



Analysis of the Re-offending Risk of Community Correction Personnel Based on Activity Path

Ping Wang^{1a}, Xuemei Zhu^{2*}

¹ School of Information, Sichuan Vocational College of Finance and Economics, Chengdu, 610101, China

² School of Marxism, Xihua University, Chengdu, 610039, China

^aEmail: 230101@scvcfe.edu.cn, *Email: xuemei_zh@126.com

Abstract. This paper uses the activity paths, activity trajectories and areas of community correction personnel obtained during the supervision process to conduct intelligent reasoning on the recidivism risk of community correction personnel. The re-offending risk of community corrections personnel is analyzed based on four characteristics: activity area, activity frequency and regularity, activity trajectory pattern, and activity location. It is helpful to identify community corrections personnel with high crime risks, conduct psychological and behavioral interventions on them in a timely manner, formulate personalized correction plans, adjust supervision measures and intensity, prevent them from committing crimes again, and ensure social security.

Keywords: Global Positioning System; Geographic Information System; Community Correction; Activity Path; re-offending.

1 Introduction

Community correction is a non-custodial form of criminal punishment execution. It refers to the criminals who meet the statutory conditions are placed in the community^[1]. Special state organs, with the assistance of relevant social groups, non-governmental organizations and social volunteers, correct their criminal psychology and behavioral habits within the period determined by the judgment, ruling or decision, and promote their smooth return to society^[2].

Since 2003, China has launched a pilot project of community correction and community service, and fully implemented it nationwide in 2009. Tens of thousands of criminals sentenced to probation, parole, etc. have adopted non-custodial community correction. As of 2021, the country has received a total of 5.37 million community correction subjects, and a total of 4.73 million have been released from correction^[3]. In recent years, about 1.2 million people have been listed each year.

At present, judicial administrative agencies in various parts of China have basically realized the precise management of correction personnel by applying information technology. GPS and Beidou positioning technology are used to locate community correc-

tion personnel, and mobile phones with positioning functions are distributed to community correction personnel, or electronic wristbands are worn to monitor the location of community correction personnel 24 hours a day^[4]. Many places have established electronic monitoring systems to realize the simultaneous recording and videotaping of various law enforcement activities of community correction, and computer entry and filing. However, due to the diversity and complexity of community correction personnel, in actual application, these methods can only play the role of tracking and timely reporting. They cannot foresee or predict the psychological and behavioral changes of community correction personnel, and cannot discover early when some community correction personnel have abnormal behaviors, so they cannot prevent some correction personnel from committing crimes again.

This paper proposes an activity path analysis of community correction personnel based on positioning system and GIS. By studying the behavioral characteristics of community correction personnel, analyzing the activity paths and entry and exit places of community correction personnel, their possible next behavior can be inferred, so as to classify community correction personnel according to the possibility of re-offending. Community correction personnel are divided into three categories: high-risk, medium-risk and low-risk personnel, and they are managed and controlled separately, and adjusted in time according to the activity situation, so as to detect the signs of re-offending of high-risk community correction personnel as early as possible. And artificial intervention on these dangerous personnel can reduce the occurrence of crimes and ensure social security.

2 Positioning Systems and Geographic Information Systems

2.1 Positioning System

Common positioning systems include the Global Positioning System (GPS) and the Beidou Satellite Navigation System (BDS). These systems can provide high-precision location data, which provides a basis for monitoring the activity paths of community correction personnel^[5]. Through special equipment such as electronic bracelets and positioning mobile phones, the location information of correction personnel can be obtained in real time, and the activity trajectory of community correction personnel can be drawn on the map. Through the positioning and monitoring of community correction personnel, the system can quickly detect abnormal situations, and take timely measures to curb risks and maintain the safety and stability of the community. Thirdly, the community correction personnel positioning system can also provide important data support for crime prevention^[6]. By analyzing the activity trajectories of correction personnel, relevant crime patterns and trends can be discovered, thereby strengthening the early warning and prevention of potential criminal behaviors^[7].

2.2 Geographic Information System

Geographic Information System (GIS) is a technical system for collecting, storing, managing, analyzing and displaying geospatial data^[8]. It can integrate and analyze the

location data obtained by the positioning system with geospatial data, and provide a powerful tool for analyzing the activity paths of community correction personnel.

GIS plays the following important roles in the analysis of the activity paths of community correction personnel: 1. Visual display. The activity paths of community correction personnel are presented in an intuitive map form, so that supervisors can clearly see their activity range and whereabouts. 2. Spatial analysis. Analyze the spatial relationship between the activity path and specific areas (such as prohibited areas and high-risk areas) to determine whether there are any violations. 3. Hot spot analysis. Determine the places where community correction personnel often stay or appear frequently, which may be the concentration of their social activities or areas with potential risks. 4. Path optimization. Plan the best patrol route for supervisors to improve supervision efficiency. 5. Spatiotemporal analysis. Combined with the time dimension, analyze the changing patterns of activity paths in different time periods to understand their daily routines and behavior patterns. 6. Risk assessment. Comprehensively assess the risk of community correction personnel reoffending based on the public security and environmental factors of the areas where the activity path passes.

3 Collection of Activity Path Data of Community Correction Personnel

In order to obtain the activity trajectory and path of community correction personnel, it is necessary to collect their activity locations in real time. According to the actual needs and budget of community correction work, appropriate positioning devices can be selected, such as electronic bracelets, mobile phone software positioning, etc. to obtain location information. Because GPS signals may be lost in some special environments, such as basements and tunnels, it is necessary to combine base station positioning to obtain the real-time location. We can also obtain location data from other aspects, such as surveillance cameras on the road, and location information generated by community correction personnel using mobile payment and taxi software.

According to the risk level and supervision requirements of community correction personnel, determine a reasonable data collection frequency. For high-risk personnel, a higher collection frequency can be adopted, such as once every 1 minute; for low-risk personnel, the collection frequency can be appropriately reduced, such as once every 15 minutes. Next, it is necessary to process the collected activity path data of community correction personnel, clean the collected original location data, remove duplicate, erroneous and abnormal data. Based on the cleaned data, the activity trajectory of community correction personnel is generated by the algorithm.

4 A method for Analyzing the Reoffending Risk of Community Correction Personnel Based on Activity Paths

After obtaining the activity paths and areas of community correction personnel, their

behavioral characteristics can be analyzed, and the re-offending risk of community correction personnel can be analyzed according to the characteristics of the places they often visit.

4.1 Analysis Based on Activity Areas

According to the characteristics of the activity areas of community correction personnel, risk assessment can be carried out. The outer envelope rectangle, circle or block range is obtained through the activity trajectory of community correction personnel to determine their main activity range. The supervision system can analyze whether their activity range exceeds the prescribed area, as well as the size and change trend of the activity range.

First, observe the size of the activity range. If the activity range of community correction personnel is too wide and lacks regularity, it may imply that their lives are unstable and they have more contact with people from various backgrounds, which increases the potential risk of re-offending. A high risk assessment can be given.

Secondly, pay attention to the nature of the activity area and place. Frequent appearances in high-crime areas, entertainment venues, or areas where bad people gather may indicate that they are susceptible to bad environments, thereby increasing their risk of crime.

The time pattern of activities is also important. If you often move outdoors at night or in the early morning, especially in some areas with poor security, it may mean a higher possibility of crime.

Analyze whether their activity trajectory is close to the victim or the place related to the original crime. If this is the case, it may reflect that they have not yet gotten rid of the psychological inducements of crime and have a relatively high risk of crime.

In addition, compare the degree of correlation between their activity range and normal life needs such as work, family, and education. If the activity range is unrelated to normal life needs and difficult to explain, this may be a danger signal.

On the contrary, if the community correction officer's activity range is mainly concentrated in the workplace, home, and community service locations, and the time is regular, consistent with the normal life and work schedule, it usually indicates that he is trying to integrate into normal society and has a relatively low risk of crime.

Taking into account the size of the community correction personnel's activity range, regional nature, time pattern, and relationship with normal life, we can more accurately assess their crime risk and provide valuable reference for community correction work so that corresponding intervention and correction measures can be taken in time.

4.2 Analysis Based on Activity Frequency and Regularity

Count the number of activities and stay time of community correction personnel in different areas, analyze the frequency and regularity of their activities, for example, whether they often appear in specific places, such as Internet cafes, bars, nightclubs, etc., and conduct risk assessment on community correction personnel based on this,

which can reflect the risk size of community correction personnel's activity frequency and regularity.

Community correction personnel with high and irregular activity frequency may have the following risks: Too close social activities, frequent participation in various social activities, complex relationships, may make them come into contact with bad people, increase the risk of being adversely affected and reoffending. Excessive activity may reflect the correction personnel's inner tension, anxiety, panic, or inability to adapt to normal life, and unstable psychological state. This psychological state can easily induce impulsive criminal behavior.

Community correction personnel with too low activity frequency and too small activity area may also be at risk: Too few activities may mean that they are out of touch with society, out of tune with the surroundings, and it is difficult to establish a normal social network and integrate into society, thereby increasing psychological pressure and crime risk. Low activity frequency may affect their employment and economic income, leading to greater personal economic pressure, and economic difficulties may drive them to commit crimes again.

However, to accurately assess the risk of crime, we cannot rely solely on the frequency of activities, but also need to conduct a comprehensive analysis based on the nature, location, companions and other factors of the activities. Although a community correction person has a high frequency of activities, but mainly participates in vocational training and community public welfare activities, his crime risk may be relatively low. On the contrary, if the activity frequency is high but they are all in bars, chess and card rooms, etc., the crime risk may be higher.

4.3 Analysis Based on Activity Trajectory Patterns

Using methods such as cluster analysis and sequence pattern mining, the patterns and regularities of the activity trajectories of community correction personnel can be discovered. For example, whether there is a fixed travel route, whether there is frequent contact with specific people at a specific place, whether there is a place overlap with other community correction personnel, etc. The analysis of their activity trajectory patterns mainly includes the following aspects:

1. Daily activity patterns. Observe whether they have fixed waking and resting times, and the distribution of activities at different time periods of the day. Analyze the differences in their activities on weekdays and weekends to determine whether there are abnormal changes in their work and rest schedules. Check whether there are weekly, monthly or seasonal cycle patterns in the activity trajectory. Breaking this periodic abnormal behavior may be a signal of some kind of change.

2. Activity area preference. Determine the main areas where they often move, such as communities, workplaces, shopping centers, etc. Observe whether there is any behavior of deliberately avoiding certain areas, which may indicate psychological resistance to specific places or potential risk factors.

3. Travel mode and route. Understand the main travel mode of the correction personnel, whether it is walking, cycling, taking public transportation or driving. Analyze whether the route they choose is reasonable and fixed according to their travel purpose.

If the regular route is suddenly changed, it may mean that a special event has occurred and further attention is needed.

4. Interaction place with others. Find out the place where they meet or gather with others, and judge whether the communication object is stable and normal. If you often come into contact with unidentified people in remote places, or often go to public places such as bars and dance halls where people gather, there may be a higher risk.

5. Speed and stay time. Calculate the length of stay in different places. Staying too long or too short in sensitive places may reflect abnormal conditions. Analyze the speed of movement. Abnormal fast movement or long-term stillness requires analysis of the reasons.

6. Compare historical data. Compare the current activity trajectory with the past to observe whether there are significant changes. For example, the activity range is wide during a period of time, and suddenly becomes very small after a period of time, or vice versa.

Through detailed analysis of the activity trajectory patterns of community correction personnel, potential problems and risks can be discovered in a timely manner, providing a strong basis for the adjustment of correction measures and the optimization of supervision strategies.

4.4 Analysis Based on Activity Locations.

The locations where community correction personnel often move can be divided into four risk locations: high, medium, low, and no risk locations, according to the complexity of the personnel. High-risk locations include the following categories:

1. Entertainment venues, such as nightclubs, bars, etc. These locations have complex personnel and noisy environments, and are easily affected by bad atmospheres. For community correction personnel, frequent appearances in such places indicate that they cannot resist temptation, lack self-discipline, and are at risk of reoffending.

2. Gambling venues, including underground casinos, illegal mahjong halls, etc. Gambling venues often make people addicted, leading to economic difficulties and the breakdown of family relationships. This shows that they do not have the right values and money views, and cannot get rid of the temptation brought by gambling.

3. Remote and uninhabited areas. Such as abandoned factories, wilderness, etc. These places are difficult to supervise. If community correction personnel frequently appear in such places, they may be suspected of engaging in illegal transactions in private, hiding prohibited items, etc.

4. Specific crime-related places. If a person who is receiving community correction for economic crimes frequently appears in financial transaction places or high-risk investment areas; a person who commits a theft crime often moves around places where valuables are sold or stored. This may suggest that they are still obsessed with their past crimes and have a tendency to commit crimes again.

If community correction personnel often appear in abnormal activity places, It is necessary to attract the attention of the regulatory authorities, strengthen supervision and management, and carry out timely education and intervention to prevent the occurrence of re-offending.

5 Conclusion

This paper proposes a method for collecting, processing and analyzing activity path data through analyzing the activity paths and trajectories of community correction personnel, and explores its application in the reoffending risk control of community correction personnel. According to the activity paths of community correction personnel obtained by the positioning system and geographic information system, the above risk analysis method is used to analyze the crime risks under various influencing factors such as activity trajectory, mode, frequency and location, and the reoffending risk of each community correction personnel can be obtained, so that they can be classified and managed according to their crime risks. Combined with their personal information, criminal records and other factors, their reoffending risk is evaluated to provide a basis for formulating personalized correction plans and adjusting supervision measures and strength. Practice has proved that this method can effectively improve the accuracy of community correction work, help understand the scope and trajectory of correction personnel's activities, and provide them with more targeted education, employment assistance and other means to reduce their reoffending risk.

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References

1. Walton, D., Martin, S., & Li, J. (2019). Iwi community justice panels reduce harm from re-offending. *Kōtuitui: New Zealand Journal of Social Sciences Online*, 15(1), 75–92.
2. Weatherburn D, Yeong S. Does correctional supervision of amphetamine users reduce the risk of re-offending?[J]. *Addiction*, 2021, 116(6): 1472-1481.
3. An interview with Jiang Aidong, Party Branch Secretary and Director of the Community Correction Administration Bureau of the Ministry of Justice. *People's Forum*, 2021.8.
4. Deng Yuanjian. Practice and reflection on the construction of smart correction in the new era: A case study of Yangpu District, Shanghai[J]. *People's Mediation*, 2023, (01): 53-56.
5. Wang sheng, Guo hongyu, Location information mining of community corrections, *Computer Applications and Software*, 2019, 36(3) :38-41+56.
6. Link T C, Reece B. Barriers to the adoption of technological innovations in corrections: A review and case study[J]. *International journal of offender therapy and comparative criminology*, 2021, 65(2-3): 262-281.
7. Belur J, Thornton A, Tompson L, et al. A systematic review of the effectiveness of the electronic monitoring of offenders[J]. *Journal of Criminal Justice*, 2020, 68: 101686.
8. Ali E. Geographic information system (GIS): definition, development, applications & components[J]. *Department of Geography, Ananda Chandra College. India*, 2020.

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