
Creating and Generalizing Linear Networks

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Cartographic Solutions & Consulting

Introduction

Data Intelligence through Spatial Relationships and Feature Information

- **Feature Information**
 - features classes, theme groupings, attribute information
- **Spatial Relationships**
 - topology, hierarchies and networks
- Spatial feature relationships can be used during the Generalization process
 - Topology – continuity, connectivity and location
 - Hierarchy – structure, order and priority



Introduction (Continued)

Why map producers avoid hierarchical data models

- **Difficulty**
 - Focus on local area and individual features
- **Time**
 - Quick data capture for single scale product
 - Value added information is not worth the effort for one time use data
- **Cost**
 - Expensive systems
 - User training



Introduction (Continued)

Why hierarchies are important

- Map production involving cartographic databases, multi use data and rapid map products
- Model generalization introduced into the map production flow
- Hierarchies provide structure to linear feature networks
 - Hierarchy gives order and priority to the features that constitute the linear network
 - Model generalization removes less important features which conflict with other features in the network.
 - Elimination of features from linear networks is known as *Line Typification*.

Introduction (Continued)

Automated Digital Map Generalization and “The Blind Cartographer”

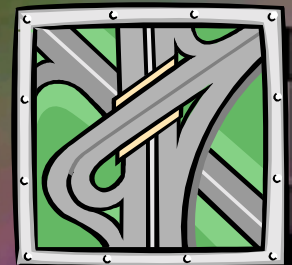
- **Map Generalization**
 - necessary when the map content exceeds the capability of graphic representation
 - preserve the basic structure and characteristics of the geographic data and represent them in a legible manner
- **Manual Process**
 - Cartographer uses experience, training and sight
- **Automated Process**
 - Relies on intelligent map data



Hierarchical Schema for Network Features

Linear Network features are some of the most prevalent and important features displayed on map products

- **Transportation Road networks**
- **Drainage River systems**
- **Purpose of the network is to link individual features that are connected physically or through attributes**
- **Primary cartographic qualities used for constructing networks include attribution, length, straightness, continuity and patterning.**



Hierarchical Schema for Network Features (Continued)

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Digital mapping requires an organized data structure for recording and storing the spatial data that define cartographic feature information.

- **Data Model defines the schema for data content and structure**
- **Topology is the mechanism for describing data geometries**

Review Dynamo Data Model
Review Dynamo Hierarchy Structure

Building Linear Networks

Usefulness of Feature Networks

- **Dependant on the requirements of the map product and the amount and type of generalization**
- **Help determine when and where generalization is required**
- **Adds level of intelligence to the map product that may not always be appreciated by the end user**
- **Map producer can increase the level of automation in the production process.**

Feature Merging

- **Required when data capture collects many small individual features**

Building Linear Networks (Continued)

Transportation Systems and Grids

- **Systematic features which generally require connectivity to other parts of the network**
- **Many parts seem to have no beginning and no end**

Constructing Feature Hierarchies and Networks

- **Develop schema**
- **Assign the necessary parent hierarchy features to low level feature components**
- **Merge components and hierarchy feature into network**
- **Update based on cartographic evaluation**

Building Linear Networks (Continued)

Components of DynaGEN application

- **Complete Hierarchies Operator**
- **Hierarchy Network Merge**

Review Road Hierarchy Structure

Generalization of Linear Networks

Manual generalization of linear networks can be difficult and tedious work

Typification

- Reduce or eliminate conflicts between lines in the network
- Eliminate line features that do not represent a significant part of the network
- Maintain representative pattern of the more significant features in the network

Generalization of Linear Networks (Continued)

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Computer assisted Generalization can produce acceptable results

DynaGEN Line Typification

- Conflict resolution algorithm
- Critical features for Priority Typification

- DynaGEN Demo