The Mobilization Mechanism of Young Volunteers in Major Emergencies Based on Big Data Analysis Technology

Xu Wang

Jilin Engineering Normal University, Changchun 130052, China
13024429@qq.com

Abstract. With the continuous occurrence of major emergencies, emergency work input is increasing, major emergencies are increasingly concerned by the society. When major emergencies come, the government has advantages in controlling resources and organizational system, but there are inevitably some limitations. Based on big data analysis technology, this paper studied the mobilization mechanism of young volunteers in major emergencies, in order to put forward reasonable suggestions for improving the mechanism of volunteer mobilization. Combining vertical system and the system level, this paper put forward the perfect our country major emergency management system of the construction of the digital science and technology policy recommendations, and based on the current domestic COVID-19 cases, combined with large data analysis techniques for outbreaks in parts of the volunteers mobilize data are analyzed, the results show that whether the work rate or promotional rate, were higher than 89%, above the level of the everyday. This requires us to improve the standard and unified digital epidemic information collection system, so as to facilitate personnel control under major emergencies.

Keywords: Clustering analysis algorithm · Big data analysis · Volunteer mobilization · Major emergencies

1 Introduction

Modern society, the major events are often related to health, economic, political, diplomatic and other fields, and cause a series of subsequent effect and chain reaction, and highly developed modern society information and traffic, the correlation between each other to strengthen all over the world, making it a public health emergency rapid enlargement of the diffusion of power and influence, once the improper handling can cause panic and international crisis [1, 2]. How to improve the speed and efficiency of emergency response is an urgent topic for public health workers in China [3, 4].

Zara hero examines the increasing work rights activities of community volunteers in South Africa. In the context of broader policy and legal developments, Zara Trafford tracks the emergence of sporadic mobilisations for decent work, supported by local health campaign organisations, and then the formation of CHW alliances. The South African national union of nursing workers was founded in 2016. Various tensions were observed during field visits prior to the formation of nukvoza and important questions
were raised about representation, legitimacy and the hierarchy of power [5]. Piotr Konieczny discusses negotiation, direct democracy and volunteer mobilization in the Internet age by analyzing the level of voting participation among wikipedia’s volunteer editors. On January 18, 2012, during the “first Internet strike” against the stop online piracy act legislation in the United States, more than 2,000 wikipedia users voted on whether their site should take protest action. However, the number of people who voted was only a small fraction of the total number of wikipedia users [6]. Lorenzo Bosi, from a systematic research perspective, assesses how the outcomes of different types of social movements influence each other over time. This should allow the consequences of social movements to be viewed from a different perspective, shifting the focus from a single outcome to the process of social change resulting from the interaction of different types of influences. Based on experience and using a process tracking approach, Lorenzo Bosi investigates how the UK government’s policy response to the destructive mobilization of the Catholic community in Northern Ireland and the PIRA armed movement affected the PIRA volunteers’ post-campaign lives [7].

On the basis of a large amount of reference materials and semi-structured interviews, this paper combines the big data analysis technology and the expert consultation method to analyze the data of the volunteer mobilization in four different periods: the detection and early warning period of major emergencies, the emergency response period, the mitigation period, the recovery period and the reconstruction period [8, 9]. Based on this, corresponding technical Suggestions are proposed in order to better optimize the data system and more comprehensively reflect the social mobilization of emergencies [10].

2 Proposed Method

2.1 Major Emergencies

Emergencies refer to natural disasters, accidents and disasters, public health events and social security events that occur suddenly, cause or are likely to cause serious social hazards and require emergency measures. According to the emergency degree of public emergency, damage size, range, personnel and property losses, from low to high is divided into general (IV), large (III), major (II) special major (I) phase, and with blue, yellow, orange and red. The grading standards for emergencies shall be formulated by the state council or departments designated by the state council.

2.2 Big Data Analysis Algorithm

Cluster analysis is also called group differentiation. As an unsupervised learning technique, it can dig out hidden data distribution patterns from seemingly random data. Clustering is to group the data without pre-given grouping rules. It can automatically judge the group to which each data should belong according to the characteristics of the data. Its obvious feature is “birds of a feather flock together”, that is, data in the same class will have a high degree of similarity, while data in different classes will have a
low degree of similarity. In specific algorithms, clustering is usually defined to distinguish similar or different.

Any data set can be regarded as a sample of random variable \( o \). In order to determine the degree of difference between \( o \) and the uniform distribution in the data space, Hopkins statistics need to be calculated first. The following steps can be followed:

Take \( N \) points from the space of \( D \), and make sure that each point in the common space is equally likely to be included in the sample. For each point \( P_I (1 < I < n) \), find the nearest neighbor of \( p \) in \( D \), that is:

\[
x_i = \min_{v \in D} \{ dist(p_I, v) \}
\]

(1)

Evenly extract \( n \) points from \( D \) to find the nearest neighbor distance between \( q \):

\[
H = \frac{\sum_{i=1}^{n} y_i}{\sum_{i=1}^{n} x_i + \sum_{i=1}^{n} y_i}
\]

(2)

3 Experiments

3.1 Experimental Background

During the covid-19 outbreak, building a digital public health emergency management system can help slow down the outbreak and provide scientific decision-making. In the information age, data flow presents explosive growth, and digitalization brings challenges and opportunities to public management. In the early stage of covid-19 outbreak, “Internet plus” became a technical breakthrough for China’s medical service system to cope with the epidemic due to the technical features of Internet connectivity. It is urgent to solve the scientific problems such as the accurate expression of information instructions based on data, the high coordination of relevant organizations, the timely response of personnel arrangement, the construction of scientific public health system, the collaborative governance project and the series of information serving the society.

3.2 Experimental Design

The MapReduce programming model provided by Hadoop is only divided into two phases, map and reduce, that is, 1 \( ^{\text{st}} \) job value can contain two steps. Therefore, for an algorithm with multiple iterations like k-means, MapReduce job P01 should be submitted every iteration, that is, the calculation of the distance of data objects and the allocation of categories in each round of the algorithm requires a job. Based on this, we imported the distribution data of volunteers during the phase 1 alert of covid-19 in a certain community, and the analysis results are shown in Table 1.
4 Discussion

4.1 Analysis of the Mobilization Mechanism of Young Volunteers in Major Emergencies Based on Big Data Analysis Technology

As shown in Fig. 1, factor analysis was carried out on the weight scores of the indexes that could be selected, and five main factors could be extracted, namely the five questions in the survey and analysis in Table 1, with a cumulative contribution of 78.468%. There is no overlap between the main indexes of load dominated by each factor, and this factor just dominates 5 indexes, which indicates that the composition structure of the index system is scientific and reasonable. Factor analysis was carried out on the weight scores of the five three-level indicators, and the main factors could be extracted, with a cumulative contribution of 87.442%. According to the factor load structure after the maximum variance rotation shown in the table, there is no overlap between the main indicators of the load dominated by each factor, and the content of 5 indicators are covered, which indicates that all the selected indicators have their independent value.

Table 1. Experimental results

| Analysis of the content                                      | Group A (%) | Group B (%) | Group C (%) | Group D (%) |
|-------------------------------------------------------------|-------------|-------------|-------------|-------------|
| Whether to arrive on time                                   | 46.1        | 23.7        | 62.4        | 56.3        |
| Whether to know the common sense of health                  | 65.2        | 72.6        | 67.3        | 85.4        |
| Daily first aid skills are available                        | 32.1        | 26.3        | 43.2        | 42.1        |
| Have a daily physical examination before you come to check your body temperature | 89.3        | 89.6        | 94.2        | 96.2        |
| Know how to protect yourself                                | 82.4        | 76.6        | 78.3        | 87.2        |

Fig. 1. Analysis of the mobilization situation under the indicators
Based on this, combining with the big data analysis algorithm, through the integration of time and space information, based on the differences of transmission risks in different regions and the characteristics of transmission risks in different stages, the spatio-temporal relative risk pattern and the changing rules of regional epidemics can be accurately evaluated and depicted. According to the personnel structure of the unit, the current epidemic situation and the movement track of the people entering and leaving the unit in the past period of time, the epidemic risk level of the unit was evaluated. According to the risk assessment results, and the CDC should be assisted to carry out epidemiological investigation of cases and follow-up management of close contacts, and the corresponding prevention and control procedures should be initiated to minimize the impact of the cluster outbreak.

As shown in Fig. 2, multiple volunteers are interrelated to form a “multi-wheel vehicle network model”. When major emergencies occur, there may be a number of disaster points, and the distance between the disaster point and the first-level Hub point is relatively far. If this happens, a certain or several second-level Hub points can be dynamically selected as a temporary first-level Hub point to centralize and allocate the resources of each city and each urban area. Different temporary first level Hub points can be selected flexibly for different scenarios.

![Fig. 2. Analysis of volunteer mobilization in multi-wheel vehicle model](image)

Due to the limited volunteer resources in each city, the interaction and sharing of emergency resources between a city and its surrounding cities is very important to ensure the safety of a city, in order to prevent the failure to respond to major security incidents in a timely manner, and the uncertain demand for emergency resources in response to security emergencies. Based on the idea of multi-hub, the inter-city
emergency resources are integrated to form an inter-city emergency resources linkage network, so as to achieve the sharing of emergency resources and improve the utilization rate of resources, so as to deal with major emergencies in various cities in a more timely manner. Based on Multi-Agent system of city emergency resources linkage system, not only suitable for the urban disasters and emergency occurs rescue rescue process, but also applicable to disasters, emergencies before the warning and disaster recovery, the network system will be according to the different types of disasters or emergencies, make the system function of each Agent in the strengthened or weakened.

4.2 Suggestions on the Mobilization Mechanism of Young Volunteers in Major Emergencies Based on Big Data Analysis Technology

(1) Digital screening and spatial locking of epidemic risk sources and affected areas. Based on the basic database of the epidemic, the database of confirmed, suspected and close contact population was constructed and dynamically updated through systematic customization, and the information of the migrant population was checked electronically. Based on the risk source data, spatial scope locking (vehicles and routes, streets, buildings, shopping malls, etc.) can be realized. Through buffer zone analysis and spatial clustering, regional and hierarchical block maps for epidemic risk prevention and control can be developed.

(2) All digital collection sinks into the frontier defense lines of hospitals, airports, stations and ports. Through a variety of channels, the health information of people related to airport terminals, railway stations and highway bayonet should be collected dynamically, and the historical record, prevention and control measures and preplans of potential risk sources imported from outside should be made well. The risk level should be adjusted dynamically according to the time window of the spread of the epidemic, and the population database of potential risks should be updated. We will build a fully digital and accurate information collection system that integrates province, city and county. Data collection systems shall be set for hospitals, stations, shopping malls, public transportation, office buildings and other public Spaces, and joint control measures shall be formulated. The government guides the flow of people, the time period and the scope of the traffic flow through the risk area and the level macroscopically.

(3) To achieve cross-regional, cross-industry data gathering, integration and sharing, important data contents include project data of infectious diseases, basic geographic data, medical data, emergency rescue, transportation facilities, public security and traffic data management data, residential building of actual cases of population data, dynamic data and its complete trajectory information and so on.

(4) Improve standards for collecting digital epidemic data sets and promote data sharing. Joint, epidemic prevention and control of medical treatment, emergency monitoring analysis, virus traceability, expert of the resource allocation, make joint outbreak of digital collection standard data sets, is advantageous for the large data comprehensive analysis and data quality check, data cleaning and information extraction, and then realize social investigation statistics network, network, express
delivery network, high-speed network, video monitoring network, network, Internet, satellite network and other accommodation of multi-source data integration and sharing. We will improve the mechanisms and laws for desensitization and confidentiality of data to achieve data co-construction and sharing.

5 Conclusions

In this paper, the response to major security incidents emergency resources linkage is defined, from two aspects: horizontal and vertical analysis, based on this, advances in combination with the volunteers mobilize mechanism of large data analysis technology, the city “city emergency linkage network resources based on Multi - Agent system” and inter-city “based on Multi - the Hub of the city circle emergency resources linkage network way”; At the same time, it also discusses the basic guarantee to realize the linkage of emergency volunteer resources, and realizes the linkage of volunteer mobilization through good mechanism guarantee, so as to effectively improve the utilization rate of resources and the government’s ability to deal with major emergencies, so as to create a safe and stable urban environment.

Acknowledgments. This work was supported by Jilin Province Educational Science Plan 2020 Youth Development Research Special Project “Research on the Mobilization Mechanism of Young Volunteers in Major Emergencies”.

References

1. Watanabe, S.: A forgotten mobilization: the Tunisian volunteer movement for Palestine in 1948. J. Econ. Soc. Hist. Orient 60(4), 488–523 (2017)
2. Roy, V., Sood, N., Foran, J., et al.: Impact of obesity on hematopoietic progenitor cell mobilization and collection in healthy volunteer donors. Cytotherapy 18(6), S41 (2016)
3. Svetlovich, T., Haplichnik, T., Anatsko, S., et al.: Non-communicable diseases prevention through community mobilization. Int. J. Integr. Care 17(5), 44 (2017)
4. Williams, J.K., Shankle, D., Marini, F., et al.: PD33-03 cell mobilization as a treatment strategy for chronic urinary incontinence. J. Urol. 199(4), e651 (2018)
5. Trafford, Z., Swartz, A., Colvin, C.J.: “Contract to volunteer”: South African community health worker mobilization for better labor protection. New Solutions J. Environ. Occup. Health Policy 27(4), 104829111773952 (2017)
6. Konieczny, P.: Wikipedia in the anti-SOPA protests as a case study of direct, deliberative democracy in cyberspace. Inf. Commun. Soc. 20(1–2), 167–184 (2017)
7. Bosi, L.: Social movements and interrelated effects: the process of social change in the post-movement lives of provisional IRA volunteers. Revista Internacional De Sociologia 74(4), e047 (2016)
8. Labriola, M.C.: Marshall Islands. Contemp. Pac. 29(1), 111–118 (2017)
9. Cernison, M.: A fast adaptation of communication strategies: activists and technology during the Italian referendum campaign on water. Natl. Inst. Econ. Rev. 168(1), 47–69 (2017)
10. Monzel, C., Becker, A.S., Saffrich, R., et al.: Author correction: dynamic cellular phenotyping defines specific mobilization mechanisms of human hematopoietic stem and progenitor cells induced by SDF1α versus synthetic agents. Sci. Rep. 8(1), 6996 (2018)