Research on Urban Security Management Based on Cluster Analysis of 110 Alert Quantities

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Abstract: With the development of social economy and wide spread of Internet Technology, mobility and openness level of the whole society has been greatly improved in recent years. Disposal of 110 Alert and fight against urban crime has become more and more sophisticated, intellective, covert and associated. Police Departments are required to adjust police force distribution, investigation means, and the operating mechanism, consummate 110 Alert Commanding & Allocating System, and improve their ability to deal with the intricate urban public security situation. In this article, we will analyze functions of 110 Command Center in urban public security management, make a Cluster Analysis of 110 Alert Quantities based on the Hierarchical Clustering Method and K-means, and raise reasonable advice in order to help policemen on duty form a scientific expectation of 110 Alert Quantities and make enough preparation for 110 Alert.

1 INTRODUCTION

In recent years, mobility and openness level of the whole society has been vastly improved, with the development of social economy and wide spread of Internet Technology. While urban crime has become more and more intellective, covert and associated, disposal of 110 Alert and combat against urban crime has become more and more sophisticated. (Yang, 2019) Information Technology being integrated with human productive activities, worldwide data increase explosively and gather massively. Data Technology has become a significant factor determining a city's management level of public security. (Xu, 2018) There exist a certain actual problems in the present police operation pattern. Public Security Departments need to grasp the opportunity of Data Technology development, make full use of substantial data resources, integrate police affairs with Data Technology, and make the police operating pattern more intelligent and advanced. (Li, 2013) They are also required to adjust police force distribution, investigation means, and the operating mechanism, consummate 110 Alert Commanding & Allocating System, and improve their ability to deal with the intricate urban public security situation.

2 CHALLENGES WE MEET IN URBAN PUBLIC SECURITY MANAGEMENT

First, more sources of risks have appeared with the development of urbanization. Some problems that ever appeared in the past become more challenging in an information society, since the crowd can easily acquire and transmit concerning information, make remarks, which include environment pollution, disputes between employers and workers, medical disputes, accident disputes, and internet financial risks. Traffic security risks also increase, as grades and mileage of urban roads improve, vehicle possessing quantity increasing, traffic safety consciousness of drivers remaining weak. Procedure of hazardous articles' production, storage, transportation, sale, utilization is sophisticated and intricate. Some practitioners focus only on profit, neglecting safety during the course of producing, transporting and utilizing hazardous articles. Without strict supervision and control, the industry of hazardous articles may bring about serious risks towards urban public security. Individual extreme crimes still exist, which may lead to grievous harm to others since density of urban population is higher than rural population. A person who holds a hostile attitude towards the society tends to make extreme violent crime. Unluckily, this kind

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of people exist in the whole human history, so do they nowadays. They look as normal as others on ordinary days. Once taking actions, they become violent, ferocious and cruel. It costs a lot of time and police power to investigate and prevent an unknown person's extreme crime. Therefore, police's pressure of dealing with terrorism is also very high.

Second, development of we-media makes urban security management more challenging. Some people do not exactly understand the balance of social rights and social responsibilities, pursing their rights through unreasonably hyping up on the internet and disturbing the cyber order. These people are selfish, littered with self ego, paying little attention to others' feelings, and only caring about their own interest and feelings. If only their interest is aggrieved, they will exaggerate and widespread their situation on the internet, incurring much attention. Some social conflicts concern a large quantity of people in various regions, which is difficult for the police to deal with effectively. In the past, civil disputes are concentrated on family, marriage and debt, but now they have covered environment protection, tort, removing old houses, inappropriate judgment etc. In the past, conflict parties are limited to citizens and citizens. Now, they include citizens and factories, citizens and corporation, citizens and administrative units, factories and administrative units etc. Diversification of conflict parties bring much work to grass-root police departments. Conflicts and disputes are closely related to people's production and life. If an individual's appeal is not satisfied, he will turn to the internet, find people who have the same appeal, and maximize their interest in an extreme way. People who have ulterior motives may make use of these conflicts and disputes to spread cyber rumor and false information. Some cynical, pessimistic and hostile people are usually influenced by these people with ulterior motives, paying special attention to cases concerning police and other government officials. If police departments make response inactively, they may incur harsh criticism on the internet, and cyber public sentiment crisis may turn to public security problems. Once trapped in a cyber public sentiment crisis, police departments may lose authority and credibility. Whatever they say or do, the crowd on the internet do not believe, causing harm and erosion to the whole social credit system.

Third, New forms of crime and risks appear in urban regions. While quantities of traditional forms of crime have decreased, new forms of crime have appeared and increased rapidly, including internet fraud and cyber financial crime, etc, which have encroached on a large number of people, being difficult to prevent and deal with. Internet fraud and telecommunication fraud are two most widespread forms of urban crime, affecting a large quantity of people and causing a large amount of property loss. Most of the victims of internet fraud and telecommunication fraud are elderly people, who live alone and owe a large of amount of money to support themselves and prepare for possible diseases. They are liable to believe in others, and easy to cheat. Young people who indulge in the cyber game may become victims too. Some criminals go abroad and make crime of internet fraud and telecommunication fraud, making it difficult for the police to investigate and capture them. It needs international police co-operation if domestic police want to capture and arrest them. With the development of online shopping, the number of concerned fraud cases increases rapidly. Posting and delivery employees are able to collect information of senders and receivers, and may abuse their individual information, causing potential safety hazard. Practitioners of hotels, especially private hotels, also have the chance to collect and let out the crowd's private information. Once fraud criminals have mastered citizens' private information, they may make concerning people believe in them and transfer accounts to them. Nowadays, criminals usually make use of smart phones and new transmission technology to make crime. For example, they may absorb public saving illegally under cover of new industry. All the above new-form crime and risks bring much pressure to police departments. (Jiao, 2007).

3 CLUSTER ANALYSIS OF 110 ALERT QUANTITIES

Cluster Analysis is mathematical statistics that classifies objects based on numeric characteristics, which is used most often in practical work procedure, being able to classify either samples or variables. With the development of computers, Internet Technology and Big Data, interpersonal exchange has become more and more frequent, and people's need to analyze, manage and utilize Big Data has become more and more urgent, while Cluster Analysis plays a more and more significant role during the course of Data Mining, as traditional statistics can not satisfy present researchers' need. Under the background of Social Informatization and Big Data, researchers of any field need to collect, analyze and utilize data, which has become more and more difficult. Cluster Analysis is a

significant means for researchers to deal with these problems. (Annikaer, 2019)

Cluster Statistics is statistics that can reflect nature distance of samples or variables, including Distance and Similarity Coefficient. Distance can be used to classify samples, including Absolute Value Distance, Euclidean Distance, Minkowski Distance, Mahalanobis Distance, etc. Euclidean Distance is used most often in practical work procedure. Similarity Coefficient is usually used to classify variables, including Cosine and Correlation Coefficient, etc. Pearson Correlation Coefficient can be used to classify successive materials.

The Hierarchical Clustering Method is easy, accurate and efficient, which is a branch of Cluster Analysis, and universally applied in practical cases. Biology researchers have used the Hierarchical Clustering Method to classify animals, plants and genes; traffic experts have used the Hierarchical Clustering Method to classify factors that affect traffic accidents; economic researchers have used the Hierarchical Clustering Method to classify economic indicators of different regions to acquire economic information and offer suggestions. (Qin, 2017).

In order to decrease the fluctuation range of 110 Alert Quantities of each period, we divide one day into 12 stages, including 0:01-2: 00, 2:01-4: 00, 4:01-6: 00, 6:01-8: 00, 8:01-10: 00, 10:01-12: 00, 12:01-14: 00, 14:01-16: 00, 16:01-18: 00, 18:01-20: 00, 2:01-22: 00, 22:01-24: 00. Using SPSS, we can acquire the clustering result as follows.

From the above figure, we can see that the period 0:01-6:00 can bee regarded as one category, in which 110 Alert Quantity is relatively smaller; periods including 8:01-12:00 and 14:01-18:00 can bee regarded as one category. The Diagram Based on Hierarchical Clustering Method is like a tree, from which we can judge which two periods are closest in distance. K means is usually utilized to classify big-sample data quickly, in which we can set initial cluster centers artificially, making full use of previous research achievement, and saving much time. However, this means has some limitation. It can only be used to cluster samples instead of variables; variables we use should be continuous. It is supposed that there are n variables to be clustered into K categories, which make up a n–dimensional space, and each sample is one point in the space. First, choose K points as initial cluster centers; second, make other sample points clustered to category centers based on the principle of minimum Euclidean distance and we will acquire a scheme of initial clusters, means of

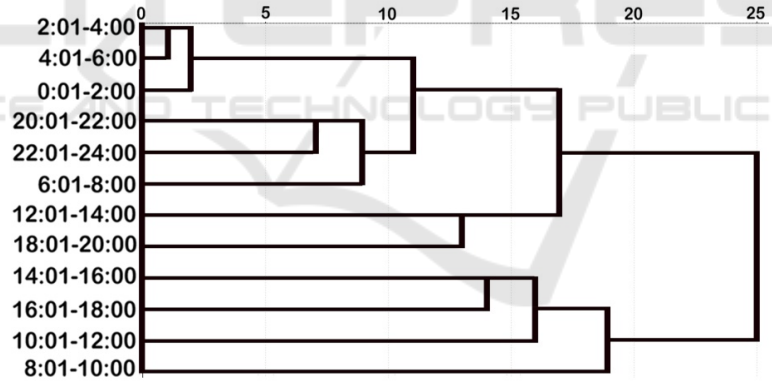

Figure 1: Diagram Based on Hierarchical Clustering Method.

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
Cluster	2	2	2	2	1	1	1	1	1	1	2	2
Distance	16	17. 6	17. 8	24. 5	30. 2	27. 3	27. 4	28. 5	26. 9	27. 2	25. 3	19. 5

Figure 2: Clustering Members of 2 Categories.

Sample Nomuber	1	2	3	4	5	6	7	8	9	10	11	12
Cluster	2	2	2	2	1	3	3	3	3	1	2	2
Distance	16	17. 6	17. 8	24. 5	22. 1	25. 7	26. 9	25. 8	25. 3	22. 1	25. 3	19. 5

Figure 3: Clustering Members of 3 Categories.

each initial cluster having been calculated; at last, re-cluster samples based on calculated means until reaching the standard of converging. Using SPSS, we can acquire the following result of two clusters and three clusters. In the following figure, 1 stands for the period of 0:01-2:00, and 2 stands for the period of 2:01-4:00, and so on.

From the above figure, we can see that if samples are divided into two categories, the higher period includes 08:01-20:00, while the lower period includes 0:01-08:00 and 20:01-24:00.

From Figure 3, we can see that if samples are divided into three categories, the higher period includes 08:01-10:00 and 18:01-20:00, the lower period includes 0:01-8:00 and 20:01-24:00, and the ordinary period includes 10:01-16:00.

4 STRATEGIES OF URBAN SECURITY MANAGEMENT BASED ON CLUSTER ANALYSIS OF 110 ALERT QUANTITIES

First, it is required to allocate police power appropriately. An instant monitoring and judgment system needs to be established in order to estimate and allocate police power appropriately, as police power is to be allocated according to public security situation of different districts. Through Cluster Analysis, we have mastered the objective fluctuation law of 110 Alert Quantities, according to which the command center can allocate police power dynamically. In the period from 0:01-6:00, 110 Alert Quantity is relatively smaller, and the corresponding police power can be set relatively smaller. In periods from 08:01 to 10:00 and from 18:01 to 20:00, 110 Alert Quantity is relatively larger, and the corresponding police power can be set relatively larger. Police personnel departments need to master data and keep track of categories, ages, educational backgrounds of policemen. Police power exchange is a significant supplement of police power allocation, the purpose of which is to encourage fluidity of police power, and make time distribution, personnel structure and work quality more balanced and coordinated. Allocation of police power should also be based on policemen's individual career development in order to realize balanced and effective distribution. Local Police Stations do not necessarily need policemen with high-level knowledge, technique and specialty. Elder policemen, middle-age policemen and young policemen need to cooperate closely and collocate reasonably. When a policeman has worked in the same Local Police Station for 10 years, he will be asked to work in another position. However, the longer time a community policeman works, the better, since he has known well almost all residents and surroundings. When policemen retire, young policemen must be supplemented in order to keep the balance of police power. (Zhao, 2011)

Second, it is required to improve patrolling power. The most effective way is to improve police visibility in order to prevent city violent crime. Composition of police power is like a pyramid, which means that if more police power is distributed to streets, control level of city security will be enhanced. Young policemen are dynamic, enthusiastic, and if the command center sends them to streets, patrolling power will be greatly improved. They can also acquire rich practical experience, which is beneficial to their career development. A policeman without grass-root work experience surely will not be fit for any position in police department. Therefore, fresh policemen should be strictly demanded to work for one or two years in Local Police Stations. On one hand, grass-root police stations have more police power to distribute, on the other hand, young policemen acquire practical experience, which is beneficial to both sides. It must be pointed out that some non-police alert takes up much patrolling power. Some alert needs to be handled by other government sectors. However, they call the police. Usually patrolling police force go to the spot and investigate facts. The whole procedure cost much time and energy of patrolling police power. An effective way is to shunt these non-police alert tasks to other government sectors. Police departments can not play the role of other government sectors. If an alert should not be handled by the police, 110 command center is responsible for telling the person calling the police to turn to other government sectors for help instead of calling the police. Folk public security power is also to be combined with official police power in order to set up a city security net and avoid shortage of patrolling police power, which includes social volunteers, security guards of schools, enterprises, factories and communities. (Liu, 2015) With the help of modern internet and telecommunication technology, folk public security power can be easily integrated into the social public security net. When one alert happens, the neighboring folk public security power will actively respond and reach the spot instantly.

Third, it is necessary to enhance intensity of community police. In a traditional city management mode, police departments are major suppliers of public security, while other folk public security

power is limited. The traditional management mode focuses on dealing with city violent crime instead of prevent and avoid crime, which has brought more and more challenges to police departments, and can not assure satisfying management effects. Therefore, police departments need to realize that the traditional management mode is expensive and not fit for the present social structure under the background of a transitional city mode. Transition from combat of crime to prevention of crime is the basic trend and fundamental strategy. Police departments need to switch roles and lay more emphasis on preventing crimes based on community police. The community is a tie of social development and public security, based on which police departments take actions to prevent city crime. Social power is a significant resource to absorb more residents to take part in resolving conflicts and preventing violent crimes. (Ji, 2020) Community policemen know well people and environment in this district. When strangers appear, they may realize. Once illegal cases take place in his community, he can find it out at once and report to the command center. Cooperating with folk public security power, and making an intense social security net, community police can play a more significant role, and level of a city's public security management will be improved.

5 CONCLUSION

We have analyzed functions of 110 Command Center in urban public security management, made a Cluster Analysis of 110 Alert Quantities based on the Hierarchical Clustering Method and K-means, and raised reasonable advice. From the research, we have discovered that there exists different 110 Alert Quantities in different periods of one whole day, based on which police departments can scientifically adjust police power. The research helps policemen on duty form a scientific expectation of 110 Alert Quantities and make enough preparation for 110 Alert. Limited by samples we collect and the city we choose, the research result may be inappropriate for other cities. If we want to find out national rules of 110 Alert Quantities, we need to collect and make a cluster analysis of other cities. That is, rules we have found out in this city may not apply to other cities. In the future, research on this field should focus on factors that affect 110 Alert Quantities of a city and make more precise prediction of 110 Alert Quantities based on weather factors. Change of 110 Alert Quantities is instant and dynamic. In future research, we may make full use of advanced algorithm and visualization to help 110 Command Center make scientific determination and adjust police power reasonably and efficiently.

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