Network Distance Based Ecofriendly Walk Score Calculator

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(1) Straight Line Vs. Network Distance
(2) Network Data Model
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Straight Line Distance Vs. Network Distance

Straight line distance
Euclidean distance
Crow-flies distance

Network distance

Retail market analysis
Service allocation
Facility planning
Transportation planning
Garbage collection
Time-space geography
(Travelling time/distance)
more ...
Network
An interconnected set of points and lines that represent possible routes from one location to another. (ESRI)
e.g. road network, river network, etc.

Network Data Sources
Road center lines (from map vendors)
Manual digitizing on road maps
High resolution satellite images
(edge detection, not practical)

For Tsukuba City
GSI data + Zenrin Data + Manual Digitizing
GSI = Road center, does not cover small roads
Zenrin = Only road outlines
Network Data Model

Digitize → Clean → Build Network Data Model

- 4 records
- 12 records

ArcINFO Clean Command
SANET (ArcGIS Extension)

Stored information about Which node is what links and directions, ..
ArcGIS Network Analysis Software oriented
Network Data Model

Applications
Numerous..
At least we can perform “Shortest Path Analysis” without any attribute information.

If we have additional attribute information such as:
- Speed limitation per road  
  shortest vs. quickest
- Number of accidents per road  
  shortest vs. safest
- Number of crimes per road  
  shortest vs. safest
more.....

Exceptions
Pattern analysis (clustered or dispersed)
Post disaster studies (roads are broken)
But really important for pre-disaster
(Simulate different disaster scenarios for emergency preparedness)
Shortest Path Vs. Greenest Path Analysis

Shortest Vs. Greenest
Calculation of greenness score

Greenness Score = \frac{\text{Vegetated area in the 10-m buffered road}}{\text{Road buffered area}} \times 100

ALOS re-sampled to 5m
To reduce errors between vector and raster

Greenness Score = (Vegetated area in the 10-m buffered road/Road buffered area) \times 100
Shortest Vs. Greenest

Shortest Path: P1-P2: 1.41Km (G.Score: 14)
Total Distance: 1.41Km
Total Average Green Score: 14

Greenest Path: P1-P2: 2.34Km (G.Score: 58)
Total Distance: 2.34Km
Total Average Green Score: 58
Shortest Path Vs. Greenest Path Analysis

Multiple points/places

Route Information: Greenest
P1-P2: 3.34Km (G.Score: 55)
P2-P3: 1.85Km (G.Score: 51)
P3-P4: 2.65Km (G.Score: 61)
P4-P1: 3.57Km (G.Score: 55)
Total Distance: 11.41Km
Total Average Greenness Score: 55
Network Data is important

Time and space/distance sensitive researches

Applications are numerous
*Retail market analysis, urban planning, transportation planning, emergency preparedness, etc.*

Essential for connectivity studies
*Average block/street length, number of connected nodes, …*

Integrates with other remote sensing data or GIS dataset
*(crimes, accidents, speed limitations, traffic volume, greenness, …)*
Thank You