STUDY ON DESIGN AND APPLICATION FOR TRAFFIC THEMATIC MAP LEVEL 1 DATA

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ABSTRACT: We design level 1 traffic thematic map for common data structure. Level 1 means the road that can passing cars. If public office and private company use this form, they can save amount of money from overlapping update. And widely use of traffic analysis, navigation and traffic information system. For design common data structure we compared several data structure(traffic thematic map, ITS standard node/link, Car navigation map), and generalization these characteristic data. After generalization we considered about application parts. It can use of public part(traffic analysis, road management, accident management) and private part(car navigation, map product, marketing by variable analysis) etc.

1. INTRODUCTION

Every year, Public office related traffic area and private company of constructing digital map expense maintenance and mending cost for their own standard map data. If there's unified database for map data, we can save maintenance money and share same standard digital map data. However there are still many problems. Especially, Interesting and construction scope is different among them. For example, public office user have a importance of analysis application and private company user have a priority of detail and high level information service like car navigation. However if their objects are different, POI (Point of Interest) exist in their common area. We analyze structure and characteristics about different database among CNS map, ITS node/link data and traffic thematic map. Finally, we design common and high level DB structure for end user. We expect that traffic thematic map level 1 data can utilize making decision data in public, traffic statistics and demanding prediction data in research company, application of Car Navigation System service in private company and other application usages.

2. RESEARCH CONTENTS

2.1 General Information of Traffic Map Comparison

Public parts digital map are various, for example Standard geo information(National Geographic Information Institute), Data for management for road name and buildings(Ministry of Public Administration and Security), ITS standard node/link, traffic thematic map(Ministry of Land, Transport and Maritime Affairs). Also private parts digital map are various. There are dozens of CNS maps. In this study, we compared about ITS standard node/link, traffic thematic map, CNS map that specialized traffic part.(Table 1, table 2)

Table 1. General information of traffic maps

Division	CNS map	ITS standard node/link	traffic thematic map
Road data Construction and Management	● Renewal fixed period each company	● New road : Report progress at 1month before the completion, at the same time with completion, input the new data into ITS ● Renewal of existing road : Report progress at 1month before the completion, at the same time with completion, input the new data into ITS ● Closing of existing road : Delete the data at once that closed	● 1year period : Survey only new or renewal data and input surveying result ● 5year period : Survey whole road and input the surveying result
Application usage	● Navigation service of POI search, route search and guide	● Road condition information management, traffic information service(ITS construction), BIS construction	● Traffic analysis ● Traffic plan(predict the volume of traffic)

Map Projection	• Normalized coordinate system • Normalizing second order map index size • Use real distance	• Standard ellipsoid : GRS80 • Geodetic coordinate system : ITRF2000 • Major axis : 6,378,137 • Minor axis : 6,356,752.3	• Standard ellipsoid : Bessel • Single origin : 128E, 38N • Scale factor : 0.9999 • Origin coordinate : X(N) : 600,000 Y(E) : 400,000

2.2 Data Structure Comparison

As you can see Table 3, Table 4, each data is different because their purpose of construction are different. CNS map has toward name, characteristic attribute for navigation but traffic thematic map has approach road and district for local network analysis. But there are many common attribute. Basically node/link ID and road information(road no., max speed, road rank, turn information etc.) are example. These attributes base on united level 1 traffic thematic map. New united DB will be born how compound each characteristic attribute based on common attributes.

Table 2. Node data structure

No.	CNS map	ITS standard node/link	traffic thematic map
1	Node ID	Node ID	Node ID
2	Node Level		Network Level
3	Node Class Code	Node Type	Node Type
4	Median Strip (Open or Close)		
5	Node Class		
6	Group ID		
7	Index No.		Map Index No.
8	Traffic Light Code (Yes or No)		
9	Intersection Name	Intersection Name	Intersection Name(Name/Alias)
10			Approaches Road No.
11			Restrict ID1/ID2/ID3
12	Turn Restrict	Turn Restrict	Turn Restrict
13	Toward Name		

Table 3. Link data structure

No.	CNS map	ITS standard node/link	traffic thematic map
1	Road ID	Link ID	Link ID
2			High Level Link ID
3	Road Level		Network Level
4	One Way Code		One Way(Yes or No)
5	Toll Road Code		Toll Colletion (Yes or No)
6	Median Strip		Median Strip (Yes or No)
7	Road Pavement (Yes or No)		Road Pavement (Yes or No)
8	Lanes	Lanes	Lanes(Up/Down/Total)
9			Reversible Lane No.
10			Link Capacity
11	Road Width		
12	Start Node	Start Node	Start Node(Up/Down)
13	End Node	End Node	End Node(Up/Down)
14			Length
15		Overlapping Road (Yes or No)	
16			Overlapping Road No.
17		Connection Road Code	
18			Connection Department (Yes or No)
19		Restrict Vehicles Type	Restrict Vehicles Type
20		Restrict Weight	Restrict Weight
21		Restrict Height	Restrict Height
22	Min/Max Speed	Max speed	Max speed(Up/Down)
23	Climb Code		
24		Road Name	Road Name/Road Name(alias)
25	Facilities Class	Road type	Facilities Type
26	Facilities Height		
27	Facilities Height1		
28	Road Facilities Name		Road Facilities Name

29	Map Index No.		Map Index ID
30	Group Code		
31	Road No.	Road No.	Road No.
32	Road Rank	Road Rank	Road Rank
33			Road Management Admin.
34			Car Exclusive Use Road (Yes or No)
35			Climb Lane(Yes or No)
36			Shoulder(Yes or No)
37			Bus Lanes(Yes or No)
38			New Road(Year)
39			Omission Road(Yes or No)
40			District ID
41			Old times LINK_ID
42	Infra Link Code		
43	Infra Link ID		

3. CONCLUSIONS

3.1 Level 1 Traffic Thematic Map Design

It is necessary to renewal data model for include all purpose and structural characteristics. We designed level 1 traffic thematic map's data model like Table 4, Table 5, Table 6, Table 7

Table 4. Turn restriction table

No.	Attribute ID	Attribute Name	Attribute Type	Key	Null
	Table name		TURN_INFO		
1	TURN_ID	Turn ID	VARCHAR2(15)	PK	NN
2	NODE_ID	Node ID	CHAR(13)		NN
3	IN_LINK	First(In) Link	CHAR(13)		NN
4	OUT_LINK	Second(Out) Link	CHAR(13)		NN
5	TURN_TYPE	Turn Type	CHAR(3)		
6	Day_Code	Day of the Week	CHAR(3)		
7	Time_Code_S	Start Time	CHAR(3)		
8	Time_Code_E	End Time	CHAR(3)		
9	NETWORK_LEVEL	Traffic Network Level	NUMBER(1)		NN

Table 5. Node data modelling

No.	Attribute ID	Attribute Name	Attribute Type	Key	Null
	Table name		AD0102		
1	SHAPE_ID	Shape ID	NUMBER(38)		
2	NODE_ID	Node ID	CHAR(13)	PK	NN
3	NODE_Type	Node Type	CHAR(3)		NN
4	NODE_Class	Node Class	CHAR(3)		
5	NODE_NAME	Node Name	VARCHAR2(30)		
6	NODENAME_ALIAS	Node Name(Alias)	VARCHAR2(30)		
7	APPROCHES	Approaches Road No.	NUMBER(1)		NN
8	RESTRICTEDTURN	Turn Info(Yes or No)	CHAR(1)		NN
9	JOINNODE_ID	Join Node ID	CHAR(13)		
10	DISTRICT_ID1	District ID 1	VARCHAR2(13)	FK	NN
11	DISTRICT_ID2	District ID 2	VARCHAR2(13)	FK	NN
12	DISTRICT_ID3	District ID 3	VARCHAR2(13)	FK	NN
13	NETWORK_LEVEL	Traffic Network Level	NUMBER(1)		NN
14	MAPINDEX_ID	Map Index ID	VARCHAR2(8)	FK	NN
15	Median_Strip	Median Strip(Open or Close)			
16	Point_Class	Point Class			
17	Traffic_Light	Traffic Light (Yes or No)			
18	Toward_Name	Toward Name (Yes or No)			
19	REMARK	Remark	VARCHAR2(30)		

We designed DB about level 1 thematic map that have characteristic of CNS map based on traffic thematic map. It includes characteristics of ITS standard node/link. For extension traffic thematic map use of car navigation, we add toward name table and add traffic light field. Also it has restriction information about height, weight for safety car driving.

Table 6. Toward name table

No.	Attribute ID	Attribute Name	Attribute Type	Key	Null
	Table name		Toward Name		
1	NODE_ID	Node ID	CHAR(13)		NN
2	Link_ID	Link ID	CHAR(13)		NN
2	Board_Loc	Board Location	VARCHAR2(30)		
3	Long_Dis	Long Distance Name	VARCHAR2(30)		NN
4	Close_Dis	Short Distance Name	VARCHAR2(30)		NN

Table 7. Link data modeling

No.	Attribute ID	Attribute Name	Attribute Type	Key	필수
	Table name		AD0022		
1	SHAPE_ID	Shape ID	NUMBER(38)		
2	LINK_ID	Link ID	CHAR(13)	PK	NN
3	UP_FROM_NODE	Going Up Start Node	CHAR(13)	FK	
4	UP_TO_NODE	Going Up End Node	CHAR(13)	FK	
5	DOWN_FROM_NODE	Going Down Lane No.	CHAR(13)	FK	
6	DOWN_TO_NODE	Going Down Lane No.	CHAR(13)	FK	
7	UP_LANES	Going Up Lane No.	NUMBER(2)		
8	DOWN_LANES	Going Down Lane No.	NUMBER(2)		NN
9	LANES	Lane No.	NUMBER(2)		NN
10	REVERSIBLELANE	Reversible Lane No.	NUMBER(2)		NN
11	UP_MAXSPEED	Going Up Maxspeed	NUMBER(3)		NN
12	DOWN_MAXSPEED	Going Down Maxspeed	NUMBER(3)		NN
13	ROAD_NAME	Road Name	VARCHAR2(30)		
14	ROADNAME_ALIAS	Road Name(Alias)	VARCHAR2(30)		
15	ONEWAY	One Way (Yes or No)	CHAR(1)		NN
16	ROAD_NO	Road Number	VARCHAR2(13)		
17	ROAD_RANK	Road Rank	CHAR(3)		NN
18	ROAD_ADMIN	Road Management Admin.	VARCHAR2(30)		
19	AUTOEXCLUSIVE	Car Exclusive Use Road (Yes or No)	CHAR(1)		NN
20	UP_CLIMBINGLANE	Going Up Climb Lane (Yes or No)	CHAR(1)		NN
21	DOWN_CLIMBINGLANE	Going Down Climb Lane (Yes or No)	CHAR(1)		NN
22	UP_SHOULDERLANE	Going Up Shoulder (Yes or No)	CHAR(1)		NN
23	DOWN_SHOULDERLANE	Going Down Shoulder (Yes or No)	CHAR(1)		NN
24	UP_BUSLANE	Going Up Bus lane (Yes or No)	CHAR(1)		NN
25	DOWN_BUSLANE	Going Down Bus lane (Yes or No)	CHAR(1)		NN

3.2 Applications

Like this level 1 traffic thematic map of united DB is used of not only political decision in public office and traffic statistics, prediction about volume of traffic in research organization but also Car navigation system in private company and other various purpose we can respect.

Table 9. Application about level 1 map data

Division	Application field	Main subject
Public section	Traffic analysis	● Selection of optimum location ● Prediction of Traffic Demand ● Bus Infomaion System ● Freight Expense Computing
	Road Management	● Integration System of Road Management ● Road Facilities Management
	Accident Management	● Total Situation Board of Accidents ● Urgent Transport Route Searches ● Bypassing Course Searches
Private section	Car Navigation	● CNS(Car navigation system) ● BNS(Bike navigation system)
	Map Product	● Theme map Product for Tourist (Sight seeing, Food, leisure)
	Marketing	● The Customer Inducement by Accessible Analysis

3.3 Result

We unite several traffic map structure. As a conclusion common traffic map has an advantage not only Table 9 but also save cost about constructing and support data. If the saved money can use for more correct and the newest data, then the level 1 data customer will more satisfy by the good service.

4. REFERENCES

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