

Adaptive path management considering temporal and circumstantial variations

Jong-Un Won¹, Jae-Won Kim², Yong-Jang Kwon¹

¹Logistics research team, Korea railroad research institute(KRRI)
176, Cheoldo, Bangmugwan-ro, Uiwang-si Gyeonggi-do, 437-757, Korea
juwon@krii.re.kr, yjkwon@krii.re.kr

²Natural Science Research Institute, Korea University
145 Anam-ro, Seongbuk-gu, Seoul 136-701, Korea
kimjw16@korea.ac.kr

Abstract. In this paper, we propose adaptive path management method depending on road traffic restriction factors such as temporal and circumstantial variations. Proposed method reflects road traffic restriction factors such as vehicle type and departure or running day and time, etc and provides path that is suitable for situation. Because road traffic restriction factors are very diverse, path searching speed can be slowed. Therefore, we use network and shape data when we find path in order to search path quickly. Based on this, we suggest path suitable for vehicle type, driving time. Also we build path management system that can adapt to road conditions promptly if road is controlled by reasons of accident or event. In this way, we can support safety driving of deadweight cargo vehicles and dangerous goods vehicles and improve the safety of the people.

Keywords: network DB, road traffic restrictions, transport route, navigation path

1 Introduction

Recently, traffic volume is increasing with development of industry.[1][2] Also dense population societies are forming because of urbanization and we restrict traffic of heavy goods vehicle in densely populated and business area.[3] Additionally, we restrict traffic of dangerous goods vehicles transporting harmful chemical substance in absolute preservation area such as water protection zone.

Traffic restriction area restricts travelable time depending on vehicle weight and type of freight. But traffic restriction areas are mostly aimed at heavy goods vehicle and dangerous goods vehicles.[2] Also we need to make a detour when there is road traffic restriction for reasons of traffic accident and event. But, most of Navigation is designed for passenger car.[4][5] So they do not provide road information according to characteristic of vehicle cargo and road traffic restriction information because of accident and event. In this situation, we need to adaptive path management considering road circumstance and vehicle type. In this paper, we propose adaptive path management considering temporal and circumstantial variations. Adaptive path

management reflects dynamic road circumstances such as traffic accident, event and provides suitable path to vehicle according to vehicle weight, type of freight and road traffic restriction information. To applying additional constraints conditions and minimizing path searching time, we use network and shape data. In this way, we realize adaptive path searching.

2 Network Database table

2.1 network DB table

There are so many restricted areas including road traffic restriction and water protection road in Korea. The information about traffic restricted areas that consist of variable area and sustainable area should be independent on network DB. Therefore, in this paper, network DB gets only the flag data for water protection road and road traffic restriction in order to The detailed information about restricted is stored in restricted area DB

Table 1. Restricted area field in network DB

No	Field name	Description	Note
15	flag_danger	Risk degree	
16	speedlh	maximum speed	permitted speed
17	flag_water	water protection road	
18	flag_cargo	road traffic restriction	

3 Restricted Area

3.1 Road traffic restrictions

Pass restricted area consists of water protection zone, road traffic restrictions and temporary road traffic restrictions caused by accident and event. In water protection zone, we only consider type of freight that was forbidden in that area. So we set up 0 or 1 in network data field and determine pass or not.

On the other hand, road traffic restrictions and temporary road traffic restrictions are tend to be composed of area. So, we implement road traffic restrictions as area and apply to shape data to reflect search convenience and adaptability. Road traffic restriction area are appeared as regular polygonal shape and expressed by main coordinate. Network Data check on fields of road traffic restrictions and determine that the link needs to examine about traffic restriction examination. If traffic restrictions are identified in that link, we search shape data of related road traffic

restrictions to check out detailed traffic restriction conditions. At this time, we search shape containing related link by comparing link-coordinate with shape-coordinate. After finding shape, we compare link conditions with shape data like below metrics. If link conditions are contained in traffic restriction conditions of shape data, the link is excepted from available path and we can avoid path restricted area.

4 Simulation

In order to evaluation for restricted area database, we simulate the path searching whether the path has any restricted area or not around the road traffic restrictions and water protection road.

4.1 water protection road

There is a water protection road(res line in Fig.1) around Dukdong lake in Korea. So we set the Origin and Destination and search the path(blue line in Fig.1) to avoid the restricted road. Fig. 1 shows the result avoiding the water protection road.



Fig. 1. The path avoiding water protection road.

4.2 Road traffic restrictions

Also, we simulate the searching path avoiding the road traffic restrictions. First of all, we set vehicle weight of 10 tons, start time of 7AM and 11AM, and then search the path between Hangjoo bridge to Amsa-dong to avoid any restricted area. Olympic highway contains several constrains. For example, the load 10 tons vehicle traffic is restricted between 7:00 to 10:00 AM. Fig.2 shows two paths dependent on departure time. In case of departure time 7:15, selected path is through the outside circle highway(60km). But if the departure time of a vehicle is at 11AM, the vehicle is recommended with running through Olympic highway(44km).

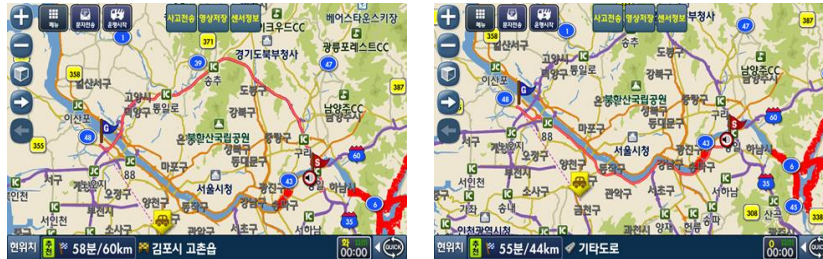


Fig.2. The path with departure time 7:15(left) and 11:00 (right)

5 Conclusion

This paper introduced adaptive path management considering temporal and circumstance variations. Restricted areas have temporal areas which is accident area or big events where people crowd and continuous areas which are water protection roads and road traffic restriction at the same time. The network database was designed for simple decision whether the road is restricted or not. had water protection field and traffic restriction field for restricted area. Restricted DB was designed with type of vehicle, time and day of the week in order for criteria of avoidance. Road traffic restrictions were implemented of shape data in order to operate independently from the network DB. The performance of the developed system was tested with searching the path avoiding restricted areas around the road traffic restriction and the water protection road.

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