

# Research on Intelligent Management System of Floating Population in Residential Quarters based on Computer Network

Jianbin Luo, Yanbin Long

University of Science and Technology Liaoning, Anshan 114000, China.

## Abstract

This project discloses a computer network-based intelligent management system for floating population in residential areas, which belongs to the technical field of community population management. It includes a management server, which obtains rental information from the landlord or a third-party intermediary platform and registers it. The rental information at least includes the number of all tenants  $Q$  and the identity information of each tenant; An electronic fence is set up in the area containing the rental house to record the flow of personnel  $u$ ; It is agreed that the maximum value of personnel flow per hour in one day is  $b$  times of the average value; Concurrent coefficient of personnel flow  $c$ ; The maximum number of times the same person moves every day is  $t$ ; Keep a redundancy coefficient  $r$  (1% 10%); Calculation module: use formula to calculate the community activity coefficient of rental house in this area,  $p$ :  $p = (q * b * c * t) / (1r)$ . A threshold community stability coefficient range  $TOP_{min}$ - $TOP_{max}$  is preset, and if  $p$  is within this range, it is determined that the community stability in this area is high. This project is beneficial to the management of renting houses for floating population.

## Keywords

Computer Network; Residential Area; Floating Population.

## 1. Introduction

With the development of cities, mastering the dynamic situation of floating population and rental houses has become a difficult problem in comprehensive social management. At present, the information of floating population mainly depends on the community administrators to visit and register from house to house, and there are many loopholes in management, such as unclear base, unclear situation, violation and evasion of law-abiding registration, etc. How to track and collect the information of floating population, It is an urgent problem to be solved at present.

For example, the published Chinese project patent: Registration and Management Department of Floating Population in Community Rental Housing Based on Internet of Things, disclosed the identity card of the tenant. The door number information is related, and the Internet of Things is used to track the visiting information of the floating population, ensuring that the information does not return to the first floor and strengthening supervision; But in practical application, he needs to invest more terminal equipment, Comprises a counter installed on the door frame of the rental house and a plurality of sensors connected with the counter, which undoubtedly increases the cost; Moreover, the use of a lot of hardware also brings trouble in maintenance. If these devices are maliciously damaged or fraudulently bypassed, the whole system itself cannot play an early warning role.

## 2. Project Content

The purpose of this project is to provide an intelligent management system of floating population in residential areas based on computer network, which includes a management server: obtaining rental information from the landlord or a third-party intermediary platform and registering it, wherein the rental information at least includes the number of all tenants and the identity information of each tenant; An electronic fence is arranged in the area containing the rental house, Used to record personnel flow  $u$ ; It is agreed that the maximum value of personnel flow per hour in one day is  $b$  times of the average value; Concurrent coefficient of personnel flow  $c$ ; The maximum number of times the same person moves every day is  $t$ ; Keep a redundancy coefficient  $R(1\%-10\%)$ .

A calculation module: calculate the community activity coefficient  $p = (q * b * c * t)/(1-r)$  of rental houses in this area by using a formula, and preset a threshold community stability coefficient range  $TOP_{min}-TOP_{max}$ . If  $p$  is within this range, it is determined that the community stability in this area is high, and the number of registered tenants is suitable for the actual community activity scene; If  $p$  is not in the range, it is determined that, Community activities are inconsistent with the number of registered tenants, and real tenants need to be corrected;

The method of correcting real tenants includes:

1) acquiring the layout of the rental house, and establishing a corresponding model between the registered tenants and the rental house;

2) Use the access control system to screen out new tenants and reduced tenants;

Put the reduced tenants into the corresponding model to find out whether there is a matched rental house, if not, mark the tenants and place them in the track tenants, if yes, push the tenants to the historical tenants of the rental house, and initialize the rental house vacant at the same time; Put the new tenant into the corresponding model to find out if there is a matching rental house; If yes, do not deal with it, if not, mark the tenant, and fuzzy match the tenant with the vacant rental house; The management server sends a reminder message to the landlord or the third-party intermediary platform of the vaguely matched rental house to urge the tenant registration to be completed.

3) Using the monitoring system to screen out unfamiliar households, which are those who have neither applied for access control certification nor entered registration information in the management server; Fuzzy matching between the household and the registered tenant; The management server room reminds short messages to the vaguely matched tenants, and urges them to complete the tenant registration.

According to the tenant registration, the following methods are used to judge whether to partition the apartment type: according to the contract of renting registration, judge whether it is "shared rent", if it is "shared rent", proceed to the next step, if not, give up; Retrieve all the contract information of the household in the registration status, judge whether the number of contracts is greater than the number of "rooms" in the original apartment type, If it is greater than, it is judged as the partition type, and if it is less than or equal to, proceed to the next step; Get the actual number of residents and the maximum allowable number of residents of the original apartment type, and compare them. If the former is larger than the latter, it is judged as the partition apartment type.

The fuzzy matching method between newly added tenants and vacant rented houses includes the following steps: determining the location area of their rented houses by using an access control system or a monitoring system, obtaining the layout of adjacent rented houses of the rented houses, fitting into a plane figure, constructing an electronic fence at the entrance of the area according to the figure, extracting the center point  $a$  at the exit, Then mark the center points  $b_1, b_2, b_3$  at the entrance of each rented house, and compare the walking track of the newly

added tenant with the angles of  $ab_1$ ,  $ab_2$ ,  $ab_3$ . The smallest angle is the rented house that the newly added tenant fuzzy matches.

The fuzzy matching method between unfamiliar residents and registered residents includes the following steps: using the electronic fence set at the entrance of the rental house, the registered residents who have entered the same rental house together with unfamiliar residents for several times are captured, and then the credit card information of unfamiliar residents when they enter the entrance guard is traced back to judge whether they are consistent. If they are consistent, the household is a registered household matched with to; if they are inconsistent, there is no registered household matched by default, and the landlord of the rented house can be contacted directly.

### 3. Detailed Description

Embodiment: an intelligent management system for floating population in residential areas based on computer network, which is characterized by comprising:

Management server: obtain rental information from the landlord or the third-party intermediary platform and register it, where the rental information at least includes the number  $q$  of all tenants and the identity information of each tenant;

An electronic fence is set up in the area containing the rental house to record the flow of personnel  $u$ ;

It is agreed that the maximum value of personnel flow per hour in one day is  $b$  times of the average value;

Concurrent coefficient of personnel flow  $c$ ; The coefficient is selected between 10% and 15%, and the main consideration is the concurrent and mutual interference of personnel due to social activities.

The maximum number of times the same person moves every day is  $t$ ;

Keep a redundancy coefficient  $R(1\%-10\%)$ ;

A calculation module: calculate the community activity coefficient  $p = (q * b * c * t) / (1 - r)$  of rental houses in this area by using a formula, and preset a threshold community stability coefficient range  $TOP_{min}$ - $TOP_{max}$ . If  $p$  is within this range, it is determined that the community stability in this area is high, and the number of registered tenants is suitable for the actual community activity scene; If  $p$  is not in the range, it is determined that, Community activities are inconsistent with the number of registered tenants, and real tenants need to be corrected;

The above formulas are all calculated by de-quantization, and the formula is a formula for obtaining the latest real situation by software simulation of a large number of collected data, and the preset parameters in the formula are set by technicians in the field according to the actual situation.

In practical application, the scope of  $TOP_{min}$ - $TOP_{max}$  may be different in each community. It needs to use a period of big data for analysis when determining in the early stage. For example, there are more young people in the region, and the frequency of take-out and express delivery is high. Its social activity frequency is inevitably different from that of communities with more elderly people; In the community pilot application, the applicant found that, Normal check-in and check-out behavior will not cause fluctuation of coefficient  $P$  in a short time, but abnormal behavior will be reflected in a short time. If a large number of new check-in people do not register, the default value of  $Q$  will not change, but because the actual number of residents will increase, the values of  $U$  and  $C$  will suddenly increase, causing fluctuation of  $P$ , which will be keenly reflected.

In another case, residents have exchanged, but the actual number of residents has no obvious change. However, due to the different living habits of residents, the P value will also fluctuate greatly, so it is also worthy of vigilance.

However, this situation will also occur in the normal check-in and check-out node time period. Therefore, if the number of people remains unchanged but P fluctuates greatly, first check the registration record to see if there is a large-scale personnel change.

After judging the problem of personnel mobility, it is necessary to correct the registration of real tenants.

#### 4. Methods Of Correcting Real Tenants

The method of correcting real tenants includes:

1) acquiring the layout of the rental house, and establishing a corresponding model between the registered tenants and the rental house;

The layout here includes the distribution of households in the building and the distribution of each household; The distribution of households is fixed, which need not be considered and can be imported directly.

Among them, the distribution of apartment types includes initial apartment types and partition apartment types, which are all initial apartment types in the initial state of rented houses. After registration, they are updated according to the "renovation" filing of houses and tenant registration; According to the tenant registration, the following methods are used to judge whether to partition the apartment type: according to the contract of renting registration, judge whether it is "shared rent", if it is "sharing", proceed to the next step, if not, give up; Retrieve all contract information of the household in the registration status, judge whether the number of contracts is greater than the number of "rooms" in the original apartment type, if it is greater, judge it as a partition apartment type, if it is less than or equal to, proceed to the next step; Get the actual number of residents, and the maximum number of people allowed to live in the original apartment, if the former is larger than the latter, it is judged that the partition apartment is corrected to the distribution of the partition apartment, and the partition space needs to be marked for use; After the use marking is completed, the distribution of the largest tenants of the apartment type will be marked according to the local standard of per capita living area of the rented house.

This step is also a "bright spot" of this embodiment. Taking the whole building in the community as an example, the existing management system lacks accurate control over the number of people carrying the whole building. Referring to the current rental phenomenon, it is common to cut off the existing apartment types in order to increase the rental income. Therefore, it is necessary to bring this situation into the management system. It is more scientific to count the number of tenants accommodated in the whole building from the perspective of apartment type, and then adjust the range of P value by using the result of this step, so as to fit a reasonable range of P value.

Moreover, the "partition" apartment needs to be included in the registration information, so as to reduce the minimum unit for renting to the room divided in the rental contract, which is more conducive to management.

2) Use the access control system to screen out new tenants and reduced tenants; The access control system can adopt fingerprint access control, face recognition or ID card access control in the prior art. New tenants can be obtained directly; The reduced tenants here should be understood as those who have moved out of the rental house but have not registered and cancelled; If a tenant fails to pass the entrance guard system for a long time (a threshold of one

month can be set) and new tenants are added to the rental house where he lives, the tenant is deemed to be a reduced tenant.

It is worth mentioning here that there is also a situation in practice, that is, there are new tenants in their rental houses. Both old tenants and new tenants use the access control of new tenants to enter and exit, and they will also be recognized as reduced tenants; The reason is that the entrance guard was originally designed to be used during passage. If it is not used for a long time, it is reasonable to directly mark as abnormal or reduced tenants.

Put the reduced tenants into the corresponding model to find out whether there is a matching rental house. If not, mark the tenants and place them in the track tenants. This step is aimed at the tenants who have not registered their addresses, and such tenants can be screened out through the monitoring system. However, this analogy is rare in practical application, and most of them are left over from the old access control system.

If yes, push the tenant to the historical tenant of the rental house, and initialize the vacant rental house at the same time; This makes the tenant unable to use the access control system, but the vacant initialization priority of the rental house is lower than the new occupancy registration. In other words, if there is a new residence registration, the initialization operation will not be performed.

Put the new tenant into the corresponding model to find out if there is a matching rental house; If yes, do not deal with it, if not, mark the tenant, and fuzzy match the tenant with the vacant rental house; The management server sends a reminder message to the landlord or the third-party intermediary platform of the vaguely matched rental house to urge the tenant registration to be completed. The newly added tenants here should be understood as those who have checked in and have access control, but have not registered.

The fuzzy matching method between newly added tenants and vacant rented houses includes the following steps: determining the location area of their rented houses by using an access control system or a monitoring system, obtaining the layout of adjacent rented houses of the rented houses, fitting into a plane figure, constructing an electronic fence at the entrance of the area according to the figure, extracting the center point  $a$  at the exit, Then mark the center points  $b_1, b_2, b_3$  at the entrance of each rented house, and compare the walking track of the newly added tenant with the angles of  $ab_1, ab_2, ab_3$ . The smallest angle is the rented house that the newly added tenant fuzzy matches.

3) By way of example, referring to the existing layout of two ladders and four households, the exit of the elevator is the entrance. Actually, the trajectory of the personnel is fitted into the direction of the walking path, and the rental house where the target is located is determined by judging from the above angle.

4) Using the monitoring system to screen out unfamiliar households, which are those who have neither applied for access control certification nor entered registration information in the management server; Fuzzy matching between the household and the registered tenant; The management server room reminds short messages to the vaguely matched tenants, and urges them to complete the tenant registration.

In reality, the entry of unfamiliar households is often brought by registered households (if the landlord or a third-party agency signed the contract to introduce them, they must have access control), so unfamiliar households give priority to matching registered households.

The fuzzy matching method between unfamiliar residents and registered residents includes the following steps: using the electronic fence set at the entrance of the rental house, the registered residents who have entered the same rental house together with unfamiliar residents for several times are captured, and then the credit card information of unfamiliar residents when they enter the entrance guard is traced back to judge whether they are consistent. If it is consistent, the household is a registered household matched with to; Here, it is the most

efficient step to judge whether strange residents are brought in directly by registered residents, and then to inquire about the access control system, because the situation in practical application is complex, and it is also necessary to consider that strange residents enter alone, such as following others into the access control. In order to reduce the complexity of the algorithm, the above judgment is made first, and the rental house is determined at the same time, even if the registered household cannot be found, the landlord can be contacted directly. In case of inconsistency, there is no matching registered household by default, and the landlord of the rented house can be contacted directly.

## 5. Concluding Remarks

Compared with the prior art, the basic idea of this project comes from that there must be a connection between the number of residents in a certain area and the degree of social activities in the area, and the degree of social activities can be reflected by parameters such as the flow of personnel; To sum up, this project calculates the community activity coefficient in a certain area. To judge whether the number of registered tenants is within a correct range, if not, it is determined that the number of registered tenants in this area is inconsistent with the actual number.

## References

- [1] Research on the spatial distribution characteristics of China's labor force and its influencing factors based on ESDA [J]. Zhu qiaoling, qi rufu. *macro quality research*. 2017 (01).
- [2] Complex network analysis of inter-provincial floating population based on improved gravity model [J]. Chen Rui, Wang Ningning, Zhao Yu, Zhou Yonggen. *Population, Resources and Environment of China*. 2014 (10).
- [3] Study on the Complex Network of Inter-provincial Population Migration in China [J]. Dong Shang, Pu Yingxia, Ma Jinsong, Wang Jiechen, Chen Gang, Wang Yaping. *Southern Population*. 2014 (02).
- [4] Population Migration and Evolution in Yangtze River Delta Based on Social Network Analysis [J]. Wang Jue, Chen Wen, Yuan Feng. *Geographical Research*. 2014 (02).
- [5] Research on Spatial Pattern of Population Migration in Yangtze River Delta Region of China [J]. Wang Guixin, Dong Chun. *Population and Economy*. 2006 (03).
- [6] Study on the Balanced Effect of Population Migration on Regional Economic Differences in China from 1985 to 2000 [J]. Wang De, Zhu Wei, Hui Ye. *Population and Economy*. 2013 (06).
- [7] Influencing factors and spatial distribution of China's floating population [J]. Zhu Chuangeng, Gu Chaolin, Ma Ronghua, Zhen Feng, Zhang Wei. *Journal of Geography*. 2001 (05).
- [8] Economic Development and Population Migration in Agricultural Areas with High Population Density —— A Case Study of Gaozhou City, Guangdong Province [J]. Li Ling, C.Cindy Fan, Jiang Haihong. *Tropical Geography*. 2020 (03).
- [9] Study on Migration Law of Floating Population in Large and Medium-sized Cities in China [J]. Gu Chaolin, Cai Jianming, Zhang Wei, Ma Qingyu, Chen Zhenguang, Li Wangming, Shen Daoqi. *Journal of Geography*. 1999 (03).
- [10] Modeling Network Autocorrelation in Space-Time Migration Flow Data: An Eigenvector Spatial Filtering Approach [J]. Yongwan Chun, Daniel A. Griffith. *Annals of the Association of American Geographers*. 2011 (3).
- [11] Modeling network autocorrelation within migration flows by eigenvector spatial filtering [J]. Yongwan Chun. *Journal of Geographical Systems*. 2018 (4).