

Epidemic Prevention and Control Student Management System based on Beidou Satellite Navigation System

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Abstract

The novel coronavirus pneumonia virus has the characteristics of strong infectivity, high fatality rate and long incubation time, which has attracted the attention of people all over the country. The school is considered to be the focus and difficulty of epidemic prevention and control due to its dense personnel, strong mobility, and high social sensitivity. In order to reduce the possibility of the spread and spread of the new crown pneumonia epidemic, this paper designs a student management system for epidemic prevention and control based on the Beidou satellite navigation system. This paper first introduces the research background of the epidemic prevention and control student management system, outlines the research purpose and research significance of this paper, then expounds the overall design and specific application of the epidemic student management system, and details the overall operation of the epidemic student management system process. Finally, it focuses on the introduction of each functional module of the system and the detailed implementation strategy of the key technologies used and the software design of the epidemic student management system design.

Keywords

Beidou Satellite Navigation; Intelligent IC Student Card; Internet of Things Student Management System.

1. Introduction

The outbreak of COVID-19 in early 2020 has had a huge impact on the safety of people's lives across the country, as well as on the economic development and political system of the modern world [1]. The COVID-19 epidemic has attracted the attention of people all over the country due to its wide infection range, rapid spread, and difficulty in prevention and control. As of May 19, 2022, a total of 1,625,018 cases have been confirmed in my country, and the cumulative death toll has reached 15,818.

Although my country has achieved great success in preventing and controlling the epidemic, the risk of a rebound in the epidemic cannot be ignored. Based on the Beidou satellite navigation system, this paper takes the intelligent IC student card as the core, and combines the Internet of Things, facial recognition, mobile communication, radio frequency identification and other technologies to propose an epidemic management system design for college students. management during school.

2. The Overall Design of the Epidemic Student Management System

2.1. Overview

In order to win the battle of epidemic prevention and control and protect the life, health and safety of students, this paper designs a student management system for epidemic prevention and control based on the Beidou satellite navigation system based on the Beidou satellite navigation system. The epidemic student management system uses the smart IC student card

as the handheld terminal device, and the STM32 single-chip processor module, Beidou positioning, communication module, and power supply module as the auxiliary modules to realize the positioning analysis, comparison and judgment of students going out. So as to achieve the auxiliary work of safety and epidemic prevention [2].

It is embodied in two aspects. On the one hand, it is on-campus student management. When students are on campus, the system collects students' health information. By using the dormitory gate system, it can timely detect whether the temperature of students in school appears. The function of abnormality and preventing non-university personnel from entering the dormitory. If the student's body temperature is found to be abnormal, the main processor will quickly notify the school and its relevant departments, which will play a role in timely preventive treatment, thereby reducing the risk of cross-infection of the new coronary pneumonia virus among college students. probability, and basic preparations have been made to prevent the spread of the new crown epidemic.

On the other hand, it is the management of students going out. When students need to go out, the smart IC student card is combined with the school gate gate system, and the Beidou positioning module in the smart IC student card is used to complete the collection and upload of the track information of personnel when students travel outside the school. The database, through data processing and comparison, calculates whether students have the possibility of contacting cases when they go out, assists in improving the safety of students when they go out, and enhances the management of students going out. This provides strong technical support for ensuring the health and safety of students and preventing and controlling the new crown pneumonia epidemic.

Among them, the introduction of Beidou satellite navigation technology can effectively collect the activity trajectories of college students, make basic preparations for preventing the spread of the new crown pneumonia epidemic, and achieve "wisdom" in the control and management of college students.

2.2. The Concept of IoT

The Internet of Things refers to the comprehensive interconnection of objects through sensing devices and communication means, including the interconnection between objects and the interconnection between people and objects [3].

With the wide application of Internet of Things technology in the field of health care, this research aims to design a gate system that can use smart IC student cards for thermal imaging systems to detect students with abnormal body temperature in the thermal images, thereby effectively blocking the The spread of the new crown pneumonia epidemic has guaranteed the life, health and safety of students at school. Combine thermal imager technology with the dormitory gate system, and use the Internet of Things technology to monitor the screening process and obtain real-time data.

2.3. Student Dormitory Turnstile System

The dormitory gate system of student dormitory is mainly based on the combination of radio frequency identification, face recognition and other technologies. This article uses radio frequency identification technology and face recognition technology to achieve the purpose of student management in the epidemic environment. When students are in the school, the face recognition technology of the gate system can detect the body temperature of the students in school, which plays a role in helping the students in school. The collection of student health information, while preventing non-university personnel from entering the school dormitory; when students need to go out, the gate system combines radio frequency identification technology and face recognition technology to ensure that students carry smart student IC cards when they go out, so as to ensure that students go out. Collection of route information.

With the wide application of radio frequency identification technology in student management, this paper designs a student dormitory gate system based on radio frequency technology. When students pass through the gate system, the series resonance circuit in the smart student IC card is Under the excitation of the electromagnetic field, the series resonant circuit will resonate, so that there is charge in the capacitor, resulting in a one-way conduction electronic pump, so that the gate system of the student dormitory opens the valve and allows students to pass.

The gate system is equipped with two cameras that collect detailed information on face detection and temperature measurement. Using an optical camera and an infrared thermal imaging camera, provide information about the temperature at which different foci of interest were found. A thermal imaging camera is a device that uses infrared light to produce images, similar to conventional cameras that use visible light to produce images. The module segments the image based on the recorded temperature and captures color images by thermal and optical cameras. The thermal imager is used to detect and identify the high-temperature objects in the scanned area. First, the infrared image obtained by the camera is converted into an electrical signal, and the ratio of the signal strength to the radiation capacity is used to achieve the conversion of the electrical signal to the optical signal, and finally displayed on the screen. If a thermal imager can see a hot object, it can create a high-intensity infrared spectrum, which is then recorded. Face recognition uses an optical camera, uses a convolutional neural network, and extracts feature points through pooling, and records them in the database. When students pass by, the optical camera extracts face feature points to match people in the database, so as to recognize the face. Effect.



Figure 1. Face recognition and body temperature detection in the student dormitory gate system [4]

2.4. Hardware Circuit Design

2.4.1. Processor Module

The processor module of this system mainly uses STM32 microcontroller as the core hardware combined with the database to store big data and process data. The STM32 single-chip microcomputer has the characteristics of multi-function, fast data processing, and easy to use, which can play a crucial role in data processing. When students are returning to school, they can communicate with the gate system through the serial port of the smart IC student card. The gate system uploads the user's movement data to the database, calculates and analyzes the user's outing trajectory and the travel trajectory before the case is diagnosed, and compares the two to determine whether there is a possibility of contact with the case, and completes the user's outing. Auxiliary work for safety and epidemic prevention.

2.4.2. Beidou Wireless Communication and Positioning Module

This design uses the SR2828M3 Beidou positioning module, which is based on the MT3333 chip as the core. The chip has built-in Flash, the current is about 25mA during normal operation, and has a built-in LNA signal amplifier to amplify the positioning signal. It is a positioning module

that integrates small size, easy embedding, low power consumption, and high precision. The module also has the characteristics of external signal transmission and serial communication, and can be connected to STM32 single-chip microcomputer to transmit positioning information to send to the database. For the student card we designed with the positioning function, the positioning chip can be embedded in the student card and carry out serial data transmission with the single-chip microcomputer chip in the student card.

At the same time, SR2828M3 can also be used as a communication module, which has the characteristics of good stability, low energy consumption, and high sensitivity. The module follows the NMEA-0183 protocol and uses a 3.3V or 5V power supply for power supply, and the data transmission rate is 9600 bit/s. The module is connected with the STM32 single-chip processor for serial communication to improve the safety of users when they go out. In addition, its tracking sensitivity greatly expands the coverage of top positioning, which can meet the positioning needs of the system and provide strong technical support for epidemic prevention and control.

2.4.3. Power Supply Module

The power supply module of this system consists of 3 parts, the details are as follows:

①Auxiliary power supply

The auxiliary power supply required by this system is 5V DC, because the input is 220V AC life electricity. Therefore, it is necessary to convert it into 12V DC first through a transformer, then rectify and filter it through a bridge rectifier circuit and a capacitor filter circuit, and finally use an LM317 voltage regulator chip to obtain 5V DC.

②Transmitting circuit

The transmitting circuit is mainly amplified by the power amplifier circuit. After the oscillation circuit, the system uses NE555 to form a multivibrator to form an oscillation circuit to output a PWM square wave. The IR2181 switch is driven by MOS control, and finally energy is emitted through LC resonance.

③Receiver circuit

Considering the small size of the student card, it is not suitable to use a coil with a magnetic core, and the multi-layer hollow coil needs to be made flat, wide, and integrated into the student card, which limits the size of the coil. Therefore, this paper combines the smart IC student card with the multi-layer hollow coil to form a power take-off device, but the module generates electricity through the change of magnetic flux, so the area of the multi-layer hollow coil needs to be expanded. Therefore, the smart IC student card in this paper uses a patch-type coupling coil chip-type coupling coil made by a special process to obtain electricity. While ensuring the coil area as much as possible, it reduces the thickness of the coil, so that the coupling coil can be Embedded in the student card, saving the volume of the student card.

2.5. Practical Application of Epidemic Student Management System based on Beidou Satellite Navigation System

The novel coronavirus pneumonia virus has a long incubation period, so it is difficult to prevent and control, and abnormal body temperature is one of the main characteristics of infection with the novel coronavirus pneumonia virus.

COVID-19 virus has two modes of transmission: spontaneous infection and cross-infection. When students are in school, students may be infected with COVID-19 virus spontaneously. Aiming at the situation of spontaneous infection of COVID-19 virus, this paper designs a gate system to pass the gate. The facial recognition technology and infrared thermal imaging technology of the computer system are used to collect the health information of the students in school, and to detect whether the temperature of the students is abnormal in time, thereby reducing the spread and spread of the new coronary pneumonia virus.

When students go out, it will increase the probability of cross-infection, so it is necessary to collect the information of the moving route of the students who go out. In view of the above situation, this paper solves the above problems by using the Beidou positioning module in the smart student IC card. Therefore, When students need to go out, the system adopts the combination of radio frequency identification technology and gate system to avoid students forgetting to carry the smart student IC card when they go out, resulting in the inability to collect the movement track of the outgoing students. When a student goes out with the smart student card, the Beidou positioning module in the smart student IC card will automatically collect the moving track information of the outgoing person. When the outgoing student returns to school, the student uploads his outgoing travel information through the gate system of the school gate.

At the same time, by evaluating the working state of the smart student card, this paper can enter the sleep state in an environment that does not require work and reduce the energy consumption of the system. The smart student IC card in this paper mainly has two operating modes: normal work mode and sleep mode.

The normal working mode means that the processor module in the smart student card and the external equipment are in normal working state. When the student needs to go out, the smart student IC card can collect the moving track information of the outgoing students and realize the wireless communication function. The card makes all modules enter the working state, and the smart student IC card enters the normal working module at this time.

Sleep mode means that when the carrier enters the safe area of the school, the positioning and wireless communication functions are no longer required. At this time, the student card enters a state of no task for a long time. In order to save energy, the student card switches to sleep mode.

2.6. System Software Design

This part is composed of database system and VisualBasic6.0 software. The database system provides student information and is used to save student travel data, while Visual Basic6.0 is used as an auxiliary interface.

The database design uses the Think DB database system, which is mainly oriented to the database requirements of applications such as the Internet of Things, wide-area monitoring and monitoring and other application systems. The reason for using this database system is that the system inherits the traditional database. Innovation. The real-time-relational data model is applied, which combines the advantages of real-time data acquisition and can process data online. Therefore, the Think DB database system can not only save the student information, the trajectory data of the students going out, and the body temperature of the students when they enter the campus, but also can modify the student data online, which is very in line with the requirements of the design.

With the data storage system, it is natural to pair the data acquisition system and the auxiliary interface. Visual Basic6.0 software is to meet these two advantages. As for students going out during the epidemic, the school mainly collects the route trajectories and body temperature of the students going out, so the software combines the functions of displaying the distribution of the epidemic, querying and saving the trajectory, and determining the current location.

The core of the software is track query and storage. This function mainly relies on the Beidou positioning chip and STM32 chip embedded in the student card. The Beidou positioning chip can capture and track satellite signals, and can locate the specific location of the students going out in real time and transmit serial data with STM32. The STM32 chip transmits the data to the handheld terminal in real time and is the software Visual Basic6. Save the received data to the Think DB database for saving, so that you can get the trajectory of the students when they go out, and you can call up and view the data anytime, anywhere. The distribution of the epidemic

situation can be entered into the database through different channels: for example, it can be obtained directly through market research, or entered through secondary data extraction. The distribution of the epidemic can help students who go out to avoid passing through this area.

When using the design system, click on the travel track to call out the processed student's track, the starting point, the route and the ending point from the database. School administrators can check and compare the trajectories of students going out, and they can directly determine whether the student passes through a high-risk area, and then follow-up processing.

3. Epilogue

This paper takes the multi-functional intelligent IC student card as the core, and based on the Beidou satellite navigation system technology, combined with radio frequency identification, Internet of Things, wireless communication and other technologies to complete the management of college students during the epidemic. Among them, in terms of system hardware, the main processor of STM32 single-chip microcomputer is used as the core to determine the travel trajectories of students when they go out. Whether there is a possibility of contact, and complete the epidemic prevention assistance during the epidemic. When on campus, the multi-functional smart IC student card is combined with the dormitory gate system to complete the temperature detection of the students on campus.

The design plan adapts to the epidemic prevention situation during the new crown pneumonia epidemic, reduces the probability of college students being infected with the new crown pneumonia virus, and makes basic preparations for preventing the spread and spread of the new crown epidemic. It can be practiced in the application of new crown virus epidemic prevention.

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