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Spatial, Local Analysis and Evaluation and Possibility of Predicting Crimes and Presenting Strategies by Using the ARCGIS software

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ABSTRACT: one of the effective methods in this field is the analyzing and identifying the crimes and the effective analysis of data with the help of the ARCGIS software and also the statistical analysis like the clustering method, which is used for identifying the hot places of crime. ARCGIS software analysis and clustering analysis helps groups that are in accordance with several algorithms in collecting data (Everitt, 1974: 44). The purpose of this spatial and local evaluation and analysis is to have the possibility of predicting crimes by using the temporal series models and the ARCGIS software to study the city Qazvin. The research method that has been used in the data analysis of this research is statistical methods and statistical and graphic methods and the software Office/Excel have been used. For graphic and statistical analysis and a combination of the Geographic Information System software have been used. The lateral software (Crime Analysis) is among the software that provides the condition for the possibility of dramatic analysis and analysis associated with delinquency of the centers of uprising crime in the environment Geographic Information System. The second version of the lateral software Crime analysis is also used. The statistical population of this research includes a series of the committed crimes (types of theft). The results of the research will be growing by using the formula of lowest squares of forecast of household robberies in 1392 with a 1.4 percent increase. Household robbery will decrease about 1.2 percent and car theft will increase about 2 percent. It is worth noting that by enhancing the security items and informing, this statistic will decrease; otherwise, given the forecasts that have been done, it will increasingly grow.

Keyword: Spatial, Local Analysis and Evaluation, Possibility of Predicting Crimes, Presenting Strategies

INTRODUCTION

Some works that were done with the title of analyzing the places of uprising crime in the Zanjan city for the thesis of the graduate students of geography and urban programming of the same university indicated that it is very good to do this in terms of analysis and works that have been done in the GIS software. And also in Qazvin province, we can refer to the work that has been done by Ms. Elham Abbasi as well, which was entitled identifying and analyzing the centers of uprising crime in the Qazvin city. Theories that explain the relations between society and space: 1. Ancient Greek and Rome: generally, a surprising silence can be observed about the space that man has created in the social theories and philosophy until modern times. Although in the ancient Greek and Rome architecture was efficient, great philosophers such as Plato and Aristotle did not pay much attention to making the principles of philosophy spatial, but unlike these two, great architectures such as "Vitruvius" and "Alberti" considered the citizens in terms of ethical and aesthetical aspects not in terms of social rights. 2. Emmanuel: from the eighteenth century, the space that was created by humans also shined as an issue in the social theories in Europe. From the philosophical aspect, one of the most sustainable approaches to space in the thoughts of the theorists was done by "Emmanuel Kant" (1724 - 1804). He believed in the separation of time and space and distinguishing history and geography. 3. Karl Marx, Max Weber and Emile Durkheim: these great social theorists did not separate the issue of city from the spatial structure or society or the social structure. Although these theorists did not deal with the "space" issue directly, and although they explained society with different methods, but they did not express a duality of knowledge about time and space and an independent substance for space. This truth becomes evident due to the fact that they dealt with the subject of city and its issue in the context of social relations. 4. Ernest Burgess (School of Chicago): among the theories that were presented after these three theorists, the school of Chicago or the theory of "Human Ecology" was the first cohesive theory. Robert Park, who was one of the main funders of this theory, believed that "the structure of city is effective in human nature and demonstrates it." He divided the population of humans into "community" and "society".

He believed that the first one is the reflection of biological level and the second one is the reflection of cultural level of humans and he imagined the spatial structure of city in accordance with the human nature or the biological level. Henri Lefebvre, David Harvey and Castells (modern theorists of space and society): Henri Lefebvre (who died in the year 1991) mentions the most political method of dealing with space, "space is political. Space is not a practical objectivity which is separated from the ideology or politics". He believed that in the capitalism system, space is like other good. And "the reproduction of capitalism relations is not in the enterprise, but it is in the space." He considered the contrast between the personal interest and social need, between dominance of capitalism and social life in space as the most important manifestation of their contrast. Therefore he believed that by turning to self-management in the space, we can encounter with capitalism. Existence of mutuality and emphasis of modern theorists on space and society: What is mutual among the modern theorists of space is the attempt to revive the approach of the three funders of modern social sciences to space, in terms of its unity with society, and also its unity with the time with the method of "Einstein". They believe that space is a fundamental element of society. But they don't think that space is entirely the product of the desire of one class. They rather think that just like history or time, space is also the result of fight and conflict of classes and they believe that space includes this interaction as well. 6. Evolutionary theory of cities: the cities, in the works of Simmel and works associated with the school of Chicago, were representatives of a social economical order arising from the industrial capitalism. In these works, an image of the pattern of economical change was drawn implicitly. The city Chicago was especially the chosen representative and reagent of the modern industrial city. And several attempts were done in other industrial cities to implement the concentric circles model (which was designed by Burgess and others had changed it somehow). 7. Four process of the centrality of large industrial city in the urban system: living in the suburbs: it means that the growth of the cities happens more in the suburbs of the towns than in the downtown of the city. Avoiding de-urbanization: it means that the urban population reduces in comparison with the rural and non-urban population. Density and contraction of large cities: it means that we study and understand the city's becoming larger and smaller. Growth and increase in new region and reduce in old regions: it means that the new regions disappear under the shade of old regions. (Abbassi, Abbassi Varki, 1389)

MATERIAL AND METHODS

In analyzing the data of this research, the statistical methods and graphic and statistical analysis and the Office / Excel software have been used. A combination of the software of the Geographic Information System (GIS) has been used in order for graphic and statistical analysis. It is worth noting that the abilities of the Geographic Information System have been studied in identifying the spatial pattern of centers of uprising crime. The lateral software (Crime Analysis) is among the software that provides the condition for the possibility of dramatic analysis and analysis associated with delinquency of the centers of uprising crime in the environment Geographic Information System. The second version of the lateral software Crime analysis is also designed and presented. The statistical population of this research includes the committed crimes (types of theft) that have occurred during the three years from 1388.1.1 to 1390.12.30 in the range of the central part of the city Qazvin. The topic of the present research is a series of illegal actions and behaviors and disorders that have happened in the range of the central part of the city Qazvin, in the time period of the research with the title of crime.

QUESTIONS OF THE RESEARCH

(i) How are the principles of the clustering model for analyzing and predicting crimes?
(ii) What are the scientific and practical strategies for coping with delinquency and increase of the danger coefficient (risk) of committing a crime in the centers of uprising crimes in the city?
(iii) What are the advantages of the useable local and mathematical models in this discussion?
(iv) How do we find the proper location for creating a new police station (police court)?
(v) What parameters can be useful for mapping the crime and spatial analysis?

FINDINGS OF THE RESEARCH

Clustering tests: In the rest of the article, it is necessary for us to take a look at the clustering tests.
A. Medium center
The medium center spot is used as an approximate criterion for comparing the spatial distribution of various types of crime or for investigating the occurrence of a specific crime in various time periods. Measuring the spatial movement is one type of these specific crimes among these crimes. For example the figure (3-4) has been presented as the medium center spot for four data groups that include street robbery, household robbery and crimes related to car and a series of crimes in a hypothetical location.

In this example, the medium center for the total of crimes has been used as a criterion for comparing the four data groups of types of crimes. The medium center household robbery has higher tendency to go towards north, compared to the medium center of the crimes and the two other crimes. The medium center for the crimes related to car is the southernmost point, in comparison with other crimes and the street robbery, almost like the household robbery is placed in the north of Qazvin, but it slightly goes towards the West. By using the medium center spots, we can say that generally the street robberies and household robberies mostly occur in the northern regions and the crimes associated with car mostly happen in the southern regions (Kalantari, 1390: 48).

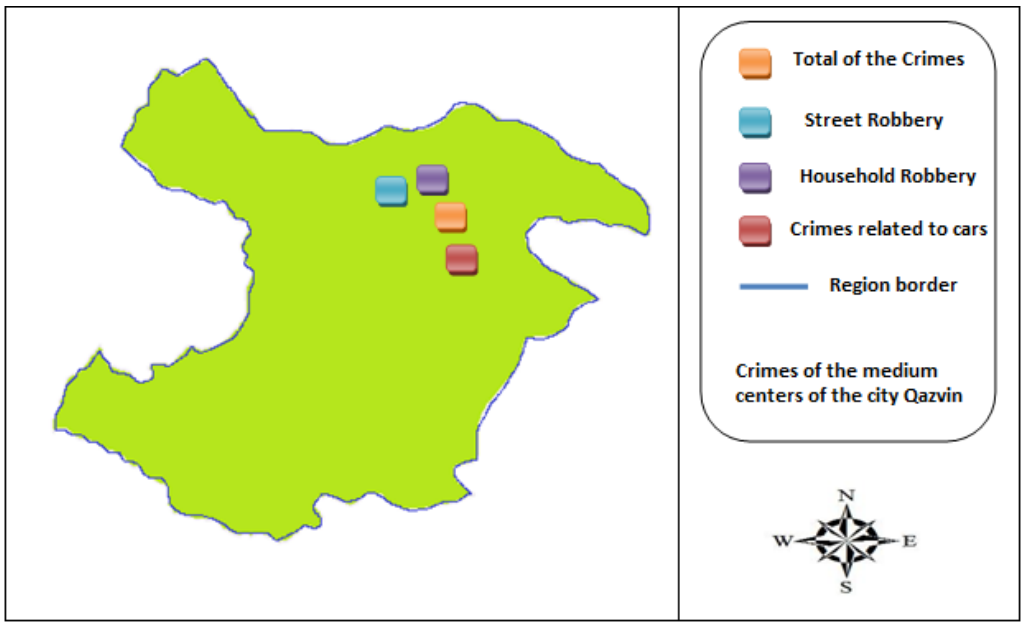

Fig. 1. The medium center spots for the four data groups of delinquency of Qazvin (Resource: Kalantari, 1390).

a. Deviation distance: The index of the standard deviation distance is used for specifying the level and way of distribution of criminal data. This statistics are generally used as a relative index, so that through then we can make the comparison of the types of crimes or the comparison of one type of the crime in different time periods possible. The more the standard deviation distance is, the more the dispersion of the data of delinquency will be (Kalantari, 1390: 24).

b. Oval of standard deviation: The dispersion levels are shown through the oval of standard deviation. The size and shape of the oval determines the rate of dispersion and shows the extension it for the movement of the criminal behaviors. In the figure number (3-4) the oval of standard deviation for the four groups of hypothetical delinquency data has been shown. The slight difference between the ovals indicates the relative difference in the pattern of dispersion of crime in the four data groups of delinquency. The smallest oval is associated with street theft which has the less dispersion among the types of crimes.

The location oval of the street thefts crimes in general and crimes associated with car goes through north and in the south of the oval the household theft has been placed. This pattern of distribution of crimes is similar to the pattern of medium center. The northwest - southeast direction of this oval shows that the main pattern of the street robbery is inclined to which direction (Kalantari, 1390: 28).

It seems that by taking the elongations of the oval towards the poles into consideration, we find out that the crime distribution in the populated areas and especially crimes such as street robbery, household theft and crimes associated with car is directed towards north, northwest and southeast. Implementation of the proper pattern for drawing the time series

In this subject, we choose and implement the following steps by using the statistical analysis software, SPSS.

In order to find the proper model, we use export modeler. This model automatically finds the most proper and fitting model for the associated variable.

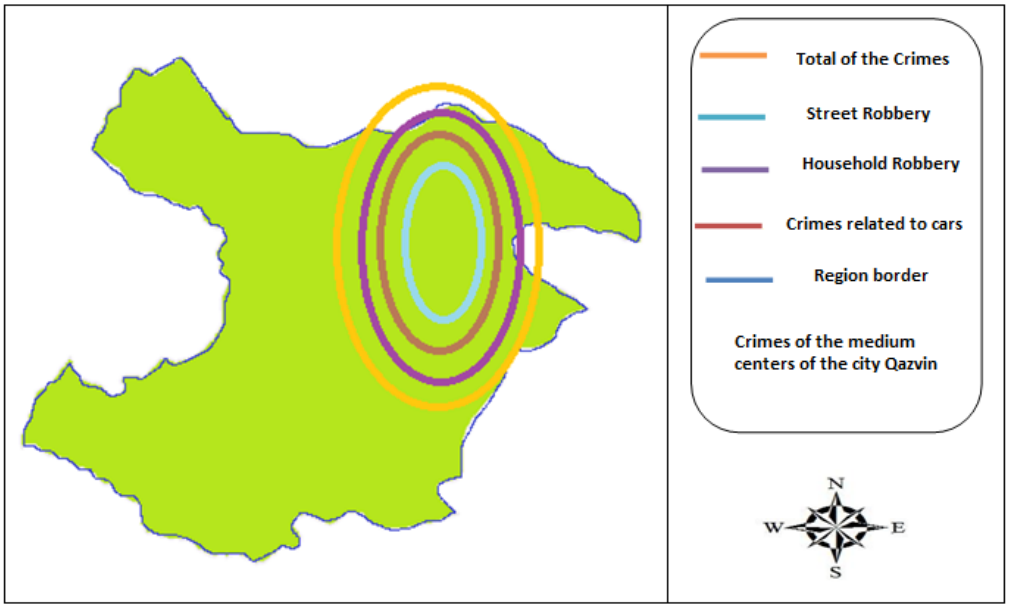

Fig. 2. Deviation oval for the four data groups of delinquency of the city Qazvin (Resource: Kalantari, 1390).

The output includes three tables and one chart:

Table 1: Table of the fitted models for various Arima groups.

Model Description

Model ID	Model Type
manzel Model_ 1	ARIMA(2,0,0)
magazeh Model_ 2	ARIMA(2,0,0)
Khodro Model_ 3	Simple

Table 2: Properness of the fitting for the time series.

Model Fit

Fit Statistic	**Mean**	**SE**	**Minimum**	**Maximum**
Stationary R-squared	.141	.122	-4.554E-17	.211
R-squared	.122	.109	-4.554E-17	.210
RMSE	9.433	5.216	6.314	15.455
MAPE	70.754	40.901	25.984	106.162
MaxAPE	675.642	475.578	139.163	1045.455
MAE	7.316	3.560	5.238	11.427
MaxAE	26.431	22.726	11.194	52.552
Normalized BIC	4.446	.984	3.859	5.582

In this table the standard average and error have been shown, which is a good number, considering the given numbers and them being low. And also other standards show proper numbers as well which include:

-Average of the square of the error : it shows that this series is close to the temporal unit of forecast which is a good number, considering the fact that it is low.

-Average of the percentage of the error : this model changes in comparison to the forecast model, which is a medium number and it shows that the time of the numbers is short and it is necessary for the timer interval to be more, so that it would offer better accuracy.

-Maximum of absolute value of the error : it shows the highest forecast error. The required number is so good and it is less than 50 percent.

-Average of the absolute value of the error: it shows the rate of change, compared to the required level of forecast in which a good number has been presented, given the low number.

-Maximum of the absolute value of the error : it is the highest error of forecast. It is the maximum of lack of confidence which is a medium number and it can be improved, only if the available statistics of the weeks and months increased.

-Informational index of Bic : it is the general index for evaluating the general fitting of the model. It has a punishment for the parameters and it destroys the additional parameters and makes the comparison of the models easier.

Table 3: The presented forecast for the last three month in comparison with the actual numbers.

Model		34	35	36
Household -Model_1	Forecast	20	24	26
	UCL	33	37	40
	LCL	7	11	12
Store -Model_2	Forecast	11	11	11
	UCL	25	25	25
	LCL	-2	-2	-2
Car-Model_3	Forecast	36	36	36
	UCL	67	69	70
	LCL	4	2	1

	Dey 91[1]	Bahman 91[2]	Esfand 91[3]
Household	21	30	35
Store	4	11	15
Car	42	42	65

From comparing the written numbers in the table and the actual numbers, which have been placed in the table following this one as a control, we can refer to this point that there is almost a slight compliance between these numbers and the numbers above them. And we must mention this point that if we increase the number of the month of the statistical analysis, we can achieve a better percentage than the forecast.

Introducing a site or optimal place for establishment of the types of police units:

An optimal place for the desired activity: some optimal places with different priorities shall be suggested, so that if there was a problem in the first priority, the next priority would be used. Undoubtedly, finding location is one of the important principles and pillars in the places of uprising crime and the best solution for prevention by the police stations.

1. Criterion for creation of new police stations:

in the respect of choosing the proper location for building a police station was achieved in accordance with the available patterns in Iran's police and by paying attention to the determined priority which was obtained in the field of the Qazvin province. It has a different usage in other provinces. It is necessary for it to be designed properly for each class and each province with each type of economical, social and cultural context of it specific aspects.

a. Being close to location with the values of center of crisis

b. Appropriate distance from the new police station

c. Being close to the main street

d. Being close to the market (bazaar)

e. Populated regions

2. Model of properness:

it is the purpose of finding optimal places. A model of properness might find proper locations for establishing a police station. Therefore, these proper locations for a new police station are found as follows: (chart 5-4).

3. Providing a map of properness:

Figure number 3 is a Chloropeth map. This figure shows the crime rate based on each region. The proper distance is around the "Bahonar" 13 police station which is problematic for areas that are more than 50 meters away from the main street and the proper distance of the available police station and in the areas of the center.

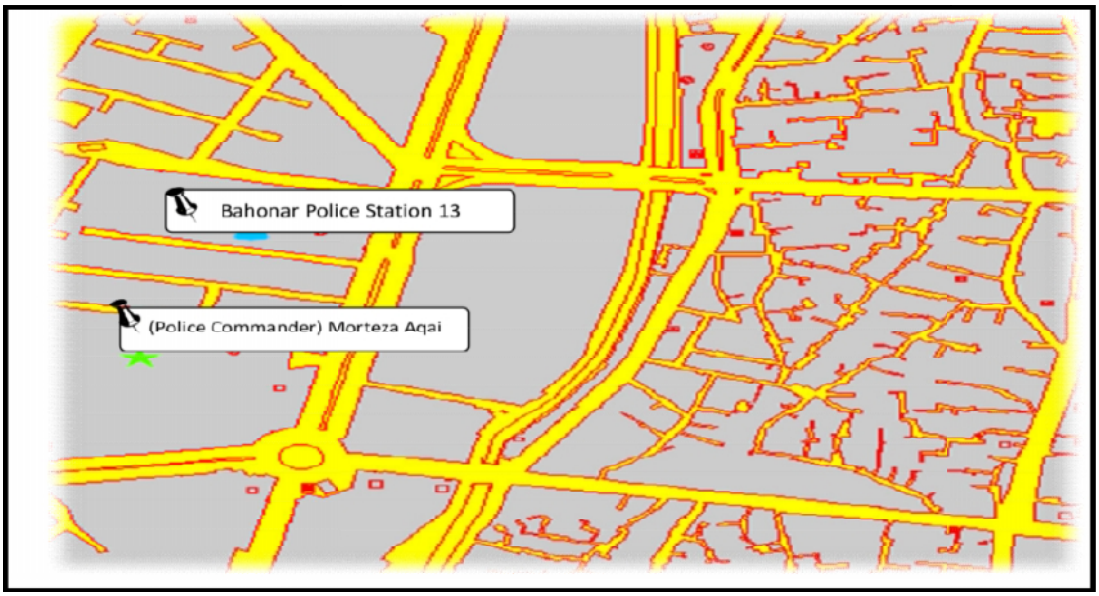

Fig. 3. Calculation of the map of the overlap of police station with the main and minor street.
*"Bahonar" 13 police station
** Commander of law, Morteza Aqayi

Clustering the urban regions of the city Qazvin:

According to the rate of the crimes that have occurred with the help of clustering in the ARGCIS software, we have to first define a new project and create Attrtbutes files that contained our required information in the cluster. Finally, the act of clustering has been done and the results for an example have been shown as follows.

The clustering that has been done in this project is associated with the type of crimes and time and location in which it has been done in the city Qazvin, in which the different colors indicate the rate of the distribution of crimes in various month of a year. By using this analysis, we can have a general view of crimes in the various places and times.

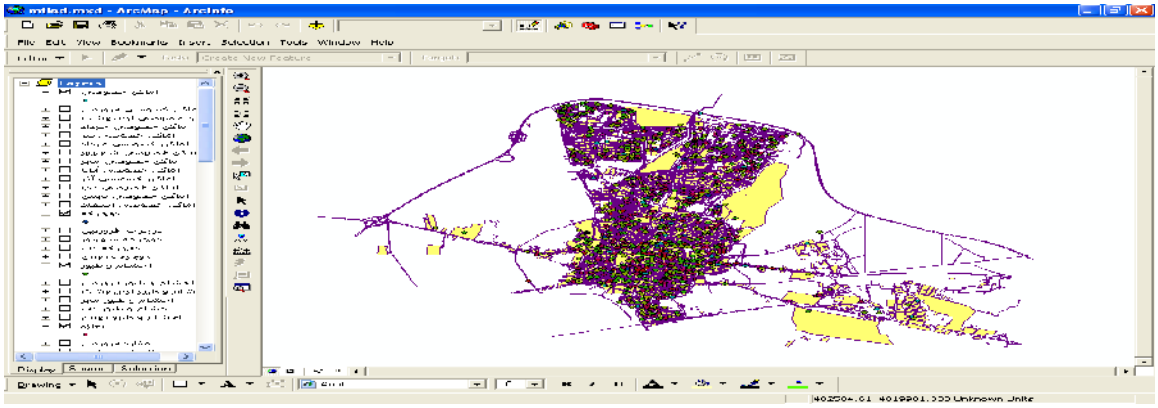

Fig. 4. The results of the final cluster.

Presenting the map of crimes in the city Qazvin:

In the following functional use, we have attempted to use clustering analysis, whereas we put the width of the population of cities in the GIS software. The various types of crimes have been put in it and in this section, the oval of the standard deviation has been drawn for it and in the next map, we deal with the division of various domains of crime in these maps by using the tools of clustering:

(The map shows the theft of livestock in the city Qazvin, in the form of population density, from one spot to another, clustering and the oval of standard deviation.)

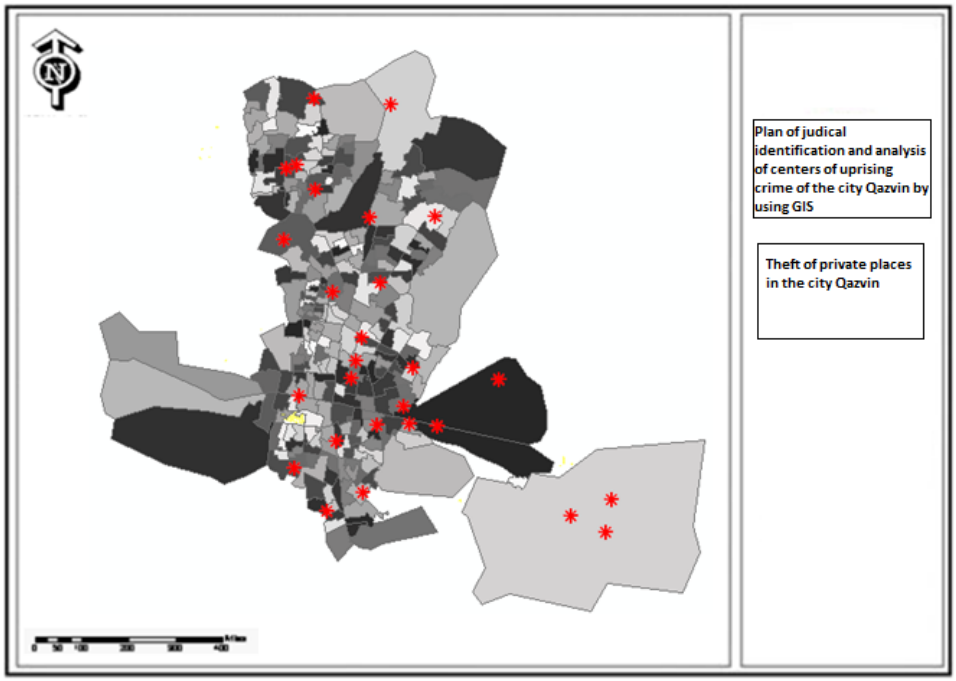

Fig. 5. The map of theft of private properties in the form of showing the population density along with a spot to spot method.

"The map represents the theft of inside of a car in the city Qazvin, in the form of population density, from spot to spot, clustering and the oval of standard deviation, that the center of the deviation oval is placed in the "Khayyam" street and due to the numerous commercial and administrative centers in this region and the number of the cars is very high and the car thieves are encouraged to do theft in these regions. And also those persons, that park their car in the street and the areas around it, believe that in these regions, thieves do not try to steal the car as much due to the numerous cars that are parked, thus the level of security of the car by the owner decreases to the false confidence in the mentioned region.

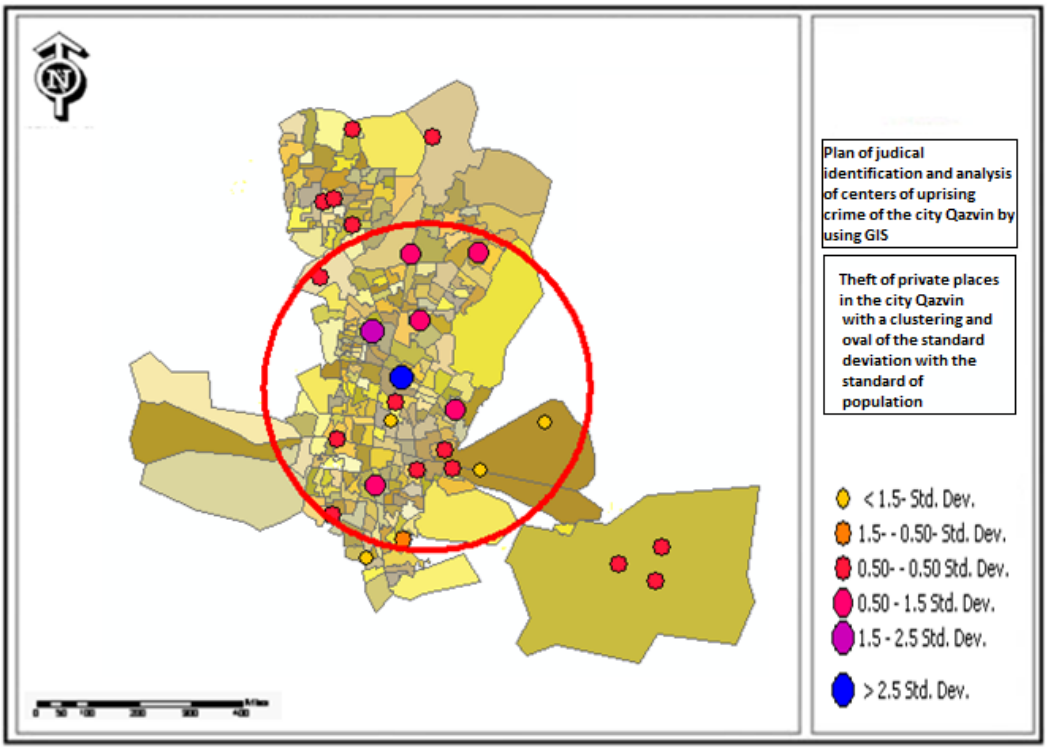

Fig. 6. The map of the theft of private properties in the form of the oval of the standard deviation along with a clustering representation.

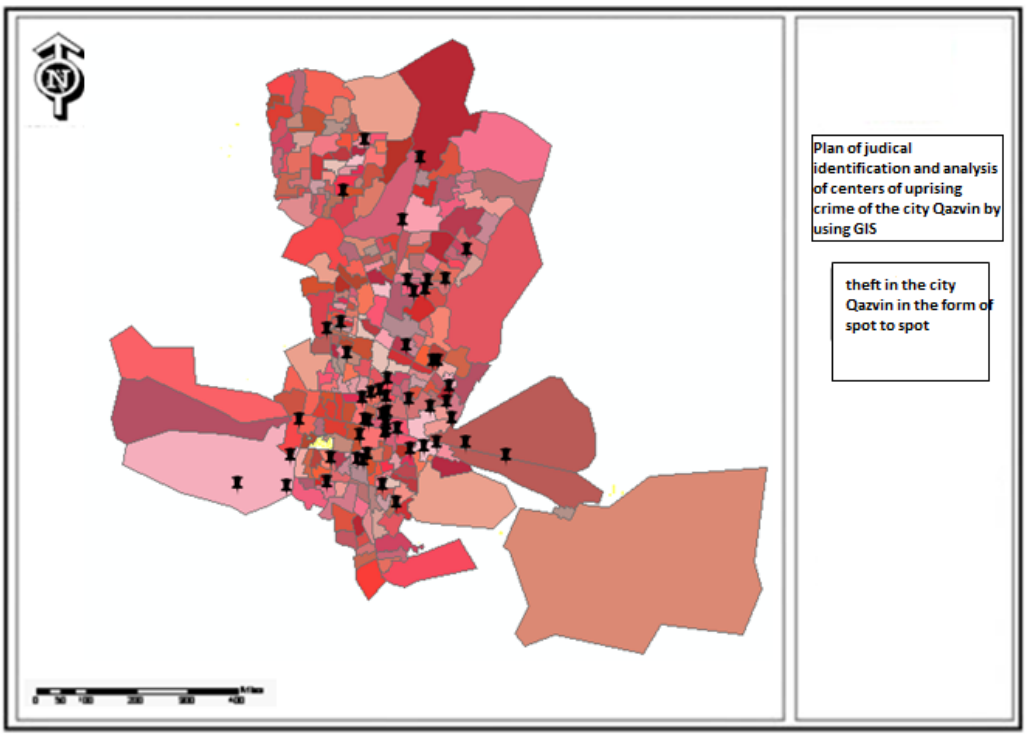

Fig. 7. The map theft in the city Qazvin in the form of population density along with a spot to spot representation.

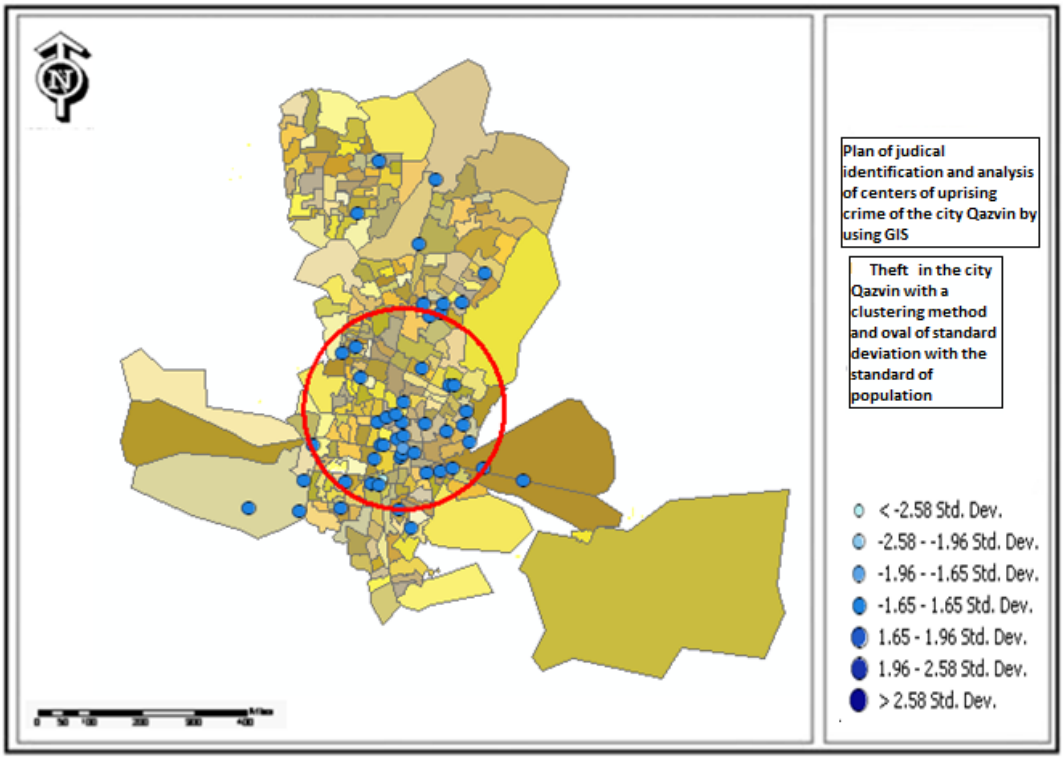

Fig. 8. The map theft in the city Qazvin in the form of the oval of standard deviation along with a clustering representation.

"Given the standard deviation towards the commercial regions and accumulation of stores, the false confidence that the people that are in these regions have about the absence of thieves and their attempt to spot to spot is because of the high traffic of population during the daily hours. It has caused the attention of the thieves to be attracted to these regions.

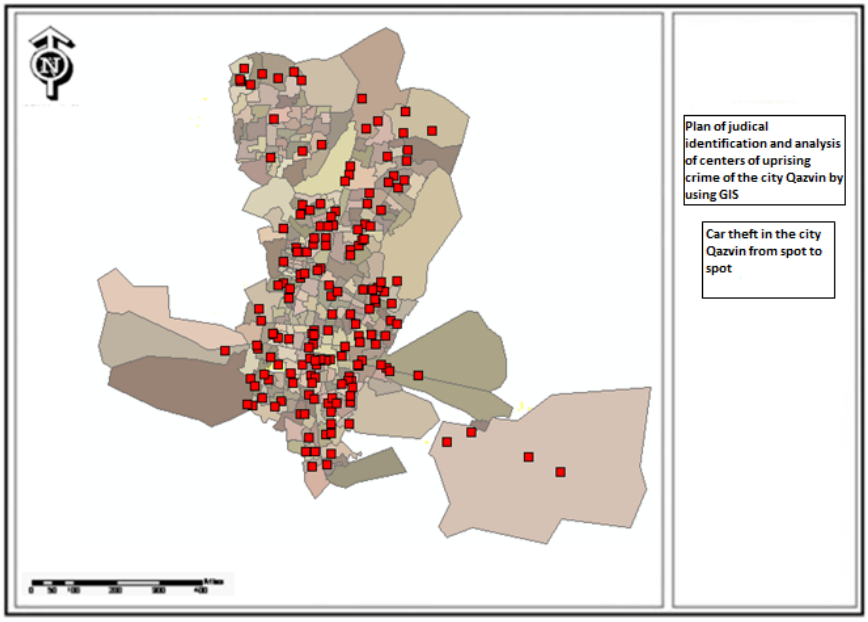

Fig. 9. The map of car theft in the form of population density along with a spot to spot representation.

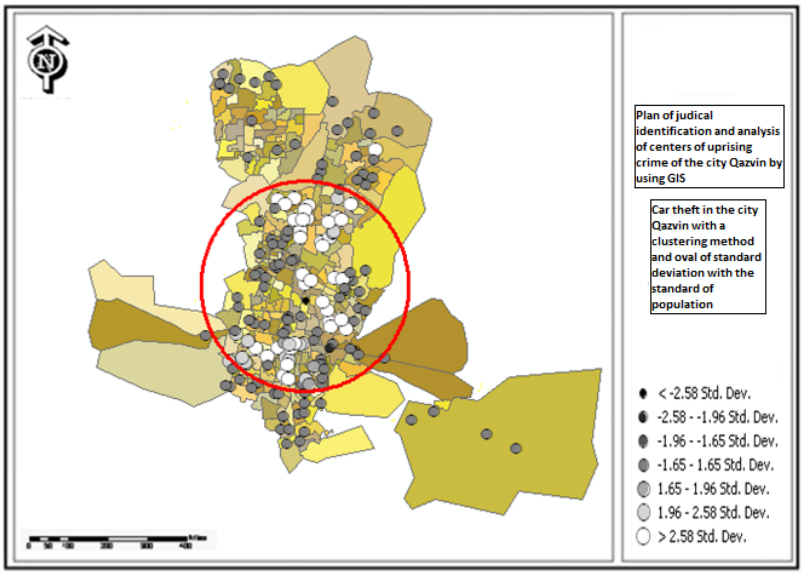

Fig. 10. The map of car theft in the form of the oval of standard deviation along with a clustering representation.

"The map shows the car theft in the city Qazvin. The center of the deviation oval is placed in the "ferdosi" street. And since there are numerous commercial and administrative centers and the congestion of cars, the thieves tend to do theft in these regions. And also those persons, that park their car in the street and the areas around it, believe that in these regions, thieves do not try to steal the car as much due to the numerous cars that are parked, thus the level of security of the car by the owner decreases to the false confidence in the mentioned region.

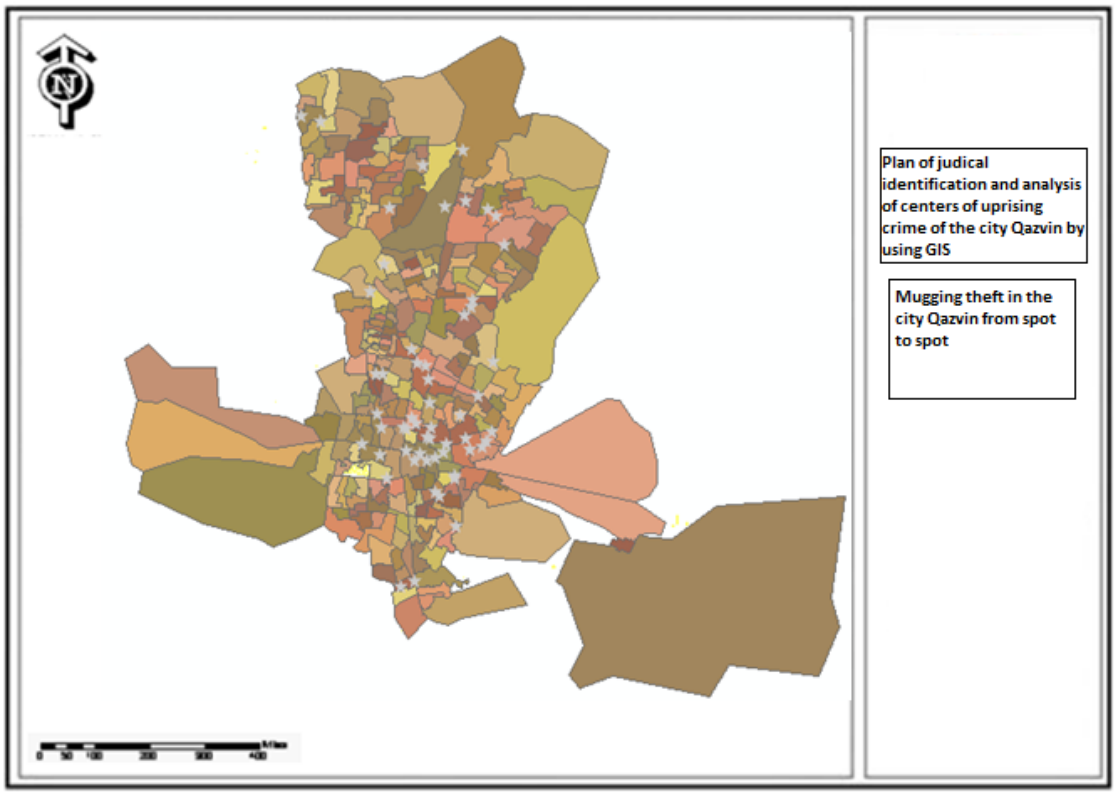

Fig. 11. The map of mugging in the form of population density along with a spot to spot representation.

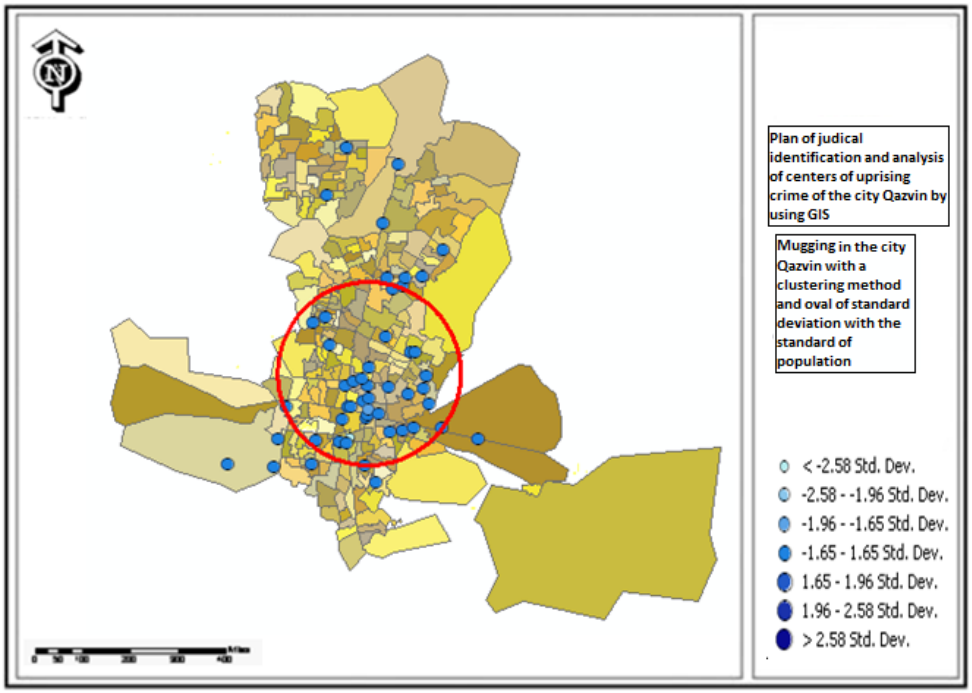

Fig. 12. The map of mugging in the form of the oval of standard deviation along with a clustering representation.

"Given the standard deviation towards the commercial regions and accumulation of banks, the false confidence that the people that are in these regions have about the absence of thieves and their attempt is because of the high traffic of population during the daily hours. It has caused the attention of the thieves to be attracted to these regions. (the center of standard deviation oval is the "ferdosi" street.)

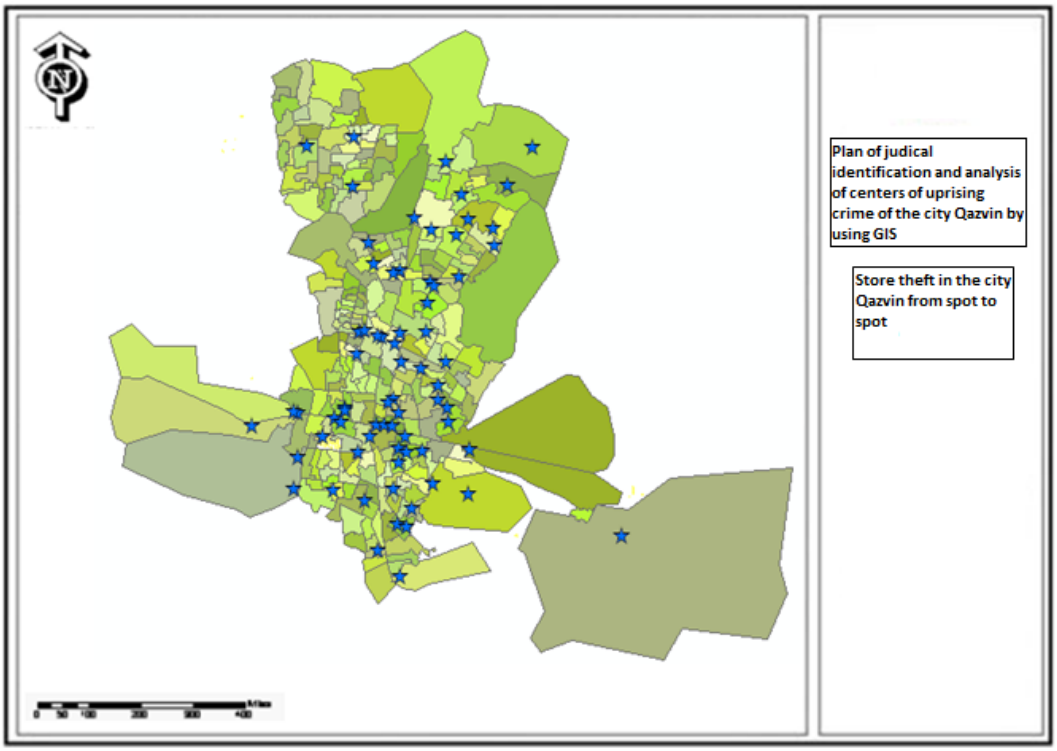

Fig. 13. The map of store theft in the form of population density along with a spot to spot representation.

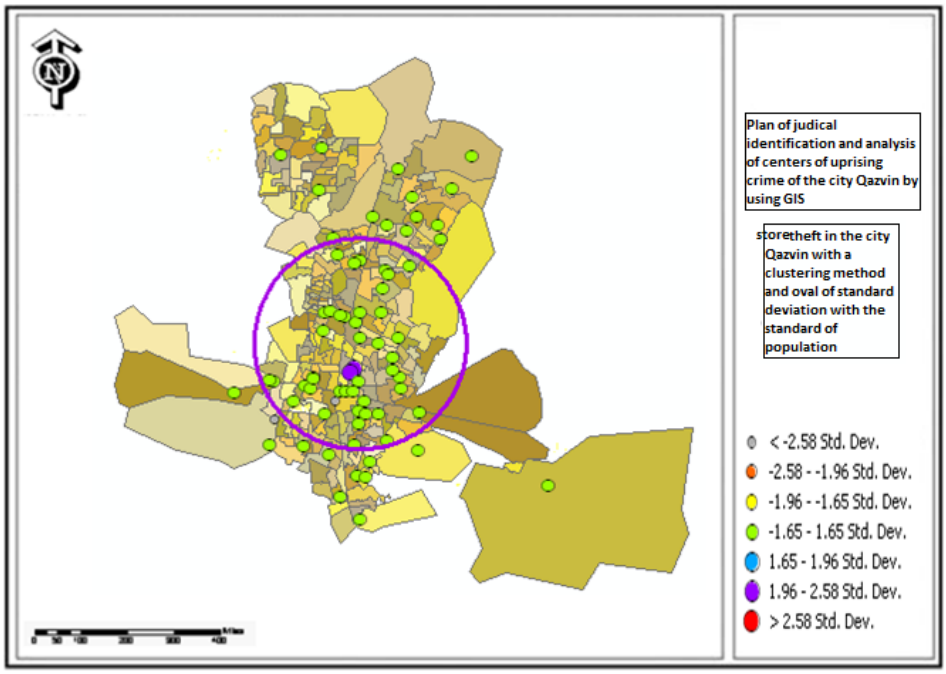

Fig. 14. The map of store theft in the form of the oval of standard deviation along with a clustering representation.

"Given the standard deviation towards the commercial regions and accumulation of stores and various shops, the inattention of the owners these places in these areas to the attempt of the thieves to rob these stores and shops and commercial centers. (The center of standard deviation oval is the "Khayyam" street.)

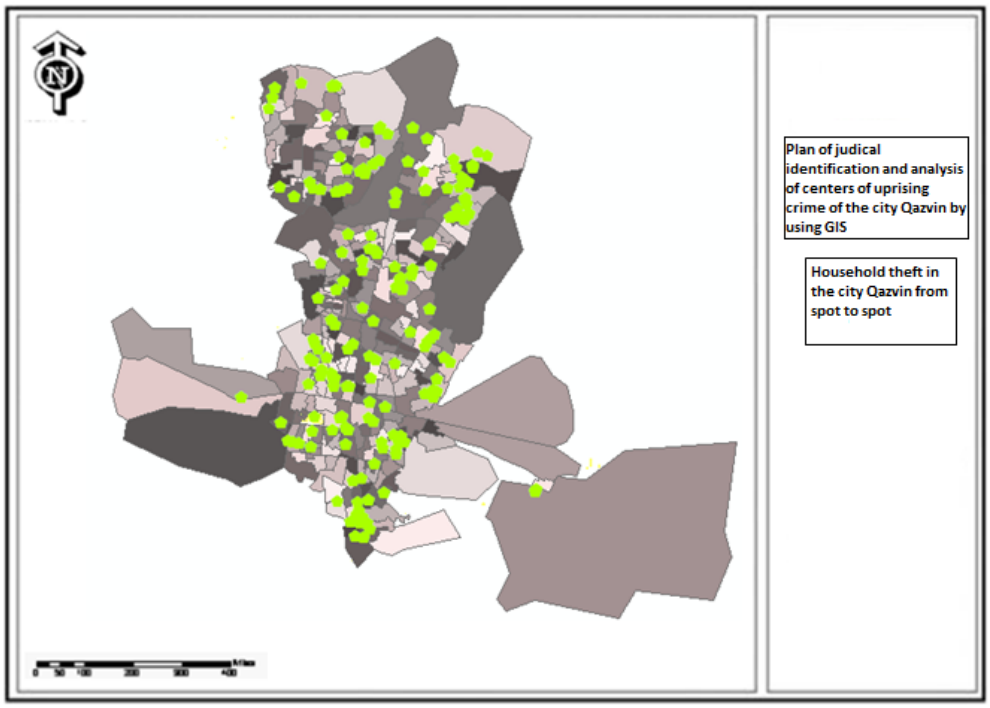

Fig. 15. The map of household robbery in the form of population density along with a spot to spot representation.

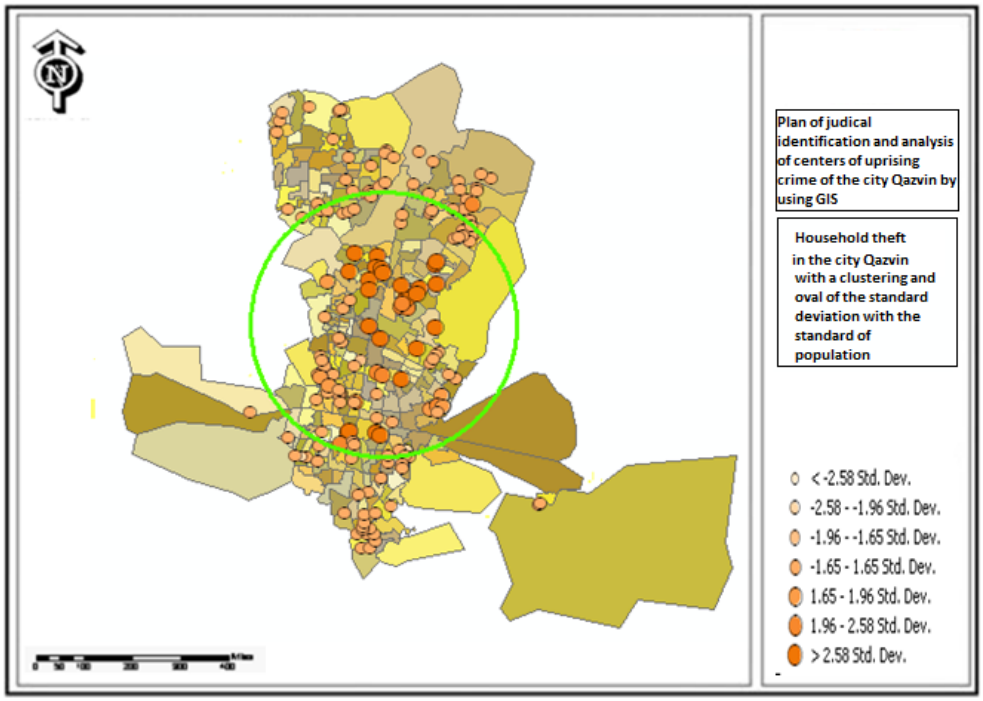

Fig. 16. The map of household robbery in the form of the oval of standard deviation along with a clustering representation.

"The residents of this area are mostly from the average class and do not care about making their houses secure as much. Because the facilities of their houses are worth less which leads to less security level of the residential house and it attracts the attention of the active robbers in this domain. (the center of the oval is placed in the "Dehkhoda" street.)

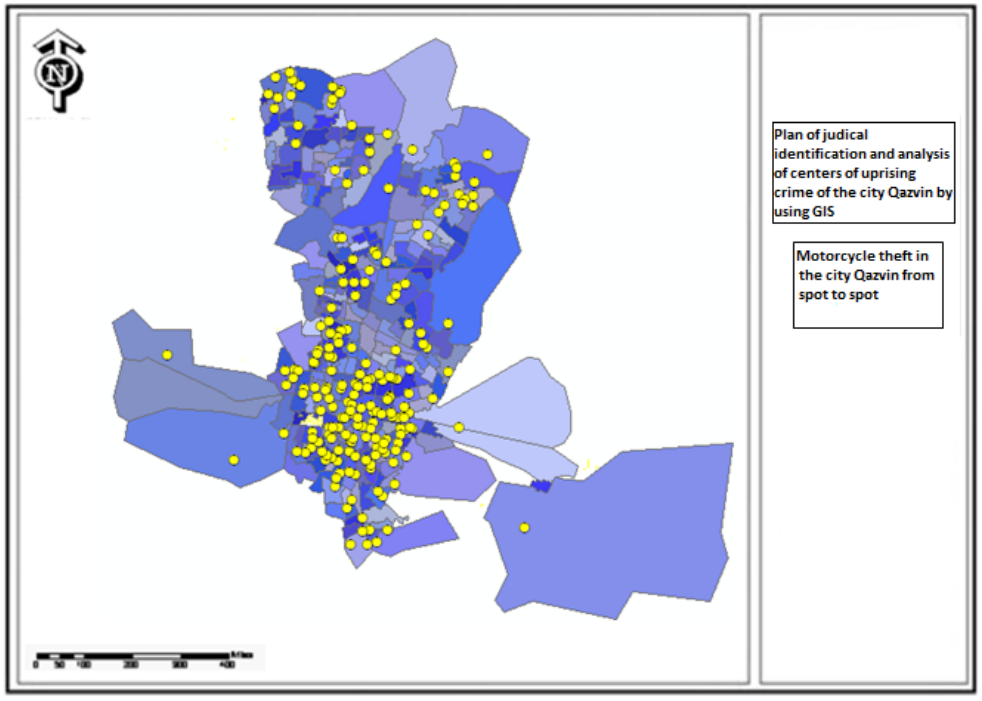

Fig. 17. The map of motorcycle theft in the form of population density along with a spot to spot representation.

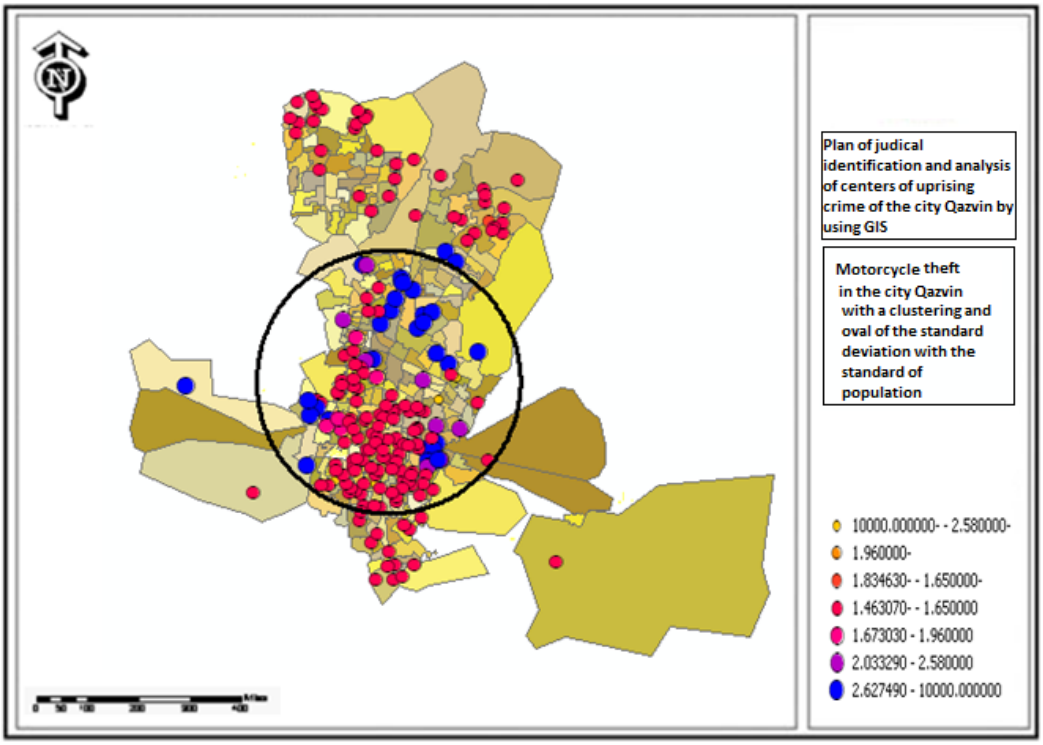

Fig. 18. The map of motorcycle theft in the form of the oval of the standard deviation along with a clustering representation.

"We can understand form the figure that in regions in which there is traffic of transportation vehicles, those persons that are so active in terms of transportation in these areas use motorcycle. Since the security coefficient is very low, we observe theft increasing in these regions. And therefore, in more distant areas, since the financial level of the residents is low, using the motorcycle in there is impressively increasing. (The center of the deviation oval is placed in the "Adl" street.)

Devising strategies:

As it was said, various factors cause the social security to decrease in the cities. The question that arises here is this, how can we provide urban security from various political, skeletal, cultural, social and economical dimensions? We can refer to these following strategies as an answer:

1. Structural and physical improvement of the urban poor and marginalized regions;
2. Spatial distribution of a fair income, wealth, and power in the entire city for all of the citizens;
3. Using public participation in the preparation and implementation of urban plans in order to prevent the creation of urban issues;
4. The proportional distribution of urban usages (cultural, educational, health and recreational) and the access of different classes to these usages;
5. Identifying the spaces of uprising crime and doing the essential things to fight these spaces and preventing their creation;
6. Considering the environmental standards and preventing the creation and building in the agricultural lands of the urban suburbs;
7. Preventing speculation of land and housing and creating a condition for the residents of the marginalized regions to have access to a proper housing;
8. Fulfilling the basic needs including food, water, shelter, income, security and work for the entire population of the city;
9. Increasing the level of knowledge and culture of the citizens (especially the poor regions of the city);
10. Improving the quality and possibility of an easy access to the public transportation in the entire city and increasing the existing capacities, in order to fulfilling the needs of the citizens, fast and easily;
11. Optimizing and rehabilitating the old and rusty urban contexts: developing the economical infrastructures and providing urban services and being active in order to increase the urban economical security and creating employment;
12. Having at least the proper level of public health and health care, in a way that these services would be available for everyone;

13. Solving the issues associated with urban traffic and pollutions (sound pollution, visual and air pollution), and paying special attention to the sustained development of the city;
14. Preventing the creation of spaces that have no civil defense, by the following acts:

"Structural action:

change in the form of the space, enhancing the light and visibility of the space, change in the location of the placement of the urban furniture which are the gathering places for people (such as telephone booths and newspaper sales), removing the form by enclosing them and the U and L shape of the recessed spaces or preventing individuals such as those who sleep in boxes (homeless people) to use them, desired use of the empty spaces under the stairs of the aerial bridge for filling the space, coordinating the size and volume of the space

"Legal action:

Dismantling the stalls of vendors and their gathering place, especially in areas surrounding large markets, reducing the rate of concentration of the population by forcing the owners of the structures to coordinate it with the performance and etc.

"Performance action:

activating the abandoned buildings, changing the usage of the abandoned buildings or confining them and etc.

CONCLUSION

The results of the research will be growing by using the formula of lowest squares of forecast of household robberies in 1392 with a 1.4 percent increase. Household robbery will decrease about 1.2 percent and car theft will increase about 2 percent. It is worth noting that by enhancing the security items and informing, this statistic will decrease; otherwise, given the forecasts that have been done, it will increasingly grow.

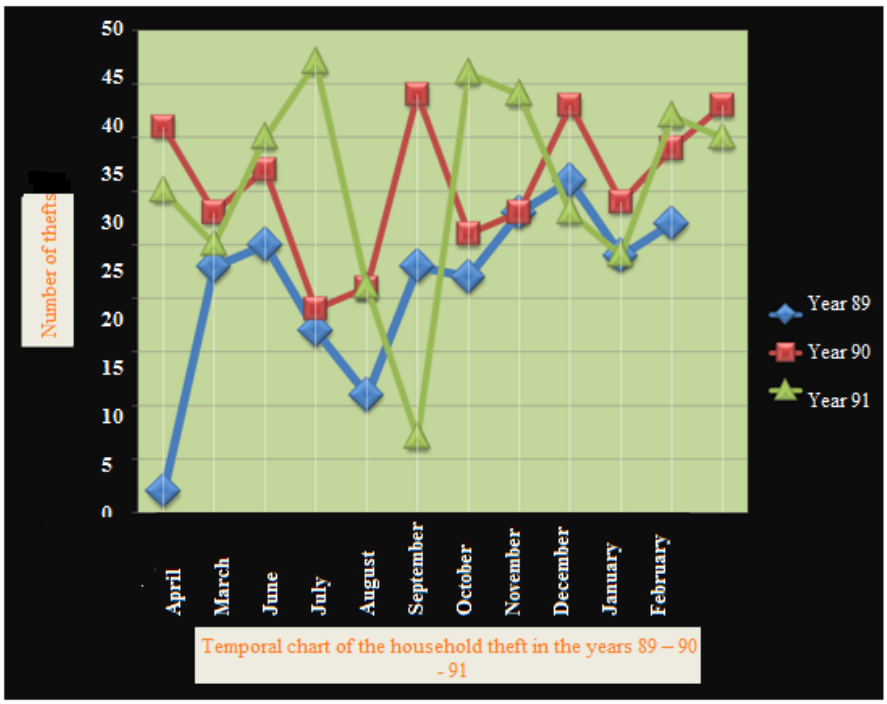

Fig. 19.

The above chart: time interval of the household robbery in the years 89 - 90 - 91

The above chat: time interval of the store robbery in the years 89 - 90 - 91

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