SELECTION OF OPTIMAL ROUTE USING VIRTUAL REALITY & GIS

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ABSTRACT:

The road is greatly changed by the constant economic growth for a long time the traffic situation such as the vehicles of increase and large, the performance enlargement of vehicles, the high speed, etc., due to increasing economic scale. Therefore, secure smooth traffic of vehicles and driving road safety that was appeared at the age of the request. The road is necessary to transfer goods and people the essential public traffic, the road network is connected with increasing the national land of function both all over the country of road network and the local road network. Each road was in charge of the national land development and the improvement of living conditions in cooperation with each other. Especially, increase a number of vehicles, according as road network by the significant of traffic that is increased in movement, convenience and economic, economic and social development provided people of the improvement of living conditions. A study about an optimal route selection model is researched over late 1980s by development of computer and GIS, and consisted including research about optimal route that use digital terrain model in domestic such as the earth volume calculations, mass curve output and automation system construction.

1. MANUSCRIPT

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Lately, the study about the driving simulation on the road and virtual reality using VGIS(Virtual Geographic Information System) is researched.
However, the optimal route selection uses topography information that is not used much in businesses because of several problems that must solve them such as complexity of data, popular enmity problem, and noise pollution.
Usually, if the route selection reviewed sufficiently data examination at the first time, it happened the additional expense due to the route alteration by data examination of insufficiency

According to Busan local capital intendance, in 2000, suspension of works by design indifferent, increased construction cost arrived to 570 situations.
Those significant reasons of construction delay are occurred by recasting expense that was not considered of popular enmity problem by the design change such as estate fluctuations and environment effect.
Especially, the downtown area has much bigger problems that were not considered of environment effect and city fine view.
Therefore, if it was considered of environment effect and city fine view after completion, it could be decreasing unnecessary construction period and expense by the design change.
This study is when the alternate road selection considered surrounding facilities, development plan, and according to estimate amount of traffic. The additional possibility of view analysis and environment effects of analysis elements will study through 3D simulation method.

2. ROUTE LOCATION DESIGN STANDARDS

2.1 Geometric structure standards

This study is judged to achieve the movement of the downtown area by the main function as built road to plan traffic situation improvement and regionally balanced development of the main road. Road cross section components are divided on the road, the separator and the shoulder. It is examined by composing correct crossing width to design speed 80km/h by freshness worthy undertaking urban areas week to 'Structure and Facility standards of the road regulations'.
Especially, the road is adapted to take into consideration the design surrounding situation which has topography situation upper restriction. Owing to design speed, the geometric structure standards is the same with table 1, such as the

minimum radius of horizontal curve, the minimum length of horizontal curve, the stop sight distance, the transition curve and the maximum eccentric grade.

		Structure and Facility standards of the road regulations 99. 8		
		Main	Approach	
		80	50	40
Minimum radius of horizontal curve(m)		280	80	50
Minimum length of horizontal curve(m)	Under 5° Pier	450/θ	300/θ	250/θ
	Over 5° Pier	90	60	50
Maximum incline(%)	Flat	4	7	7
	Hill	7	10	11
Minimum change rate of Incline(m/%)	Convex curve	50	10	5
	Concave curve	35	12	7
Minimum length of incline(m)		70	40	35
Stop sight distance(m)		140	65	45
Minimum length of transition curve(m)		50	50	35
Transition curve ellipsis curve radius (m)		1,300	220	140
Transition curve parameter		R/3≤ A≤ R	R/3≤ A≤ R	R/3≤ A≤ R
Maximum eccentric incline (%)		6	8	8

Table 1. Geometric structure standards

2.2 Alternative rote selection

Presently, the road network system is insufficient that construction of circulation road network that connects the urban and the suburban east to west direction in main road. The road maintenance in the general plan selected outside circulation road is satisfied with the function of the main network and in point of view the road selection is planned the efficiency of route that is maximized. In addition, it is connected to the urban and the significant suburban that can be disperse d the function of the city.

It must be able to activate traffic operation to become the central traffic of the downtown.

There are accommodated to the land utilization condition and the development plan that distributed the traffic volume of the main route of perspective traffic that is efficiently connected to the main route. It considered the harmony of the development plan and the smooth traffic on the intersection that can be possible to establish the route selection plan. (Figure 1)

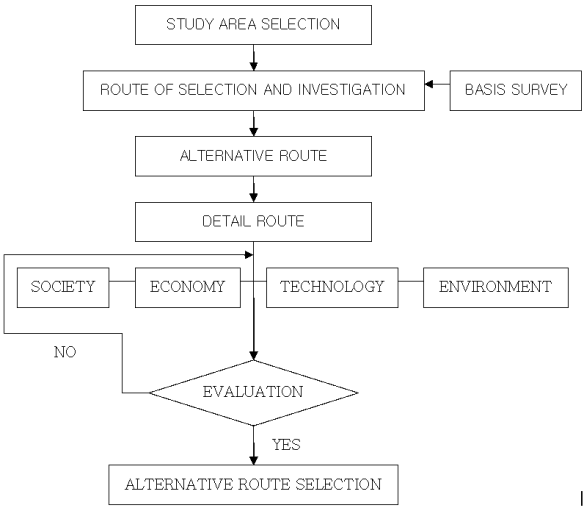


Figure 1. Alternative Route Selection Plan

3. DIMENSION SIMULATION BY THE EXISTING ROUTE

3.1 Main works

Figure 2 is the basis route map(1:1,000) which treats in three cases according to the route location design standards. Comparison plan 1 is through the tunnel in the existing road to connect I.C.. Plan 2 is passed by the tunnel in the existing road to connect the midway, and plan 3 is through the existing road and the river to pass the midway.

In this study, the beginning part of the approach and the ending part of the road are connected to outside circulation road of the function that takes charge of the downtown of the main road that considered the beginning and ending part of the relevant road of identity in the future.

It applied carriage way 3.5m, right side shoulder 2.0m and dividing strip 2.0m. In this study route of the beginning and ending part applied to consider the driving safety because it is consisted about 1km pole bridge which was used to emergency parking strip.

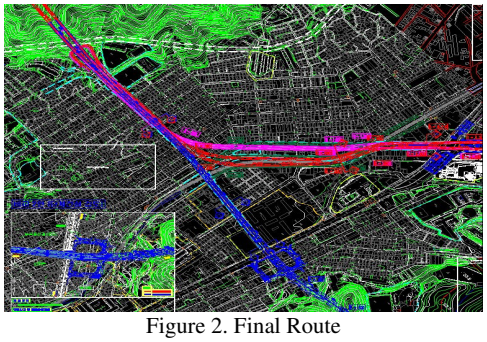


Figure 2. Final Route

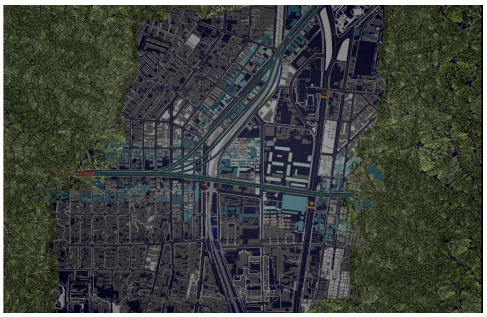
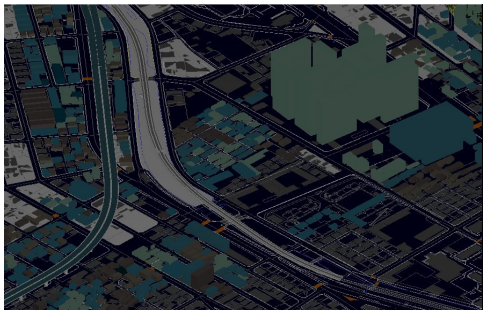
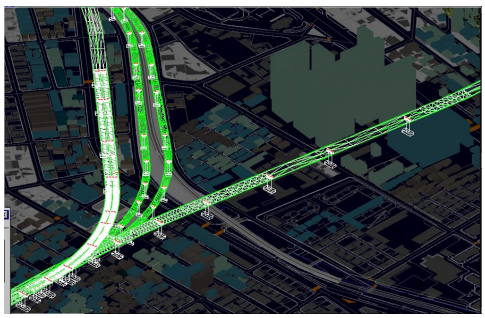


Figure 3. 3-Dimensionl Map



(a) 3-dimensional cybercity



(b) Proposed Route Design

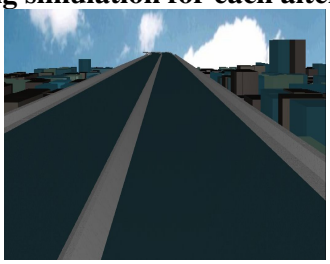
Figure 4. 3-dimensional Route for Study Area

Figure 3 is constructed on the 3-dimensional map for the candidate route that is established according to the route location design standards. Figure 4 of (a) is the 3-dimensional cybercity for the route location research area, and (b) is established to the candidate route in the 3-dimensional cybercity. It must include each point of the 3-dimensional construction that composes the polrigon for composition of the 3-dimensional construction.

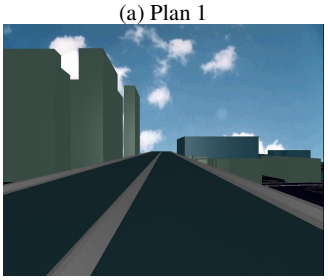
Presently, it has some problems that are built and managed to topography data which has advantages of the, so the 3-dimensional construction was created from the plan that acquired for the height of the 2-dimensional construction.

Therefore, it is difficult the creation of the complicated construction, but the creation of construction which can be create bottom of building and top portion side are equally possible. It is adapted to several modes for the real in creation of that are the most frequently using method is effective the familiar color of the real construction to put on the 3-dimensional construction.

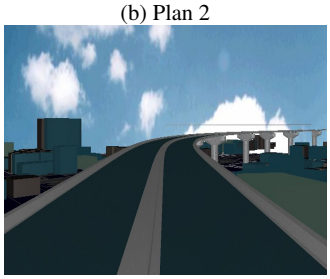
3.2 Driving simulation for each alternative.



(a) Plan 1



(b) Plan 2



(c) Plan 3

Figure 5. Driving Simulation

Figure 5 is displayed on the driving simulation process for each comparison route.

The plan 1 preserves surrounding the river of the nature environment and it appears the construction of the outside circulation road network is available without the additional construction cost.

The plan 2 is no environment defamation due to cutting the ground, but there is environment defamation due to raising the ground, and the river is needed for expanding the river width (Figure 6).

The plan 3 is expected to be disadvantageous fairly in environment conservation side for cutting area occurrence in environmental safeguard aspect (Figure 7).

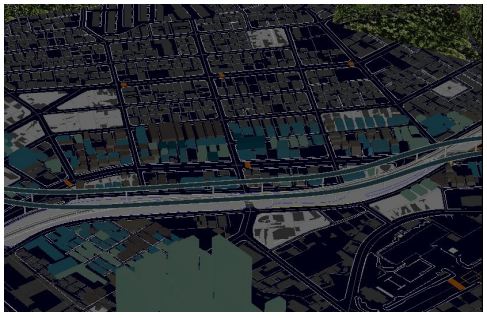


Figure 6. River and Route

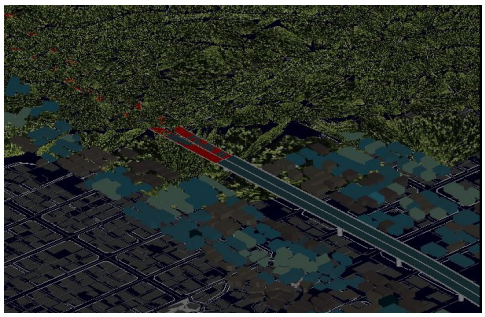


Figure 7. Cutting Area

4. CONCLUSION

This study got following conclusion about the road alternative decision techniques which use the simulation method.
First, surrounding equipment and development plan, spectacle analysis through the 3-dimensional simulation method beside examination opinion by traffic demand forecasting and so on and environment effect analysis that is considered at most suitable route location in route design are available.
Second, considering environment effect and effect that get on city fine view, needless air and expense by design change are judged to be contracted if consider environment effect and effect that get on city fine view after completion at most suitable route location.
Third, it is judged that is efficient in decision-making than existent each kind four decision ways as using techniques to see when do urban planning, draft such as route location and decision for decision area.

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