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Optimal Tourism Route in Historical Urban Areas– A Case Study of Tehran's Down Town, Iran

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ABSTRACT

The ideal dynamic optimal tourism route choice is the most important problem for urban and tourism planners. In this paper, we consider Tehran's down town Iran transport network to find optimal tourism resources. Accordingly, eight minor criteria under the titles of closeness to the tourist attraction, closeness to the tourist facilities, building architecture's quality of the route, visual qualities of the route, access hierarchy, street traffic volume, access route length and time limit in the route on the basis of four criteria (access to the tourist attraction and facilities, route aesthetic, safety and accessibility rate) was selected and assessed by Analytical Hierarchy Process (AHP) and optimal urban tourism routes was determined by Network Analyst in Geographical Information System. Results from the analysis indicated users choose towards the adaption to network optimal tourism route.

KEY WORDS: *Urban Transportation, Optimal Route, Urban Tourism, Historical Areas, Tehran*

Introduction

Considering ever-interesting population growth people demand for living in cities has made urbanism as one of the most significant phenomena of contemporary era. In the same time increasing demand for urban transportation needs. As a result, demand for urban tourist travel increased in same way as a natural consequent of high population density, more leisure time, etc. (Philip, 1992) and urban tourist attraction, facilities and services are considered as supplies for tourist travel in the cities. If it is not replay to travel demand in some cities, it will make some problems such as traffic variety and to cause traveler's satisfaction. Urban transportation is so sophisticated because of multiple origin and destinations, seeking, fuzzy and accidental nature of urban transportation, etc (Rodrigue, 2004). Most of times it is not easy to improve urban infrastructure or increase urban transportation network capacity because of high expenditures, old texture vulnerability, etc. accordingly, use of efficient theory such as graph theory and appropriate instrument like geographic information system(GIS) seems to be inevitable in achieving a perfect way for determining the optimal urban tourism routes. Yagar is one of pioneers who studied methods of optimal routes in 1971. He studied "Dynamic traffic assignment by individual path minimization and queuing". He explained methods which, were designed to imitate effectively the assignment of traffic according to the principle where each user minimizes his own travel time and argued these methods assume a demand pattern which does not vary with time. Then, A large verity of studies are performed all around the world in order to the best routes for managing urban movement (Yagar, 1975; Robillard, 1974; Filipiak, 1984; Mahmassani & Herman, 1984; Van Aerde et al, 1987; Hamerslag, 1988; Ho, 1990; Sumi et al, 1990; Birge & Ho1993; Jauffred & Bernstein, 1996; Miller & Storm, 1996; Ran & Boyce, 1996; Chen & Hsueh, 1998, 1999; Wu, 1998; Yang & Meng, 1998; Chen & Chang, 2000; Garcia et al., 2000; Chen et al., 2001; Ozbay et al., 2001; Daganzo, 2002; Dial, 2002; Huang & Lam, 2002; Pattanamekar et al., 2003). This research aims to choice dynamic optimal tourism route in

Tehran's Down Town as historical urban areas by means of access to the tourist attraction and facilities, route aesthetic, safety and accessibility rate criteria and use AHP in order to analysis of these routes.

Area of Study

The study area is located in down town of Tehran., the capital of Iran. Most of tourist travels in Tehran are concentrated in this historical district of city. This area includes 23 museum and 34 monuments. Fig. 1 indicates the study area in Tehran.

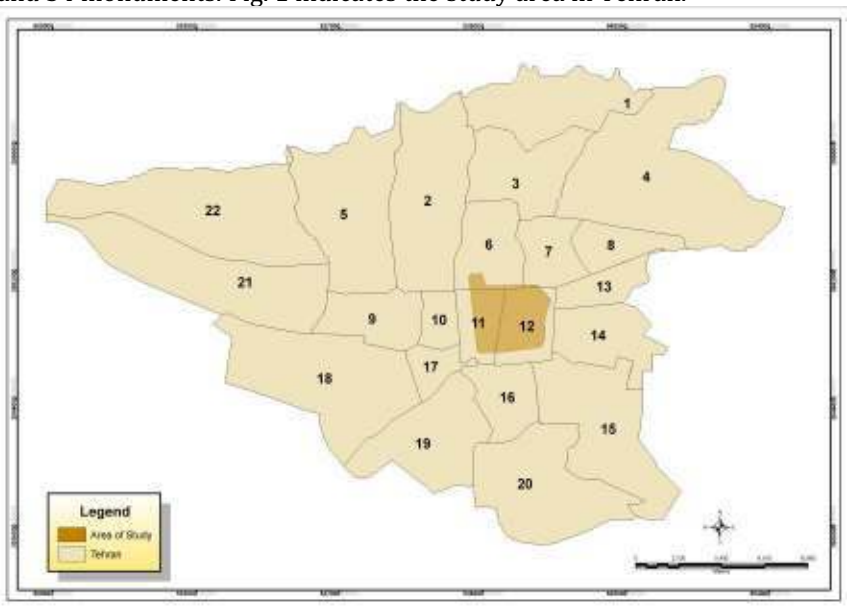

Fig. 1- Position of historical area in Tehran

Materials and Methods

First step in the methodology consists of development of a digital GIS database in which spatial information is formed. Because of different scales upon which criteria are measured, it is necessary that factors be standardized before combination. Criteria used in this study include two kinds of criteria; those whose increase will result in prosperity augmentation and those whose increase will terminate in prosperity drop. In this research, a linear scaling method is applied using the minimum and maximum values as scaling points for standardization. Equations 1 and 2 are considered for two kinds of mentioned criteria respectively.

$$Yij = (Xij - Xj\ min)/(Xj\ max - Xj\ min) \quad (1)$$

$$Yij = (Xj\ max - Xij)/(Xj\ max - Xj\ min) \quad (2)$$

Where:

Yij = Standardized value for ith criterion and jth option
Xij = Raw score for ith criterion and jth option
Xj min = Minimum score for ith criterion and jth option
Xj max = Maximum score for ith criterion and jth option

Considered criteria classify the urban routs between two classes: unsuitable (value 0) or suitable (1). With a weighted linear combination, factors are combined by applying a weight to each followed by a summation of the results to yield a suitability map (Equation 3).

$$S = \sum Wi\ Xi \quad (3)$$

Where:

S= suitability

Wi= weight of factor i

Xi= criterion score of factor i.

In the context of criterion weights, a wide variety of techniques exists for the development of weights. The technique used here and implemented in Arc GIS software is that of pair wise comparisons developed by Saaty (1977) in the context of a decision making process known as the Analytical Hierarchy Process (AHP). In the procedure of multi-criteria evaluation using a weighted linear combination, it is necessary that the weights sum to one. In Saaty's technique, weights of this nature can be derived by taking the principal eigenvector of a square reciprocal matrix of pair wise comparisons between the criteria. The comparisons concern the relative importance of the two criteria involved in determining suitability for the stated objective. Ratings are provided on a 9-point continuous scale, which is illustrated in Table 1. The procedure then requires that the principal eigenvector of the pair wise comparison matrix be computed to produce a best fit set of weights. These weights will sum to one as is required by the weighted linear combination procedure. Since the complete pair wise comparison matrix contains multiple paths by which the relative importance of criteria can be assessed, it is also possible to determine the degree of consistency that has been used in developing the ratings. Saaty indicates the procedure by which an index of consistency, known as a consistency ratio. The consistency ratio (CR) indicates the probability that the matrix ratings were randomly generated. Saaty indicates that matrices with CR ratings greater than 0.1 should be re-evaluated (Mahini and Gholamalifard, 2006).

Table 1- Relationship between Priorities and Numbers in AHP Rating Procedure

Number*	Priority
1	Equally preferred
3	Moderately preferred
5	Strongly preferred
7	Very strongly preferred
9	Extremely preferred

** Even numbers indicate between-category priorities.*

The results from the application of the presented methodology are routes for collecting optimal tourism routes. The major and minor (sub-) criteria used in the present study are shown in Table 2.

Table 2- Major and Minor Criteria used in Optimal Urban Tourism Route Process

Major Criteria	Minor Criteria
Access criteria to the tourist attraction and facilities	Closeness to the tourist attraction
	Closeness to the tourist facilities (hotel)
Route aesthetic criteria	Building architecture's quality of the route
	Visual qualities of the route
Safety criteria	Access hierarchy
	Street traffic volume
Accessibility rate criteria	Access route length
	Time limit in the route

The optimal urban tourism routes are chosen by means of Network Analyst tools in Arc GIS software (by use of graph theory and dijestra algorithm).

Results

In order to determine the optimal tourism routes in the historical area, inlet and outlet nodes (Enqelab Sq., Ferdowsi Sq., Bou Ali Sq., Qiam Sq., Mohamadiye Sq. and Razi Sq.) are

taken in to consideration according to the spatial behavior of tourists for entering the transportation network of the historical area (Fig. 2)

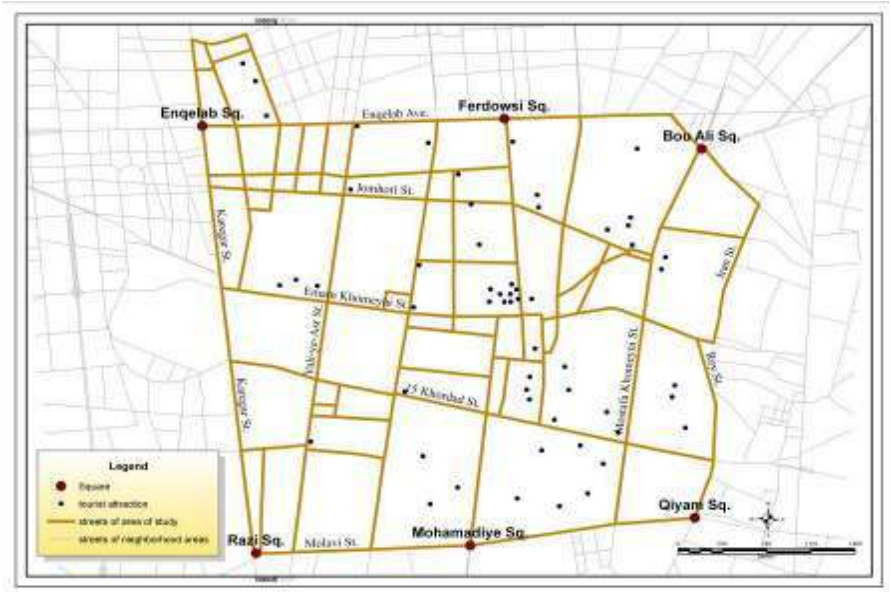

Fig. 2-Tourist's inlet and outlet nodes to the transportation Network of Tehran's down town

Access criteria to the tourist attraction and facilities

Closeness to the tourist attraction

Considering the closeness of different transportation routes, tourists select their routes. According to these criteria, the preference of different routes will be determined. Among exciting routes, Farvardin 12th street with 669.15 m and Ferdowsi street with 17.28 m distance from tourist attraction are farthest and nearest route, respectively. The average distance of transportation network is estimated to be 229.08 m. optimal routes according to their closeness to tourist attractions are show in Fig. 3.

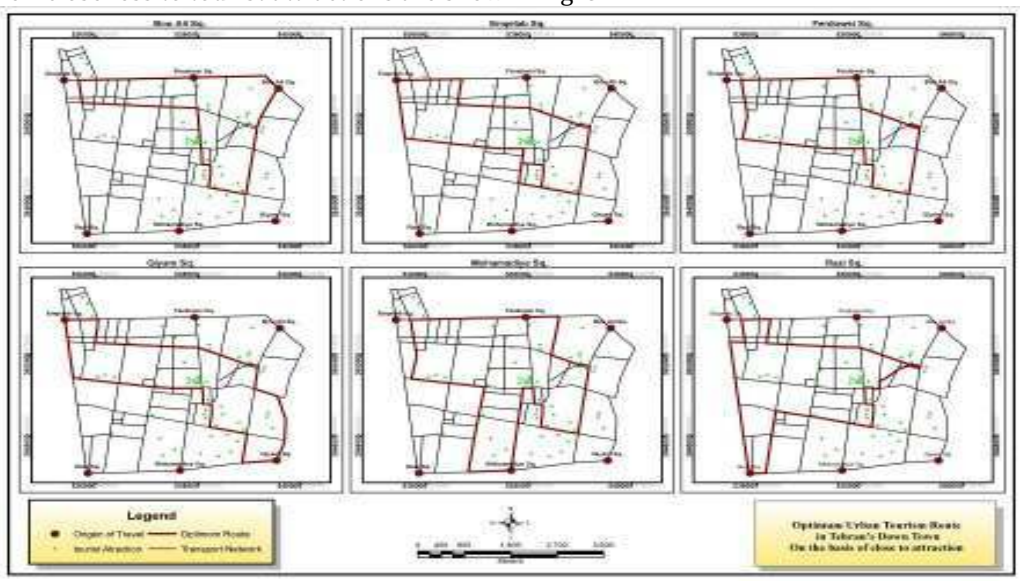

Fig. 3- Optimal routes according to their closeness to Tourist attractions in Tehran's down town

Closeness to the Tourist Facilities (Hotel)

Convenient access to tourist facilities is among the most preferred parameters considered by tourists. Among exciting routes, Molavi street with 2997.22 m and Karegar street with 64.7 m distance from tourist facilities(hotel) are farthest and nearest route, respectively. The average distance of transportation network is estimated to be 890.15 m. optimal routes according to their closeness to tourist facilities are show in Fig.4.

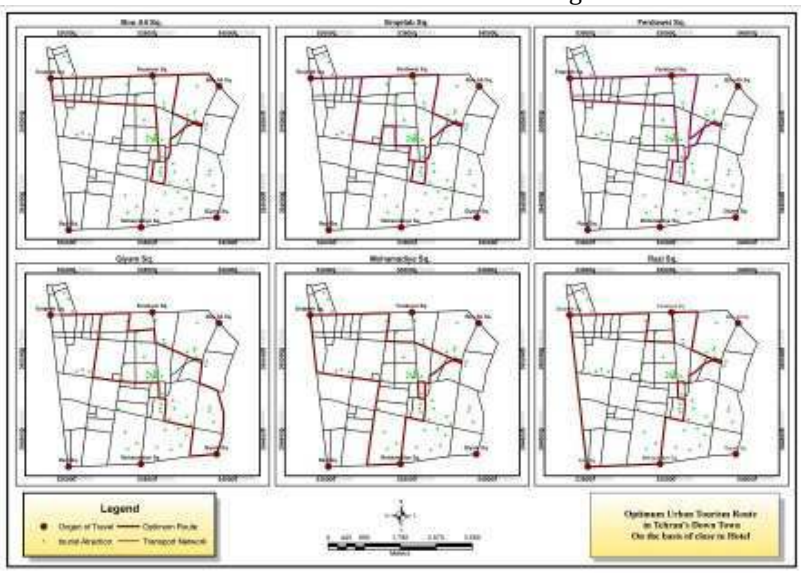

Fig.4- Optimal routes according to their closeness to tourist facilities in Tehran's down town

Route Aesthetic Criteria

Building Architecture's Quality of the Route

Building architecture quality of the route is among the most preferred parameters considered by tourists. According to the study, 33.33 % of exciting routes have relatively low, 54.55 % have medium, 3.64 % have relatively high and 8.48 % have high building architecture quality of the route. Optimal routes according to Building architecture quality of the route are show in Fig. 5.

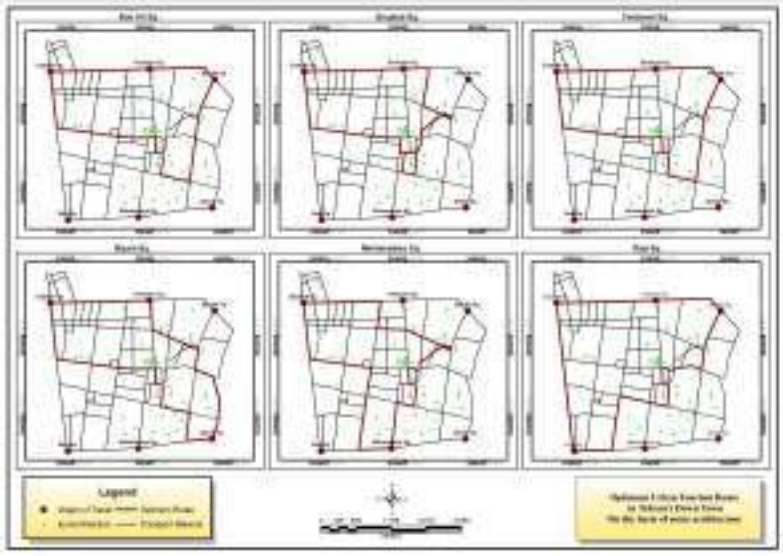

Fig. 5- Optimal routes according to Building architecture quality of the route in Tehran's down town

Visual Qualities of the Route

Visual qualities of the route are highly considered by the tourist as a preferred parameter. According to the study, 52.12 % of exciting routes have relatively low, 38.79 % have medium, 7.88 % have relatively high and 1.21 % have high visual qualities of the route. Optimal routes according to visual qualities of the route are show in Fig.6.

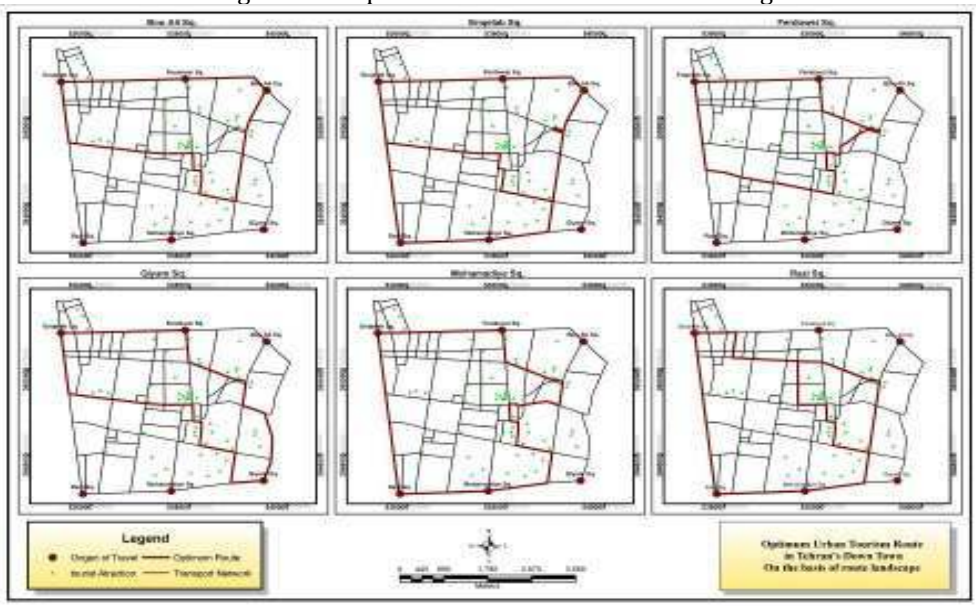

Fig. 6- Optimal routes according to visual qualities of the route in Tehran's down town

Safety Criteria

Access Hierarchy

Urban access hierarchy is classified in four categories according to their characteristics namely: first class main street, second-class main street, local access and concentrating street. According to the study, 64.85 % of exciting routes are first class main street, 30.91 % are second class main street and 4.24 % are local access. Optimal routes according to Access hierarchy are show in Fig.7.

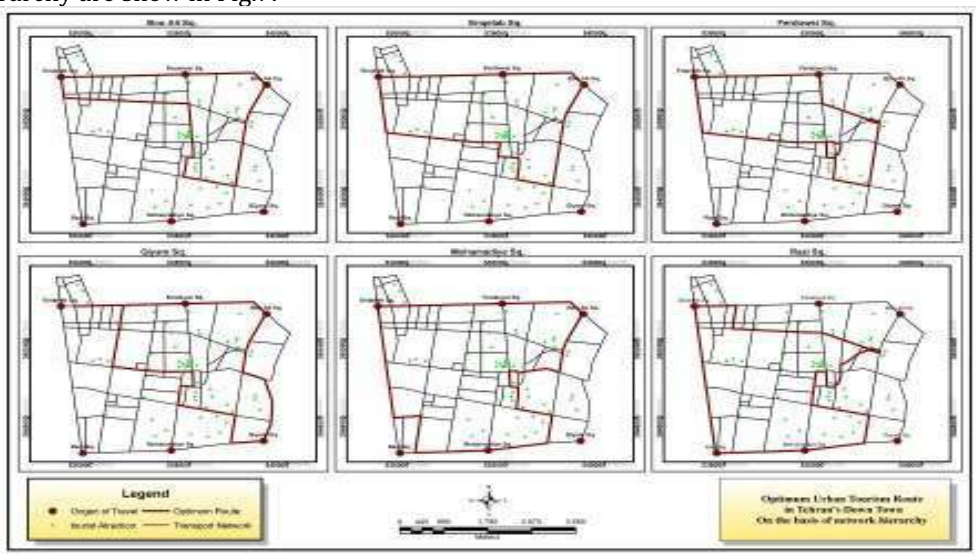

Fig. 7- Optimal routes according to Access hierarchy in Tehran's down town

Street traffic volume

Low traffic volume is highly considered by the tourist as a preferred parameter. According to the study, 12.73 % of exciting routes have relatively low, 29.09% have medium, 17.58% have relatively high and 17.58% have high traffic volume. Optimal routes according to Street traffic volume are show in Fig.8.

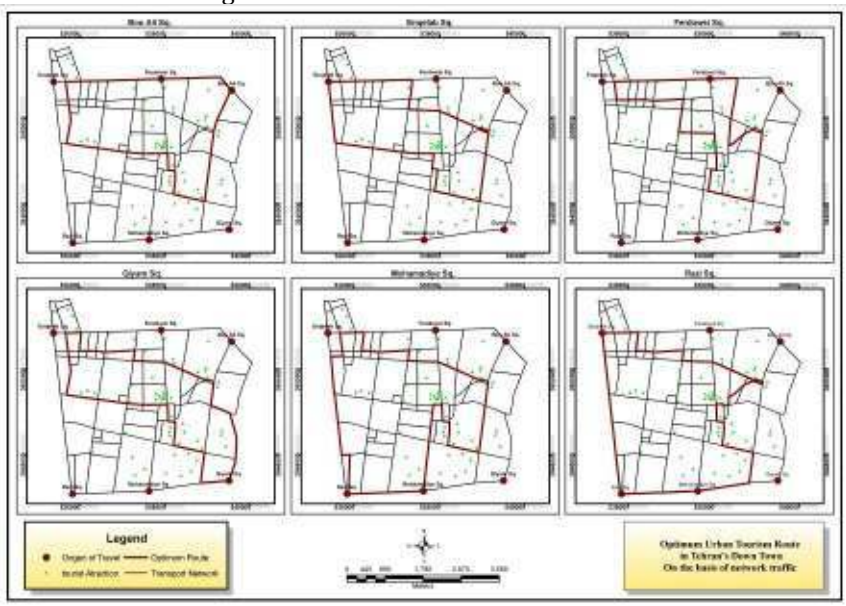

Fig. 8- Optimal routes according to Street traffic volume in Tehran's down town

Accessibility Rate Criteria

Access Route Length

Shortness of the routes is highly preferred by the tourists. Among exciting routes, Molavi Street (between Mostafa Khomayni and Khayam Street) with 1121.92m and Vali-ye-Asr street (between Farhang and Hashemi street) with 101.4 m length are long and short route, respectively. The average routes length is estimated to be 400.76m. Optimal routes according to Access route length are show in Fig.9.

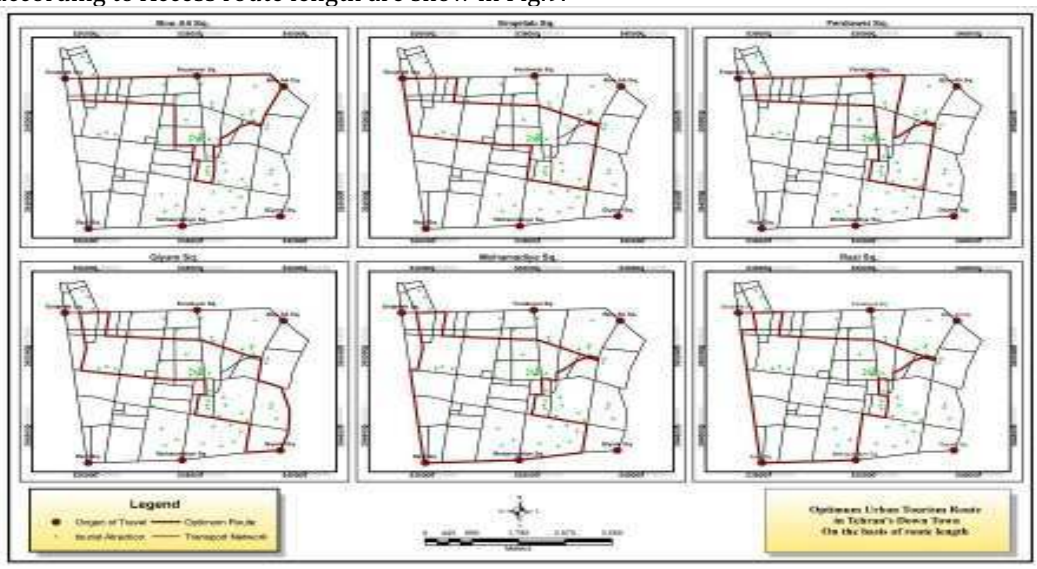

Fig. 9- Optimal routes according to Access route length in Tehran's down town

Time Limit in the Route

Low traffic volume is highly considered by the tourist as a preferred parameter. According to the study, 4.24 % of exciting routes have 30 km, 30.91 % have 40km and 64.85 % have 70km time limit. Optimal routes according to Street traffic volume are show in Fig.10.

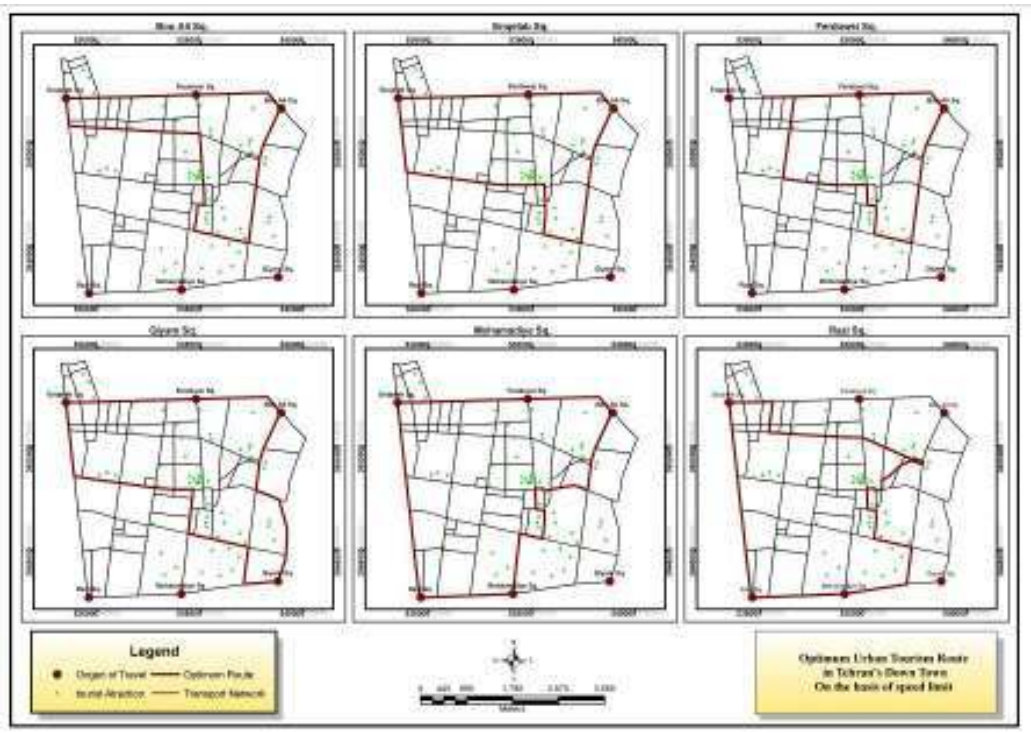

Fig. 10- Optimal routes according to Time limit in the route in Tehran's down town

Optimum Urban Tourism Route

Identification and introduction of optimal urban tourism route is useful for exciting tourist demand and is efficient in forming the required infrastructure for future development. Optimal urban tourism route in Tehran' down town are identified in the study by combining eight criteria as mentioned in material and methodology section. Final rank is calculated according to the sum of the criteria multiplied by their relative weights (Table3).

Table 3- Pair Wise Comparisons and Relative Weights of Major Criteria

	Tourist Attraction and Facilities	Route Aesthetic	Safety	Accessibility Rate	Weight
Tourist attraction and facilities	1	3	9	5	0.585
Route Aesthetic	1/3	1	5	2	0.256
Safety	1/9	1/5	1	1/2	0.055
Accessibility Rate	1/5	1/2	2	1	.0.103

Consistency ratio = 0.02, Consistency is acceptable; Source: Authors

Optimum route by considering the same inlet and outlet nodes for tourist are indicated in dig.11 and combination of this routes with routes that be chosen by tourists are indicated in dig.12.

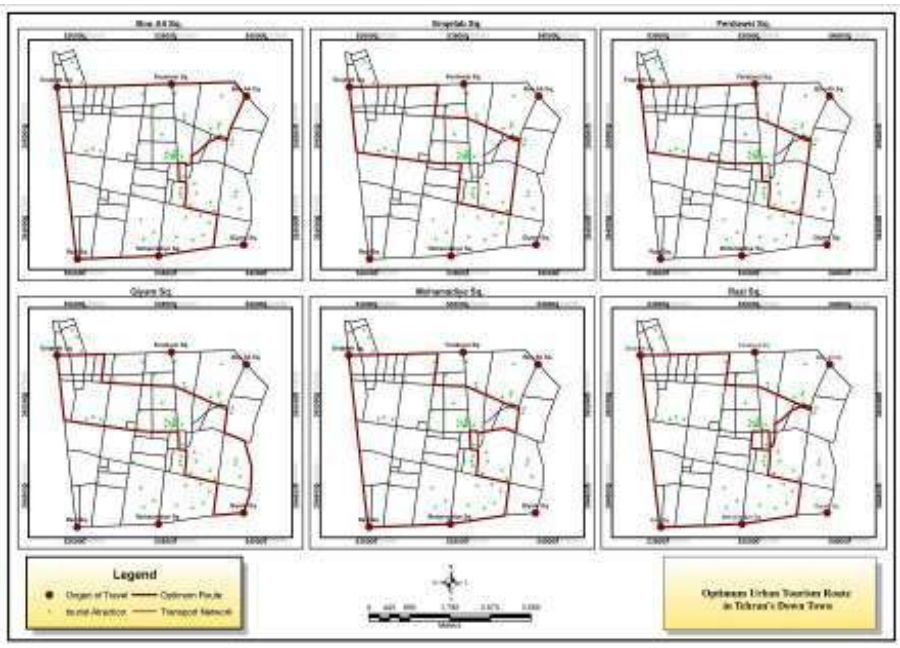

Fig. 11-Optimum urban tourism route in Tehran's down town

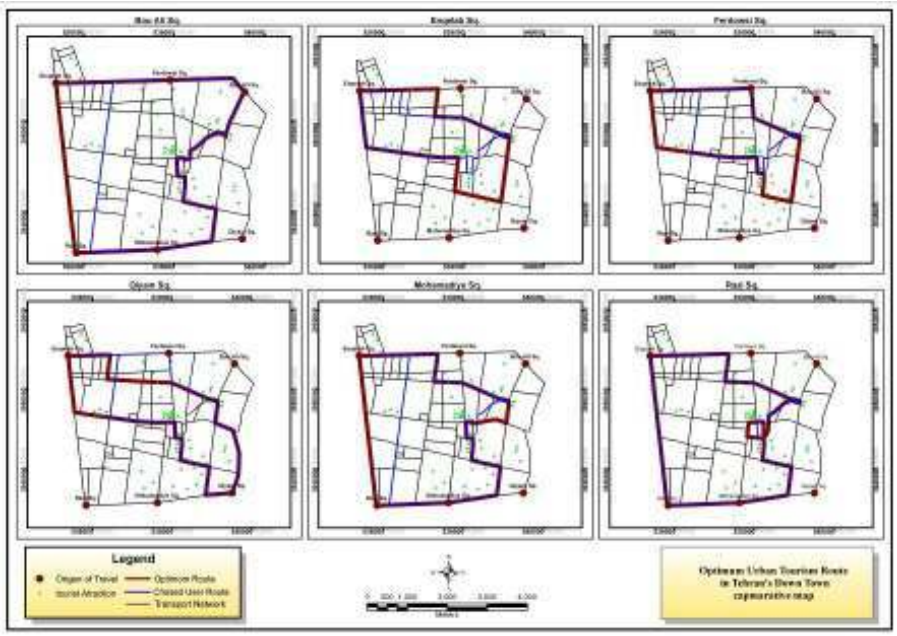

Fig. 12-Comparative map of optimal urban tourism route in Tehran's down town

Conclusion

In this research, it becomes specified it is relative conformity between network optimal tourism route and users choose routes in all inlet and outlet routes in historical area in Tehran. Sometime, intensity of impact of one criteria cause difference between optimal tourism route and users choose routes (Fig. 11).

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