReference
- IPointCollection
- IMultipoint
- IFeatureCursor
- IFeature
- IRelationalOperator
- IProximityOperator

References:

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- Chang, Kang- tsung. Programming ArcObjects with VBA. Boca Raton: CRC Press 2008
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