

Public Security Early Warning Model Based on Crime Hot Spot

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Abstract. Crimes have specific distribution characteristics in time, space. It is very important for the public security department to pay attention to and analyze the crime hot spots, especially for the daily life of citizens. This work designs an early warning system for the police and public people through displaying the traditional crime data in a multi-dimensional visual. The dynamic way in time and space is conducive to assisting the decision-making of public security protection. It generated early warning information according to the hot spot map, assisted dispatch police force distribution, and improve the execution of public security work. According to the hot data of crime, it can help to prompt the public security situation and improve personal safety protection awareness based on LBS technology.

Introduction

With the rapid development of the city, a large number of crimes are lured behind the prosperity of the city. According to the relevant data in the 2018 work report of the Supreme People's Court: The Supreme People's court accepted 82383 cases and concluded 79692 cases, up 60.6% and 58.8% respectively compared with the previous five years. It formulated 119 judicial interpretations, issued 80 guiding cases, and strengthened supervision and guidance on the trial work of the national courts. The local people's courts at all levels accepted 88.967 million cases, concluded 85.984 million cases and executed 85.984 million cases, with an amount of RMB 20.2 trillion, up 58.6%, 55.6% and 1 year-on-year, respectively 44.6%. It can be seen that at present, the crime rate in China is still at a high level, especially in some areas with large population mobility.

In order to better prevent the occurrence of the illegal crime, the focus of attention and analysis of crime is becoming increasingly important in the daily life of citizens. However, according to the research results, the data of crime rate in different regions are not transparent. Ordinary people usually perceive the urban crime and social security through news reports. The network has also reported the hand drawn public security map and the summary report of urban annual crime distribution, but these are not updated in time, lack of timeliness and intelligence, and easy to cause information asymmetry [1-2].

This work is not a simple application of police handling or receiving, but a method that can help grassroots police better understand the security situation of the area and better guarantee the safety of citizens' daily living environment. The work designed a system can display the state of public security and the information of police cases directly and dynamically, improve citizens' awareness of prevention, promote the interaction between the police and the people, and help the public security system to deploy the police force scientifically and assist in the establishment of public security prevention and control strategies. So it can achieve a good control of social security, and create a good social security atmosphere and improve the credibility of the government.

Relevant Research

At present, there have been some researches on crime hot spots, such as compstant in the United States, crime reports, and Jinshan in Shanghai, China. They use the algorithm of spatial statistics to find the aggregation area of criminal events from the point events of discrete criminal cases, so as to

prevent and combat crimes [3]. David Wiesbord analyzed the crime data of Seattle in the past 14 years by taking the street segment as the research object and geographical unit, and found that some street segments always have the characteristics of crime hot spots and long-term stability [4]. The verification of the theory further develops the theory of situational crime prevention and provides strong evidence support for the positive role of foreign countries in police crime prevention [5]. In this regard, based on the theory of location criminology, some researchers also use map description technology and data statistical analysis to study the correlation between the distribution of the floating population aggregation area and the crime of theft, and reached the conclusion that the floating population aggregation and the formation of the crime hot spot have a positive correlation [6-7]. Koppel has made an in-depth study on the police patrol in the crime hot spot area, mainly including two aspects. From the perspective of patrol time, not the longer the patrol time is, the better the deterrent effect is, the best time is 14-15 minutes. From the perspective of patrol mode, the police should randomly and intermittently shuttle between the crime hot spots, and take the initiative and medium time stay [8-9].

At present, the number of domestic tourists has surged. In 2017, according to statistics, the number of tourists reached 5.001 billion. Among them, the most wanted to know about the public security situation in the vicinity is the independent tourists who account for 15% of the total, and there are also a large number of citizens who want to know about the public security situation. At present, people want to know the public security situation is still depending on personal inquiry, the conclusion of other people's feelings. There is no rigorous mathematical logic, big data analysis, most of them have personal subjective emotions, and there is not a correct oriented analysis and understanding platform. Therefore, combined with the spatial statistical function of vector data, can help people obtain relevant information for security defense [10-11].

System Framework Design

Hot spot and cold spot are used to measure the aggregation of crime on different spatial scales. Crime hotspot generally refers to a region in space. In this region, the level of crime rate is significantly higher than the average level of the whole region, or the risk of people becoming victims is higher than the average risk of victims. With the integration of big data, Internet of things, GIS based mapping and analysis, and other advanced technologies and resources, it is certain to play an active investigative advantage based on the abnormal dynamic early warning of crime hot spots. Therefore, integrating the internal data resources of the public security, we design an application of the linkage between command and mobilization and public security defense funds. Through the form of mobile application, it can not only display the public security status and police case information intuitively and dynamically, improve the citizens' awareness of prevention, promote the interaction between the police and the people, but also help the public security system to deploy the police force scientifically and assist in the establishment of public security prevention and control strategies.

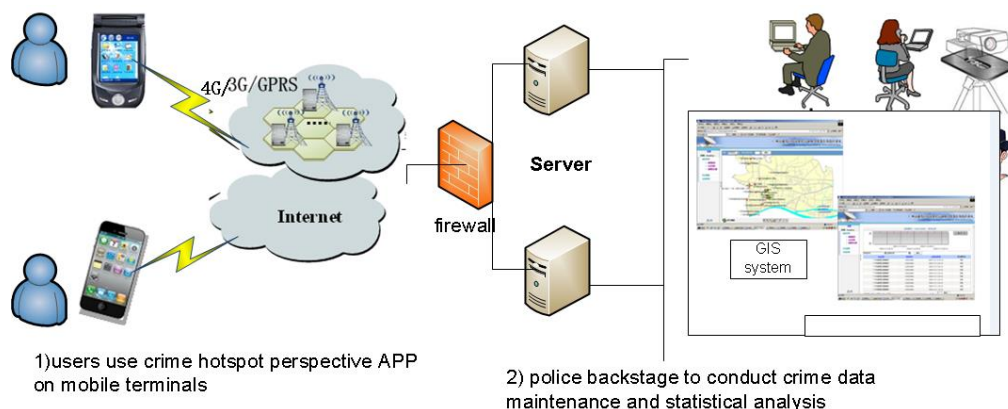


Figure 1. System framework.

The system is mainly divided into two parts as Fig.1: server data processing, request service and mobile terminal information query and reception.(1) the server-side program mainly realizes big data processing and intelligent early warning information push. (2) the implementation of the mobile terminal is based on the hybrid app design mode, which is used to view the crime hot spot information, police case reminder, police situation provision and receive the early warning information on the mobile phone.

Design of Early Warning Model

Risk Warning for Ordinary Citizens

Warning Effects. According to the location of users, Mobile terminals can give some real-time alerts, which are sent to the terminals in the form of message notification to remind users of the nearby public security situation in time. The pushed messages are divided according to the cases, for example: "in a certain period of time, there is a major traffic accident near * *, please detour"; "in a certain area, there is a child missing near * *, please take care of your child."

Dynamic Warning Mechanism Based on LBS. In order to facilitate the conversion of geographic longitude and latitude into corresponding geographic location information, baidu positioning SDK is adopted at the mobile terminal. After uploading the acquired location information to the server, the server will detect whether the user's GPS is in the early warning range of some key cases and whether there is a high incidence area of cases according to the case data information, so as to send the early warning information to the user.

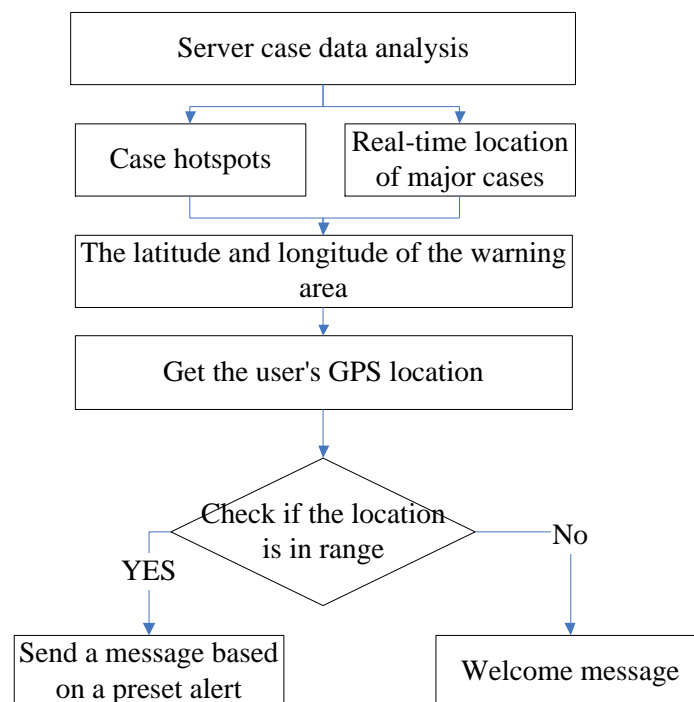


Figure 2. Dynamic warning mechanism based on LBS.

Risk Warning for Police

Warning Effects. The system will send the results of big data analysis to the mobile terminal of the police, and remind them by message notification. The mobile terminal of the police will receive the following message prompt: "in a certain period of time, how many * * cases are committed, and the number is beyond the established target, please strengthen the police force distribution of this type of case." The police can click to view the geographical distribution, and the case hotspot information will be displayed on the mobile map.

Police Early Warning Mechanism. Taking an administrative planning area as a change unit of geographical unit, the server makes big data statistics on the aggregation of cases by region and classification. It also can connect the data of regional hot spots to the Public Security Bureau in the relevant control area, connect the types of case hot spots to the police type brigade, send the warning information to the connected public security brigade, and assists the intelligent decision-making of police force distribution.

According to the threshold set by the system and the incidence of cases in other administrative regions, the early warning information can be given.

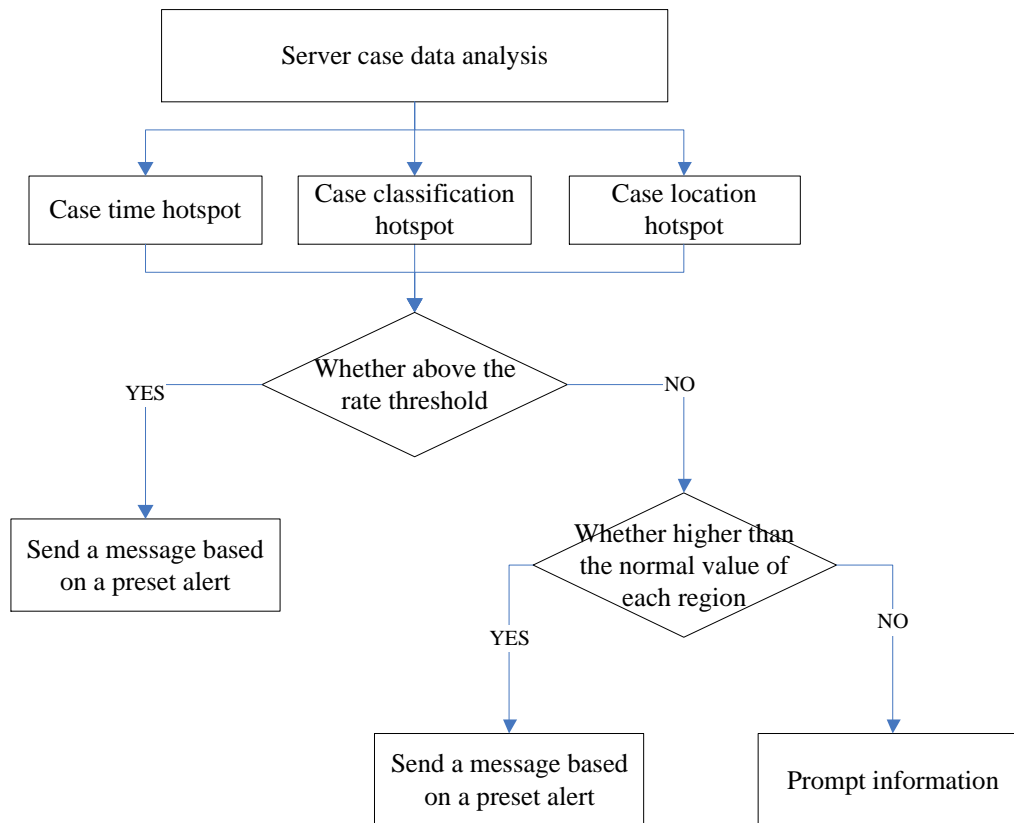


Figure 3. Early warning mechanism of police.

Summary

The early warning model based on crime hot spot has many advantages. Firstly, it can help the police to analyze the distribution of crime in different areas, provide data support for the accurate fight against crime, provide evaluation basis for the prevention and control effect, provide research basis for the law of crime transfer, provide information sources for the early warning of crime, and provide supervision for the efficient development of public security work. Secondly, the mobile app provided to ordinary citizens can let the public know the public security situation in some areas, improve citizens' sense of security and identity with the work of public security and law departments, and help them to improve their security awareness and safety precautions, so as to better protect personal safety.

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