Discussion on Defense Safety Design for Rural-Urban Fringe Zones in Changchun in the View of Criminal Pattern Theory -- A Case Study of A Typical Zone Dominated by Industrial Lands in Changchun

Keqi Wang*, Zhaorui Sun1, Baixue Liang1
1School of architecture and urban planning, Jilin Jianzhu University, Changchun, Jilin province, 130118, China
2Corresponding author’s e-mail: wkq0431@126.com

Abstract. The rural-urban fringe zones are the by-products of rapid urbanization in China. They are specific regions where the urban and the countryside permeate mutually. On account of their ambiguous, dynamic, complex and farraginous characteristics, there are many personal defense safety hidden danger, and there are many vulnerable spaces and hot spots for crime as well. The author summarizes four kinds of hot spots in view of defense safety, namely, spatial nodes, linear paths, transition edges and spatial areas. Using the crime pattern theory and the crime template proposed in paper, the author analyzes the defense safety problem on four kinds hot spots in a typical rural-urban fringe zone dominated by industrial lands in Changchun and finally puts forward feasible strategies that reverse the crime template.

1. Introduction
In some literature, the rural-urban fringe zones also are known as the “city fringe area” “urban-rural transition zone”, etc. Their spatial location characteristics, population and social structure, economic development level, land use mode have their own characteristics, such as the peculiarity of spreading. And they permeate mutually between urban and rural areas. They have dual properties both urban and rural. Due to the mass floating population and disorder industrial development, they are the difficult and weak zones for crime prevention and control. They are the criminal hot spots areas in Changchun[11]. From the perspective of the defense safety design, the rural-urban fringe zones are the places that easily cause four types of blind zones, which are the spatial blind zones, the temporal blind zones, the psychological blind zones and the social blind zones. There are some key issues that are concerned by CPTED (Crime Prevention Through Environmental Design) theories in their building’s outside environment, such as the natural surveillance, the territorial reinforcement, the access control, image building, the target strengthen, the facilities maintenance and the activities support. And there are factors that stimulate and induce crime behaviors and problems of restricting capacity, etc..

2. Parsing for criminal pattern theory
The Criminal pattern theory (abbr. CPT) was first proposed by the Canadian scholar L.Brantingham and J.Brantingham. The theory explains how the awareness spatial (living experience) of potential offenders impact on the crimes’ decision-making of their target selection process[21]. The theory considers that the decision-making and the causation of crime depend on who (personal characteristics, life experience, etc), where and when (the characteristics of the environment) and other related factors.
Personal tendency of crime and crime inducing factors interact mutually. Crime occurs in the context of complex interactions between offenders and the environment. When environment characteristics are in conformity with the motivation of potential offenders, the possibility of committing crime is high. The offenders do not randomly choose targets in time and space, but rather choose targets within an area’s “environmental backcloth”, when and where situational factors are conducive to commit\[3\]. Opportunities are the key factors that influence the crimes’ decisions and environmental background combined with suitable victims. The will of the crime can be activated or triggered.

2.1. The key factor of crime decision-making

The awareness space is an important factor influencing potential criminals to commit. The early CPT divided the core elements of environmental crime into two types\[3\][4]. The first type is crime generator. It is a kind of activity node space. Crime generators can attract the public and potential offenders to the places for non-criminal purposes, such as bus stations. Due to the convergence of people, they can create opportunities for crimes, thus it is easy to induce crimes. The other one is crime attractor, normally it refers to a kind of place that is known to offenders for being a venue where crimes regularly take place. And a known as frequent crime node space, that has greater attraction to potential offenders because of the crime opportunities. Crime attractors are places that provide specific opportunities for crime events to occur, bringing together motivated offenders for the express purpose of committing certain types of crimes\[5\].

Crime generators and crime attractors are the key concepts that have influence on the CPT awareness space. Later, Cozens Paul and Love Terence proposed a few additional key concepts on the basis of existed research\[5\], i.e. the crime detractors, the crime facilitators and the crime precipitators. CPT elucidates the relationship between crime and environment. The cornerstone of CPT is that the offenders choose crime opportunities, which are believed to be a key factor in criminal motivation in their awareness space through daily activities. CPT focuses on the activity patterns in space and how the activity patterns creating opportunities for crime, the occurrence of criminal behaviors depend on the offender’s routine activity patterns and awareness spaces.

CPT is helpful to understand why crimes focus on a specific time and spaces. Crime is not distributed randomly in space and time, but rather occurs in a non-static “environmental backcloth”. Brantingham couples proposed that the backcloth emits environmental cues and sequences of cues which people process and use to generate a cognitive image of their surroundings\[2\]. Potential offenders evaluate the environment with the aid of perception before they make a decision whether to commit a crime or not. Over time, offenders with existing readiness learn which cues, clusters of cues and sequences of cues are associated with suitable targets\[6\].

2.2. Crime template of CPT

To form “awareness space” is the premise of the crime. The awareness space of potential offender form the mind-set that has influence on the decision-making whether engages in crime or not. This means that, on the basis of their life experiences and the cognition to the spatial environment, the potential offenders search for a suitable target and a location of crime in their relative familiar environments while they are doing their daily activities, for instance, learning, entertainment, making friends and dwelling. It is the selection process of crime targets. This mindset is known as the “crime template” in the CPT (i.e. cognitive template), the urban environment corresponding to the crime templates is the inducing factors of crime, so CPT can be summed up in a simple model: Easy (vulnerable) to crime = Potential offenders have form the awareness space for crime, which conforms to the crime template. Some spatial characteristics affect spatial cognitive ability of the potential offenders and the crime templates can be summarized as follows.

1) Crime template A: Easy crime = Spatial environment enhance the “accessibility” of potential offenders. Whether the spatial environments are convenient to be close and implementing crime for the potential offenders is corresponds to the “accessibility” to potential offenders. If a space has poor
territoraility, it means that the potential offenders are easy to close, which increase the chance of crime.

(2) Crime template B: Easy to crime = Spatial environment enhance the “hide ability” of potential offenders. Whether the spatial environments are convenient to conceal their crime track for the potential offenders is corresponds to the “hide ability” of potential offenders. If a space has poor visibility, it means that the potential offenders are easy to hide themself, which reduce the risk of crime.

(3) Crime template C: Easy to crime = Spatial environment enhance the “traffic capacity” of potential offenders. Whether the spatial environments are convenient to access and escape for the potential offenders is corresponds to the “traffic capacity” of potential offenders. If a space is in favour of escaping after committing the crime, which means that the space is easy to induce crime.

(4) Crime template D: Easy to crime = Spatial environment is lack of “surveillance ability” to potential offenders. Whether the spatial environments are lack of natural surveillance, social surveillance, or lack of administrating is corresponds to the “surveillance ability” of the spatial environments. If the surveillance ability is weak, when it is more likely to stimulate crime.

3. Analysis on defense safety problems in rural-urban fringe zones dominated by industrial lands in the perspective of CPT

The research area is close to Changshen road in the northwest, Nansihuan road in the northeast, and Guigu street in the southeast. It is next to Belt expressway of Changchun city in the southwest. There are a large number of automobiles industrial ancillary enterprises and a mass of small processing factories. More than 60% lands are occupied by manufacturing factories, the vacant land accounts for 15% and the proportion of other land is about 10%. It is a typical rural-urban fringe zone dominated by industrial lands.

3.1. Defense safety problems caused by spatial nodes

3.1.1. Problems caused by architectural composition. Territoriality of small factories is weak. It means that potential offenders are easy to be close to the crime targets. At the same time, the lack of territorial division weakens people’s sense of belonging and affiliation to the space and leads to the lack of the sense of safety. According to CPT, the situations conform to the “crime template A”.

The environmental quality of small factories is poor and the surveillance abilities is inadequate. These problems bring potential offenders psychological hints that the places are lack of administration, so the “deterrence powers” is stronger enough, which may reduce the crime. According to CPT, the situations are conform to the “crime template D”.

There are hide places for crime in the outside environment around the factories. There are many blind zones in the surrounding of small factories, such as tall trees and shrubs, concave and convex of building form and processing materials piling up randomly, etc. All these sites could be the conceal places for potential offenders. To use CPT to analysis, the situations fit the “crime template A”.

3.1.2. Problems of public spatial nodes. There are a lack of rest spaces. The natural surveillance is insufficient. People will intercourse naturally in the process of having rest, which is helpful to form natural surveillance. The researching area is filled with steel structure factories, where the rest spaces there are absent, and the necessary communications among people are lack. So the natural surveillance is weak accordingly. According to CPT, the situations are conform to the “crime template D”.

There are lack of administration, with many conceal places. The authors found that the public spaces in the area are neglected. There are a large amount of industrial wastes. The spatial qualities are poor, the spatial attractions are not enough, and the area lacks of community cohesion and natural surveillance. At the same time, all these factors provide the potential offenders the conditions to crime, as is shown in the Figure 1. According to CPT, the situations are in line with the “crime template D” and “crime template B”.

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3.1.3. Problems of landscape nodes. The landscape greening lacks of “popularity” even though the area is enough, and the natural surveillance is weak there. Distribution of landscape greening is not balanced. On the one hand, a wide range of areas are lack of landscape greening. On the other hand, a large area of greening concentrates in one area, it causes the lower sense of participation and the deficient “popularity” there, as is shown in the Figure 2. According to CPT, these problems conform to the “crime template D”.

The landscape greening has no sense of deeps and hierarchies. The sense of deeps and hierarchies is insufficient. There is a lack of subdivision of the landscape greening. The surveillance groups are not taken shape. According to CPT, it may weaken natural surveillance capability, so these problems fit the “crime template D”.

3.2. Defense safety problems caused by linear paths

3.2.1. Problems of road form. The identifiability of roads is bad. Identifiability is people’s important emotional shelter. The better the road identifiability is, the better people’s sense of direction will be. And it is easier to build cognitive space. The author found that the identifiability of road in the place is poor. On the one hand, it is on account of the roadsides buildings which are mostly industrial buildings, and whose form is unitary; On the other hand, it is due to the lack of iconic elements. According to CPT, these problems conform to the “crime template A”.

The homogeneity of building’s functions. The author found that roadsides buildings are mainly industrial buildings. Pedestrians are scarce for a long period of time in the day, so the temporal blind zones are easy to take shape, and many places are lack of necessary natural surveillance. Meanwhile, the deterrent forces to potential offenders are weak. As is shown in the Figure 3. These problems are in line with the “crime template D”.

3.2.2. Problems of road net structure. The network structure of roads, namely the layout of roads, is an important factors that affects the accessibility and trafficability for potential offenders. The complex layout of roads also is tended to provide convenient criminal conditions to escape. The author found that the roads structures in the area are grid type in general. As is shown in the Figure 4, the structures of internal branches are relatively complex, make the community easier to sneak in and escape out for potential offenders. According to CPT, these problems are in line with the “crime template C”.

![Figure1](image1.png) Public spaces lack of administration.

![Figure2](image2.png) Landscape spaces lack of subdivision.
3.3. Defense safety problems caused by transition edges

The transition edges are key locations of defense safety in the rural-urban fringe zones. The defense safety problems on transition edges in research area mainly are concentrated in the inboard boundary zones of Nansihuan road. The major problems are the high accessibility and trafficability, the intersections are too many along the road, as is shown in the Figure 5. To use CPT to analyze, it means that the potential offenders are more likely to escape after implementing crime. These problems are in accordance with the “crime template C”.

3.4. Defense safety problems caused by spatial areas

There exist a large number of vacant lands in the research area, the areas are lack of administration. The attractions are not enough and the natural surveillance are weak. These vacant lands were not well managed, which leads the bad environmental images. The lines of sight are not connect fully, the potential offenders are easy to hide after committing crimes. On the basis of CPT, it is in line with the
“crime template B”. Meanwhile, the vacant lands are insufficient to attract people to stay and natural surveillance is not enough. These problems conform to the “crime template D”.

4. The defense safety design strategies in the view of CPT in rural-urban fringe zones dominated by industrial lands

4.1. Defense safety design strategies in view of problems about spatial nodes

Speaking of the building form composition, apply the crime template reversely, we can adopt the following environment improvement strategies to reduce crime conditions and opportunities. 1) To enhance identification of entrance and exit and strengthen the territority. In order to eliminate the “crime template A”, appropriate marks should be set at inlet and outlet (such as a gate) to strengthen the territority of regions. In addition, different materials should be used to pave the entrance areas of the factories to clear the territories of different space. 2) To improve environmental quality and strengthen the natural surveillance. According to CPT, this measure can eliminate the “crime template D” and maintain a neat environment which give the potential offenders a psychological hint of management orderly. In addition, people can boost the surveillance ability by setting the doorkeepers.

3) To optimize the design of the facade and eliminate the hide spots. On the grounds of CPT, these measures can eliminate the “crime template A”. Therefore, in order to solve the problem of hide spots causing by forms of buildings, facilities and components which help climbing should avoid being set up on the exterior walls of buildings to weaken access abilities of potential offenders.

Telling from the view of public spatial nodes, our designers can apply the crime template reversely, and adopt the following environment improvement strategies to reduce crime conditions and opportunities. 1) To set up rest spaces to boost the natural surveillance. In the light of CPT, the enhancement of natural surveillance can eliminate the “crime template A”. For the problem of lacking rest spaces, rest facilities should be set up on both sides of sidewalks, but attention must be paid that the distance between the recreation facilities should be appropriate. 500 meters interval is advisable; At the same time, the unoccupied areas between buildings should be used as leisure spaces, because they can attract people and boost the natural surveillance of public spaces. 2) To promote the environmental quality of public spaces. On the basis of CPT, lowering the stimulation to potential offenders, enhancing the natural surveillance can eliminate the “crime template D”.

Speaking of landscape nodes, reversing the application of crime template and adopting the following environment promotion strategies can reduce crime conditions and opportunities. 1) To ensure the visual permeability of landscapes. Improving the maintenance of landscapes, keeping the height of brushes lower than 1.5 meters. Good visual permeability of landscapes can reduce potential offender’s “hide ability”, and eliminate the “crime template B”. 2) To divide the large spaces into small spaces to create surveillance groups. Directing at the problems that the landscape spaces are lack of subdivision and the attraction is insufficient to people, the large scale of landscape spaces should be divided into some small scale semi-public spaces that are convenient to entertain and relaxing and enhance their attractions, so as to eliminate the “crime template D”.

4.2. Defense safety design strategies aim at problems about linear paths

In the view of the forms of roads, the road facilities and materials of surrounding buildings can be used to enhance the identifiability of roads by setting the characteristic street facilities and distinctive handrails or pavement materials of sidewalks to strengthen the specifics of roads, which is the most intuitive ways to enhance the identifiability of roads. For the problem of monotonicity of industrial buildings along the roads, it can be solved from the perspective of material, the specific textures and colors of facade material can boost up the identifiability of the surrounding buildings, and remove the “crime template is A”, but we should pay attention to the differences between excessiveness, to avoid the mixed and disorderly images along road interfaces; At the same time, the designers can choose
warm color materials as far as possible for the sake of getting the feelings of warm and adapting to the cold climate characteristics of Changchun city.

Speaking of layout of roads, it affects the accessibility of roads, i.e., permeability, and also affects criminal decision-making of potential offenders. Complicated road streamlines are more likely to trigger crimes than the simple ones. In view of the problem that there are too many road intersections and the high accessibility in the research area, the application of crime template can be used in reverse. On the one hand, the designers could change the through block layout to T-type layout which has lower accessibility, increase the difficulties of potential offenders escape after committing crimes. On the other hand, people can change the lower level roads, such as branches, into cul-de-sacs, which can minimize the road accessibility. According to CPT, lopping the accessibility of road can eliminate the “crime template C”.

4.3. Defense safety design strategies direct at problems about transition edges
Aiming at the problem that there are too many road intersections in research area, people can applies to crime template reversely. On the basis of meet the normal needs of pedestrians, we should control the number of intersections along the transition edges reasonably, and try to trim the count of the junctions that the roads within rural-urban fringe zones connecting to Nansihuan road. Meanwhile, controlling the configurations of intersections is simple as far as possible, for instance, adopting two-way intersection or three-way intersection, trying to avoid using four-way intersection even more way intersection. According to CPT, controlling the number and the form of intersections for Nansihuan road can limit the accessibility of the roads to potential offenders and make sure that the potential offenders are not easily close to criminal targets and escape after committing crimes. Thus the “crime template C” can be eliminated and the environmental conditions of crime prevention can be improved.

4.4. Defense safety design strategies in allusion to problems about spatial areas
For the problems of vacant lands and natural surveillance in the research area, the designers can applies to crime template reversely, optimize the environmental quality of vacant lands, attract people to reside, increase necessity activity and promote the natural surveillance. In these ways, we can eliminate the “crime template D” and achieve the goal of crime prevention. For different scale of vacant lands, we should adopt different defense safety design strategies, for example, we can change the small scale of vacant lands into minitype recreation squares. Meanwhile, subdividing them into different function areas of small scale, such as children’s activity area, old people’s activity area, and so on are advantageous to the natural surveillance. We can set up greening, environmental sketches and rest facilities along the borders of larger area of vacant land with the purposes of enhancing the attraction and making people to have a rest. At the same time, the natural surveillance abilities to potential offenders are increased and the stimulation of crimes reduced.

5. Conclusion
The Rural-urban fringe zone is a kind of difficult and weak region for crime prevention and control. In the view of defense safety, the four key locations are spatial nodes, linear paths, transition edges and spatial areas. CPT explains how the awareness spaces of potential offenders impact on decision-making of potential offenders from their targets selection processing. The Analysis is based on defense safety problems by using CPT of the four types of key locations in rural-urban fringe zones dominated by industrial lands. The author sum up the crime template between environment and crime decision-making, and then, use the template crime reversely to put forwards defense safety design strategies, which can effectively improve the environmental quality of the rural-urban fringe zones and create a kind of positive spatial environment that is not conducive to crime. All these ways can prevent and reduce crimes, as well as enhance people’s sense of safety.

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