Research on Intelligent Epidemic Prevention Scheme Based on Visualization Technology

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Abstract: For the novel coronavirus pneumonia, this paper proposes an innovative intelligent epidemic prevention and control plan. This paper presents an Internet of things system that can process big data. It integrates four functions: Student positioning, image-based behavior analysis, trajectory tracking and contact crowd network construction. It is a campus public place behavior trajectory recording hardware system. Based on visualization technology, data mining technology, blockchain technology and cloud computing technology, a student management platform under the background of epidemic situation is established. It has the characteristics of high precision, high speed, multi module and intelligence.

1. Introduction

The sudden epidemic has swept the world, posed a serious threat to the people, and affected the National People's livelihood, economy and other fields. However, normalization means a protracted war, and prevention and control requires new thinking. For some time, many places have introduced "extraordinary measures" such as shortening the departure interval of subway and 24-hour special personnel on duty in the community. With the idea of "special affairs and special handling", they have found a balance between the "tight" of epidemic prevention and control and the "loose" of resumption of work and production, which has made outstanding contributions to the war on "epidemic". However, with the normalization of epidemic prevention and control, "extraordinary measures" will eventually face a "ceiling". We must change old ideas and study new countermeasures as soon as possible.

Under the "normal" measures, the high labor cost, complex information statistics, low location accuracy, slow tracking speed of action trajectory and close contacts, and long time-consuming face recognition seriously restrict the promotion of the normalization process. With the rapid development of intelligent information technology, combined with the renewal and iteration of high-quality product raw materials, the public health guidance scheme has been continuously improved, however, there are few scenarios in which technology is applied to epidemic prevention and control, and the intelligent campus prevention and control scheme needs to be promoted urgently.

Improving the statistical efficiency of health information, positioning accuracy, rapid analysis and acquisition of action trajectory, close contacts, improving identification technology, reducing crowd temperature monitoring time and improving temperature detection accuracy are the only way for

intelligent and normalized epidemic prevention and control scheme. Under the background of epidemic situation, intelligent prevention and control scheme is the cornerstone of ensuring people's health and the accelerator for national resumption of work and production.

2. Smart eye epidemic solution

Intelligent eye and epidemic disease - the student management platform under the epidemic situation is based on campus insight and compound detector, combined with the student information management platform under the epidemic situation, focusing on the positioning and tracking needs, data processing needs, information acquisition needs, real-time detection needs and decision-making processing needs of campus users, using "relative positioning technology of adjacent nodes" and "group behavior analysis" "RFID positioning technology", "infrared non-contact imaging technology" and "visualization technology" aggregate and reorganize the information resources of the Internet and IOT hardware equipment scattered on the campus to form a system with full coverage of students' epidemic prevention affairs, multi-dimensional display of content information and integrated interaction mode, which can identify and measure body temperature when wearing masks In 3 seconds, we can get the action track of students and their indoor close contacts in 14 days, as well as the intelligent epidemic prevention and treatment center for efficient identification and detection of high-flow and high-density people.

In view of the slow speed of traditional statistical methods, the student information management platform under epidemic prevention and control can realize the online clock in and fill out of the whole school. Quickly and efficiently complete the collection of daily health information. Managers can also view the situation of students in real time. The application of cutting-edge "visualization technology" has a friendly and impressive interface, which truly achieves "convenience and quickness" and improves the efficiency of epidemic prevention and control.

If the composite detector detects suspected infected students through temperature measurement, it will immediately report to the student management platform, and counselors and relevant school leaders will be notified at the first time. Students' relevant information, accurate travel trajectory within 14 days and close contact with people can be queried on the management platform.

Meanwhile, the insight system will combine face recognition technology to accurately determine the action route of suspected infected students. Combined with the campus card swiping positioning, further narrow the scope of investigation and improve the implementation efficiency. Through video analysis, complete the accurate action track and close contact statistics of suspected infected students within 14 days.

In addition, we use the HVC algorithm based on blockchain and asymmetric encryption technology to realize multiple functions such as real positioning verification and false data filtering, so as to ensure the data security of the system.

Campus safety is related to the physical and mental health of teachers and students and the happiness of every student's family. It is not only a safety responsibility and educational responsibility, but also a political responsibility and legal responsibility. Adhering to the concept of "no risk, no risk", the insight epidemic prevention team applies the professional knowledge learned by its members, implements the epidemic prevention and control concept from all aspects of the campus, and adopts three prevention and control systems: composite detector, insight system and student behavior information management platform under the epidemic platform. Turn passive prevention and control into active prevention and control, firmly weave the campus epidemic prevention and control network, and contribute to the campus epidemic prevention and control.

3. Campus insight

3.1 Scheme introduction

Campus insight takes the student number as the input, marks and locates the student's place track through tags such as campus card based on RFID technology, determines the student's public place and the video data position to be called, and calls the monitoring video database system of school public places such as classroom, library and canteen, Through face recognition technology to confirm the specific location, so as to realize the calibration of students' indoor specific location.

The high-precision situation recognition system analyzes the student's behavior symptoms such as sneezing and coughing in real time, and obtains the face images of the students he has contacted and recognizes them.

After calculation, record the student's travel path, and calculate the propagation chain and network. Combine behavior to speed up access to close contacts. The system can break the time limitation of data access, break through the difficulty of obtaining personnel information indoors, alleviate the pressure of managers, and help promote the public health management of students after returning to school under the background of epidemic situation.

3.2 Core technology

(1) Campus trip recording system based on RFID technology and Hadoop

This module integrates the consumption records in supermarkets and canteens, access control in libraries and dormitories, class clocking in classrooms and other recorded information through labels such as campus cards. The personnel information statistics of various places are carried out through the face recognition system of the composite detector, and the place travel of each student is recorded. Due to the huge amount of data, we have built a Hadoop cluster, It realizes the retrieval system of image text data, classifies different types of students such as undergraduates, postgraduates and doctors, stores the files with the same label in sequencefile according to their daily process labeling data, and solves the problems of excessive memory occupation of name byte points and low reading efficiency when storing images or complex text files, A mapping model of structured query task to unstructured data is proposed, which greatly improves the query efficiency and expands the query range.

(2) Scene level video analysis algorithm based on LSTM and CNN

The video behavior analysis model is based on computer vision and supervised learning. The scene is analyzed every 10 frames. After CCV database training and sound feature extraction, the temporal causality between audio and visual features is constructed. A deeper framework is proposed for video. The objective function under this framework can learn the amount of interaction between any multiple people in the scene, Lock the position of students in public places through face recognition, and judge their behavior, posture and indoor action.

3.3 Innovation points

(1) Powerful group behavior analysis algorithm

Based on the fringe flow attribute, we try to analyze the crowd motion, which is used to capture the global temporal and spatial changes and local motion of crowd video. The whole crowd movement is extracted, and the similar movement patterns are obtained according to the visual characteristics and multiple social attributes of the crowd. Then the codebook is constructed by clustering all local particle swarm optimization, and the potential Dirichlet distribution model is used to detect the abnormal behavior of the population. A large number of experiments on challenging data sets show

the effectiveness of the method. It can detect a variety of group activities such as gathering, talking, dissolution, walking, chasing and queuing, and has achieved good results in the application of crowd motion segmentation and abnormal behavior detection.

(2) Indoor precise positioning technology based on RFID

This technology has been applied to four national fund projects, supported by multiple positioning sub technologies such as RFID positioning based on multi feature fusion, range free selective multiple positioning of anisotropic wireless sensor networks, and distance based sparse three-dimensional sensor network positioning. It can be used as fingerprint data through CSI channel state information, CSI amplitude distribution and subcarrier amplitude addition, Combined with received signal strength (RRs), energy consumption and hardware deployment are minimized to achieve indoor positioning accuracy less than 0.5m, which helps to make up for the defects of image data dead corners and other data

4. Student management platform under the background of epidemic situation

4.1 Scheme introduction

The student management platform under the epidemic background is based on campus insight and compound detector as the back-end hardware. Focusing on the positioning and tracking needs, data processing needs, information acquisition needs, real-time detection needs and decision-making processing needs of campus users, the information resources scattered on campus network, Internet of things and hardware equipment are aggregated and reorganized to form a full coverage of student epidemic prevention affairs Show the intelligent epidemic prevention and treatment center integrating content information and interaction mode.

Based on the high-precision positioning system, it provides campus, enterprises and hospitals with a five in one innovative solution for campus epidemic prevention and control of "health status statistics + activity trajectory analysis + traceability network construction + abnormal situation monitoring + emergency treatment scheme +", and completes the active epidemic prevention and control mode of full-automatic, all region, all-weather and all target coverage.

4.2 Core technology

(1) Visual analysis method of local correlation based on subspace clustering

Data visualization refers to the presentation of data through specific software tools in charts, maps, tag clouds, animation or any graphical way to make the content easier to understand. Data visualization can not only help the final more intuitive presentation of data, but also play a very key role in mining the hidden information in data. Its essence is to clearly and effectively convey information and communication with the help of graphical means, so as to make the content of data expression easy to understand.

It focuses on two aspects: data representation transformation and user interaction in the visualization technology process.

a. Data representation and Transformation: this part is the basis of data visualization. It is planned to study effective data extraction or simplification methods to maintain the connotation and corresponding context of information and knowledge to the greatest extent. Unified processing of the original fragmented information collection methods. Realizing the access of a variety of devices can more comprehensively grasp the real-time situation in the campus, provide first-hand information for the campus work of relevant managers, and facilitate the system work of each device in the system. The system manager does not have to record the feedback of different equipment at the same time, so as to reduce manpower and improve efficiency.

b. User interaction: realize the interaction between users and data and enhance users' control over data. In the actual campus epidemic prevention work, it is necessary to reasonably set the parameters on various occasions. For the numerical variables that are convenient to measure such as body temperature and can be uploaded to the system in time, the early warning system can be introduced, that is, calculate the daily average fluctuation range. If there is a large fluctuation, the fluctuation can be immediately captured and positioned; At the same time, the abnormal detection of some specific symptoms is defined. Extract the data model from the data visualization results, so that users can not only obtain the front-end feedback, but also add subjective judgment, adjust parameters and modify the data model. It is conducive to flexibly adjust the disposal direction of the system according to the situation.

(2) High dimensional data visualization analysis method and system

The visualization system includes establishing local subspace difference geodesic distance projection on the original high-dimensional data; Establish the mapping of clustering points and clusters; Create a visual analysis view of the series subspace.

The temperature data and location information of students on different dates belong to multi-dimensional data, but due to the strong correlation between the data, it also makes high-dimensional data mining extremely difficult, and some special means must be used to deal with it.

Based on this, a series of interactive visual analysis operations are proposed, which provides a reliable technical basis for visual subspace clustering and analysis, can effectively analyze and explore high-dimensional data such as body temperature, behavior and location information, and significantly reduce user waiting time in high-dimensional data processing, The redundancy of data is reduced, the interactivity of data analysis process is strengthened, and the reliability of operation results is improved.

4.3 Innovation points

1. Lightweight and high performance design

Based on redis cache management mechanism, it supports cache sharing among multiple servers. The interface cache management function is provided. The administrator can view the cache of the platform at any time and process the cache according to the actual situation.

2. High speed and high precision presentation effect

The campus intelligent epidemic platform is designed with a combination of simple style and technology to quickly locate the content you care about. It can be presented efficiently and accurately in one second, with a more beautiful interface, more convenient interaction and stronger terminal adaptability.

3. Good user experience

Seamless cross platform connection, convenient and fast information filling on students' mobile phones, complete background data on Teachers' side, concise and clear display and convenient operation.

4. Efficient backup and security scheme

Efficient backup and security scheme, complete response to server hardware failure, human operation error, editing version history, template file, resource file and other backup.

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