

Table 1. Attribute data of link.

Contents	
Link id (node id numbers of each end)	Number of lanes
Administrator code	Carriageway width [unit: meter]
Road type [expressway, urban expressway, national road, principal prefectural road, general prefectural road, principal city road, general city road, municipal road, others]	Condition of use [in-service, under construction, under contemplation]
Route number	Median width
Overlapped route information	Median extension length
Municipal area code	12-hours traffic volume
Link length	Travel speed (at peak times)
Width classification	Speed limit and other traffic regulations
Width of narrowest carriageway portion	Coordinates of interpolation point locations
Types of weather-related traffic restriction zones	Link type
Vehicle weight	Toll road [true, false]
Height and width restrictions	etc.

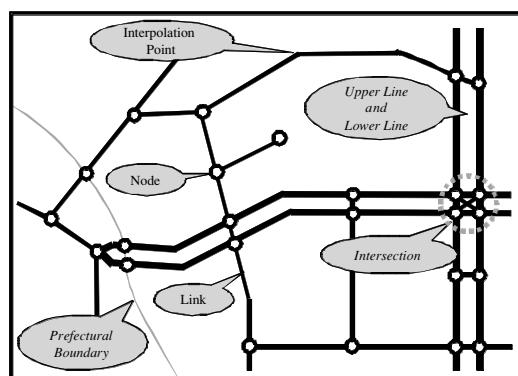


Fig. 1. Data model of the DRM Database.

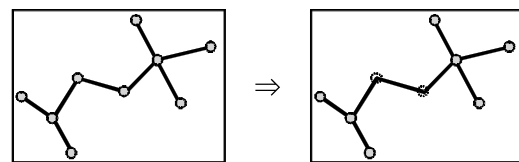


Fig. 2. Step1.

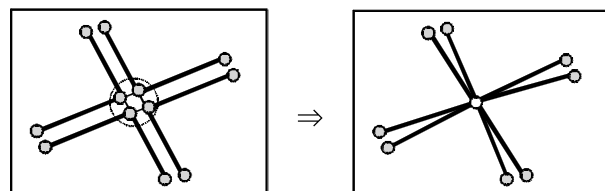


Fig. 3. Step2.

Of course, the composed network does not have the above problems and is suitable for solving transportation problems. The feature of the proposed algorithm is that it makes use of topological information of the road networks in addition to attribute data. The proposed algorithm is not limited to the DRM Database, and can be applied to general digital road maps with a little modification.

Various studies have been conducted on the automatic generalization of maps. For example, the Lang method (Lang, 1969) and the Douglas-Peucker method (Douglas and Peucker, 1973) are known as algorithms for simplifying broken-line sections. However, most of these methods focus on displaying maps, and they ignore the structure of networks.

## 2. Principal-Road Network Structural Algorithm

### 2.1 Digital road maps

The DRM Database is maintained and renewed under standards established by the Japan Digital Road Map Association (Ishida and Yaguchi, 2007). The DRM Database has the topological structure of the road networks and the attribute data of links. Table 1 shows a part of the attribute data that the DRM Database has. For example, “Road type” has the value such as an expressway, a national road, a principal prefectural road, a general prefectural road and a mu-

nicipal road, etc. “Link type” has the value such as a main road, a junction road, an intersection road, a frontage road, etc.

### 2.2 Algorithm

The algorithm for composing a principal-road network from the DRM Database is described by the following five steps:

- Step0** Composition of an initial network using attribute data,
- Step1** Deletion of nodes of degree 2,
- Step2** Contraction of intersection links and junction links,
- Step3** Contraction of two adjacent nodes,
- Step4** Contraction of adjacent nodes and links.

In the following, we explain each step.

#### Step0

We compose the network consisting of the road links that meets the following three requirements:

- “Road type” value is “national road”, “principal prefectural road”, “general prefectural road” or “principal city road”. Or, “Carriageway width” value is “13 m”