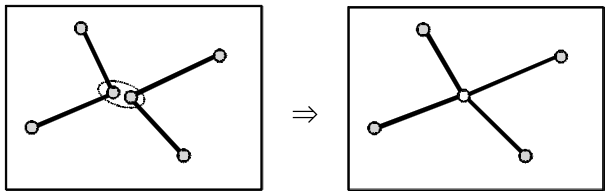
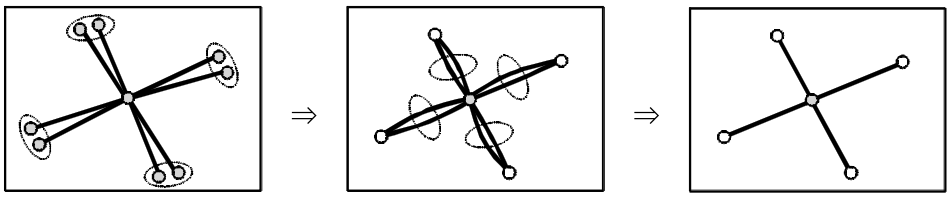
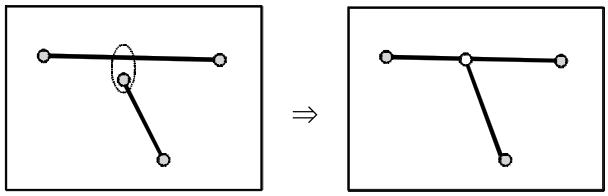


(a) Case without multiple links

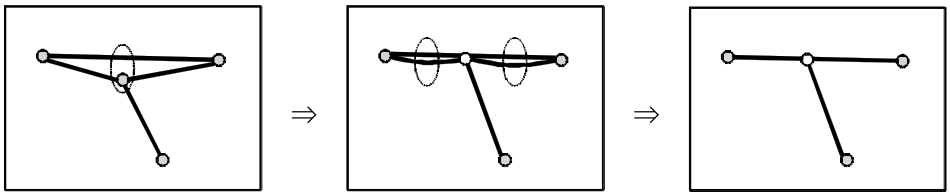


(b) Case with multiple links

Fig. 4. Step3.



(a) Case without multiple links



(b) Case with multiple links

Fig. 5. Step4.

or more.
- "Toll road" value is "false".
- "Condition of use" value is "in-service".

Furthermore, in the network, we find the maximal connected sub-network (i.e. connected component), and we use this sub-network as an initial network for composing a principal road network. When the network is disjoint, that is there are nodes that cannot be reached mutually, there is a possibility that the transportation problem cannot be solved.

Step1

In this step, we find the nodes of degree 2 and delete them. Here, the degree of the node is defined as the number of links connected with the node; for example, the node of degree 2 means the number of links connected with the node is two. Generally, when solving transportation problems, in the nodes of degree 2 the flow enters in through one link, and exits out through the other link (except for the source and the sink), the nodes are redundant. Thus, the nodes of degree 2 can be deleted without affecting the solution to the transportation problem. Therefore, because the number of nodes decreases, the network size can be reduced.

In the DRM Database, a link has interpolation points which represent shape in addition to two nodes which represent endpoints of a link. Nodes represent an intersection, a dead-end point or a change point of attribute data (for instance, the intersection of prefectural boundary). The degree of the node representing an intersection is three or more, the degree of the node representing a dead-end point is one, and the degree of the node representing a change point of attribute data is two. Therefore, all nodes of degree 2 are change point of attribute data. However, in the initial network (in Step0), some nodes of degree 2 are intersections of principal roads and narrow side streets. So, we find and delete them (see Fig. 2). When this is done, the two links connected to the node are joined. The attribute data, such as link length, is updated at the same time as the sum of the length of adjacent links. At this time, the shape of the joined link does not change because the interpolation points are maintained.