

Educational Intervention System for Learning Disabilities of Rural Left-Behind Children Driven by Cognitive Intelligence



Kong Yiquan^{1, 2, *}, Wang Jiexuan²

¹Guangdong Coastal Economic Belt Development Research Center, Lingnan Normal University, Zhanjiang 524048, China

²Mangrove Institute, Lingnan Normal University, Zhanjiang 524048, China

Abstract: Given the phenomenon those left-behind children are prone to learning disabilities and psychological problems because their parents work outside for a long time. This paper puts forward a design scheme for an educational intervention system for left-behind children with learning disabilities. The plan is to collect and analyze the data on left-behind children's learning status. According to the results of data analysis, it can predict the learning behavior, knowledge, and emotion of left-behind children. Early warning indicators and implementation rules of intervention strategies are designed in advance for the system. When the diagnosis result of left-behind children exceeds the warning index, corresponding intervention measures should be taken to solve the learning disabilities of left-behind children. Through the study of the educational intervention system for left-behind children with learning disabilities, the data on left-behind children's learning situation are collected, analyzed, and designed, and a new educational intervention system of intelligent and interactive learning is constructed.

Keywords: Left-Behind Children; Learning Disabilities; Intervention System; Academic Warning

DOI: [10.57237/j.cst.2023.02.001](https://doi.org/10.57237/j.cst.2023.02.001)

1 Introduction

With the rapid economic development, there is a large gap between urban and rural economic development in China, resulting in a lot of labor flow from less developed areas to developed areas. Now, due to the points of enrollment, the household registration system, and other reasons, they cannot take their children with them, resulting in an increasing number of left-behind children. Rural left-behind children with Learning Disabilities are one of the challenging research problems in today's compulsory education [1]. Learning Disabilities are a hidden disorder, which refers to a group of heterogeneous disorders that have difficulties in obtaining and using listening, speaking, reading, writing, reasoning, and mathematical operation abilities. Due to historical and practical reasons, the

educational intervention of rural left-behind children with learning disabilities has always been relatively weak in the compulsory education system, and a variety of problems and contradictions are prominent, which is not conducive to the construction of a fair and harmonious society in China [2]. And left-behind children's lack of parental care and education are easy to produce all kinds of learning disabilities, rural left-behind children learning disabilities can solve problems directly affect the future of Chinese education, therefore, for good education for left-behind children, we need to correctly understand and analyze the problems of left-behind children, find out why and to establish perfect the education of left-behind children learning disabilities intervention system [3]. Through the

*Corresponding author: Kong Yiquan, 20693458@qq.com

education intervention system for left-behind children with learning disabilities, the study status of left-behind children was analyzed and predicted, which provided effective solutions for left-behind children with learning disabilities.

2 System Overall Framework Design

Left-behind children learning disabilities education intervention system mainly through the analysis and prediction of left-behind children learning conditions, and the condition of left-behind children learning data, analyze data, according to the analysis results of the prediction of left-behind children learning behavior, knowledge, and emotion, and adopt corresponding intervention measures, to solve the learning problems of left-behind children [4]. Left-behind children learning disabilities education intervention system hardware part consists of a digital pen, camera, and intelligent hand ring, left-behind children when using a digital pen, can use a digital pen to record the classroom teaching situation and realize positioning function, using the camera's audio work record students' classroom behavior, students can also be via a smart hand ring is used to record and observation condition [5].

Will be collected handwriting trajectories and audio data sent via Bluetooth module to the raspberry pie, and students wear smart wristwatch temperature and heart rate data is sent via PT2262/2272 wireless transceiver module to raspberries pie, raspberry sent by the MQTT protocol, upload the data to Ali the cloud, in Ali cloud development good business logic: The implementation rules of early warning indicators and intervention strategies are designed [6]. When the academic early warning indicators

are exceeded, the system can judge the key characteristics of learners according to their early warning conditions, screen out the intervention strategies with higher matching characteristics of learners, and push them to learners, to realize automatic intervention function.

The design structure of the educational service platform control system consists of a system model, system view, and system controller [7]. Among them, the system model is the core of the platform application, the system view is used to display the relevant data of the service platform, and the system controller is responsible for the information input and processing of the service platform. The layers of the system model, system view, and system controller cooperate to realize the visualization of the multidimensional network data set of the education service platform and the coordinated operation of various applications of the platform [8].

3 Hardware System Architecture Design

3.1 Image Acquisition System Design

The image acquisition system consists of multiple cameras, an image acquisition card, a streaming video server, and a streaming media client [9]. The camera in the classroom records students' classroom learning, and the system transmits video images in real-time through the streaming transmission technology in the network, and this digital video information acquired by the streaming media video server will compress itself, and finally send real-time data to the client. The hardware structure of the video image acquisition system is shown in Figure 1.

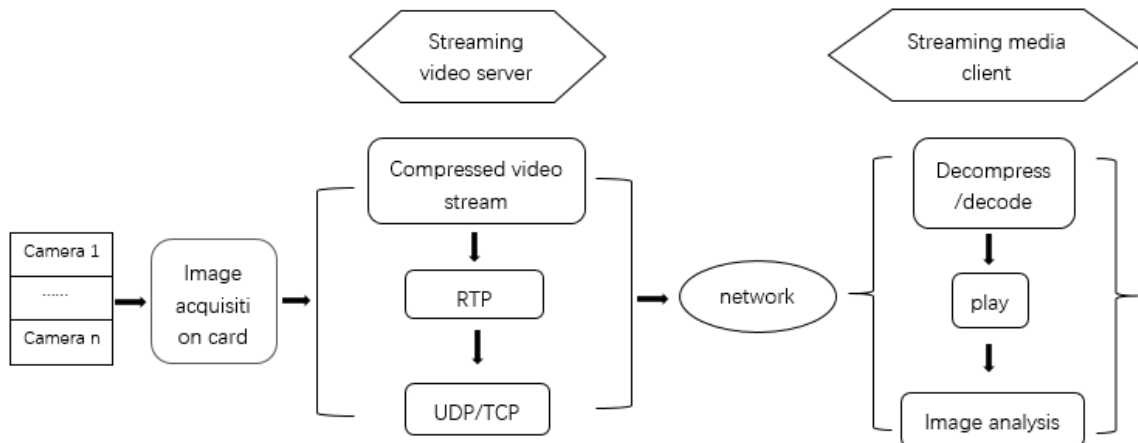


Figure 1 Hardware structure diagram of video image acquisition system

3.2 Learning Perceptual Data Acquisition Module

This system uses pulse sensor as the pulse of the heart rate sensor, photoelectric displacement method is used to test the heart rate, use the light source and a photoelectric converter to implement the function of pulses with blood volume change which change the light transmittance of the light source, and then reflected light photoelectric converter receives the human body, and the intensity of the light it receives into electrical signal output. The temperature sensor is MTS01, based on the characteristic relationship between CMOS semiconductor PN section temperature and band gap voltage, after a series of signal processing circuits, the

highest temperature measurement accuracy can be $\pm 0.1^{\circ}\text{C}$, MTS01 can be installed in the hand ring, close to the wrist skin. When the temperature sensor of the bracelet touches the inner side of the wrist of the human body, the temperature measurement is more accurate. This system also adds the heart rate sensor into the hand ring to work together with the temperature sensor, which is suitable for the bracelet. Wireless MCU CC2430 chip integrated the functions of the enhanced 8051 MCU and the RF communication front-end with Zigbee, according to the size of the internal storage space difference, divided into 32/64/128KB programmable flash memory; Using 0.18UMCOMS standard technology with embedded flash memory, the system wireless single-chip circuit design is shown in Figure 2.

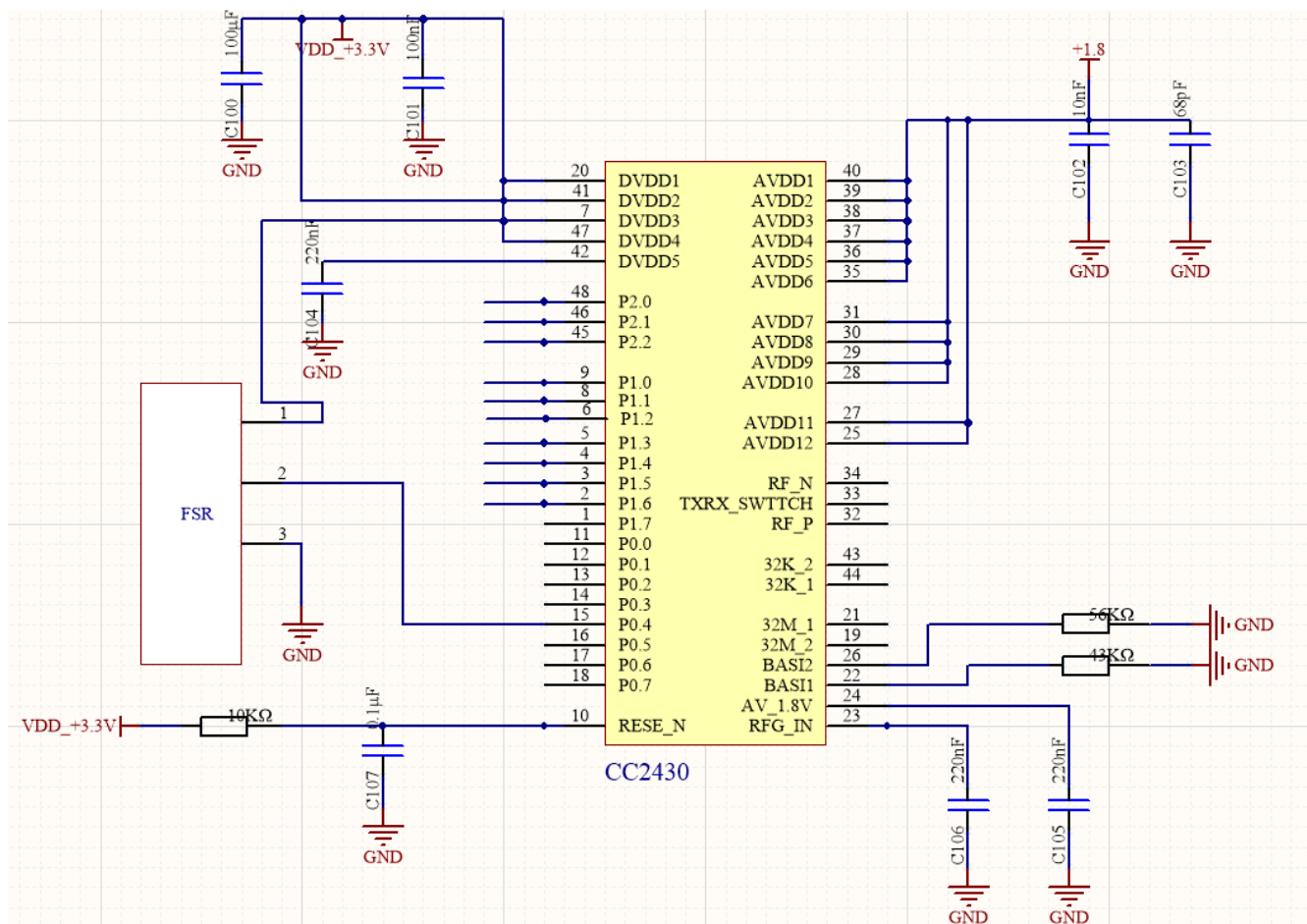


Figure 2 Circuit design of wireless single-chip microcomputer

4 Software System Design

As the design and application part of the framework,

the prototype development of an educational intervention for rural left-behind children with learning disabilities mainly solves the problem of "how to achieve it technologically". Different technologies are compared, the architecture, technical architecture, and coding

implementation of the prototype system are discussed, and the prototype is tested and evaluated [10]. Construct a

new education system, realize interactive and intelligent learning, and realize intelligent education.



Figure 3 Functional frameworks of main modules of the software system

(1) The framework construction is used to show the architecture principles of all levels, mainly including the presentation layer (UI), domain layer (BLL), and data access layer (DAL). Among them, the presentation layer is to realize

the user interface function, that is, what the user sees when using the software, and convey feedback on the user's needs to the domain layer. The domain layer is to identify the information returned by the user, which is the access

operation to the data layer. The data access layer is to add, delete, check and change the data and feedback on the operation results to the domain layer. The users of the knowledge ontology middleware system are divided into two categories: ordinary users and knowledge engineers [11]. Ordinary users do not interact directly with the ontology middleware but access the system functions by calling the API of the ontology middleware system through the application program. Knowledge engineers use an ontology editor to edit the ontology and store the results in the ontology library through ontology middleware API. The ontology middleware interface is responsible for handling service requests from users and knowledge engineers [12]. The ontology middleware interface completes the related inference task by invoking the services provided by the inference module. The ocean knowledge ontology middleware Reasoning machine is implemented by describing the logic system in detail through OWL ontology.

- (2) Based on the framework design of the education intervention system software for left-behind children with learning disabilities, design and implement the main functional modules of the software, upload the hardware modules to the Ali cloud database for data collection and analysis, and input other qualitative measurement data into the Ali cloud database through the software. According to big data analysis technology and logic, the combination of existing academic warning system for collecting the students' learning process data, admission status information, assessment of academic performance, and data, transform and denouncing presentment, and establish information database of all kinds of groups, respectively, using the technology of data analysis for analysis of presentment, and individualized diagnosis and comprehensive assessment, The final diagnosis results are presented in the software [13]. The diagnosis results were compared with the early warning index. When the value of the early warning index was exceeded, the intervention plan would be adopted for the student. After the intervention,

the system will dynamically track the student, record the state change before and after the intervention, and comprehensively judge the intervention effect of the system on students. If the effect is not good, the intervention strategy will be adjusted to implement the intervention again until the student's learning status tends to be normal. The functional framework of the main modules of the software system is shown in Figure 3.

5 System Application

Step 1: real-time left-behind children learning situation and condition to through the lattice digital pen and camera collecting handwriting trajectory and the study situation, and sent via Bluetooth module to the raspberry pie, through students wear smart wristwatch temperature and heart rate data is sent via PT2262/2272 wireless transceiver module to the raspberry pie. In the application of learning curriculum design, the system shows the game learning dialogue to learners, introduces the game learning plot and game learning challenges, and understands and grasps the learning attitude of learners. At the end of each learning game conversation, the learners were able to feedback on their emotions and feelings through self-reports. According to the feedback of learners, the application strategy of learning course design was improved, and multiple rounds of iterative optimization design were carried out. Under the new strategy, learners can continue to interact with game learning challenges and provide improved feedback. Marine science popularization education continuously improves and eliminates the defects through multiple rounds of iterative feedback, and forms an effective learning curriculum design and application strategy. Learning curriculum design also considers other acceptable conditioning factors, such as curriculum development and technical support factors, using educational game applications to measure learners' behavior and emotions, assess learners' learning, and support learners' gamified learning to achieve learning curriculum objectives [14].

Step 2: Upload the learning and physical condition data of left-behind children: Raspberry PI uploads the data to Ali cloud through MQTT protocol, develops the business logic in Ali cloud, and designs the implementation rules of early warning indicators and intervention strategies.

The intellectuals are more and more interested in the practical function of knowledge. Their idea is to obtain new knowledge based on the reasoning of knowledge. Reasoning is often considered an expanding cognitive resource because it allows new knowledge to be extended or added to existing knowledge. For example, the structure of the course content in knowledge engineering is divided into several "knowledge points", and some "knowledge points" have "sub-knowledge points", "secondary knowledge points", or involve related "knowledge points". According to the record of the learner's learning situation in the learner's ontology, the learner's learning content can be inferred, the learner can be helped to connect the past and present learning experience, and the learner can be guided to think about the expected outcome of the current game learning activities. In the "engagement" phase of the learning cycle, the platform supports the learner with activities, questions, or challenges, stimulates the learner's curiosity, motivates the learner to think deeply, and promotes persistence.

Step 3: automatic education intervention function: in Ali cloud design early warning indicators and intervention strategies for the implementation of the rules, when beyond the academic warning index system according to the collected data to judge the learner's physical condition and the learning situation, automatic matching accord with learners' intervention strategy, and its push to learners, realize automatic intervention function. Learning online using data analysis mainly includes the learner analysis, analysis, application scenario analysis, retained, transformation, sharing knowledge dissemination analysis based function modules, such as data analysis to understand the status of the platform for the overall operation, analysis of education platform source of learners, learners' composition, growth trends, learners retained and transformation, the teaching resource usage habits, etc. The learning behavior analysis methods such as data statistics, correlation analysis, social network analysis, visualization analysis, clustering, and outlier analysis are used to analyze the learning situation of the Marine education service platform [15].

System of learners' personality chemical feeling diagnosis report technical route through the analysis of knowledge for learners to take, precipitation learning data and indicators, using wavelet analysis, decision tree and clustering calculation methods in science and technology, building "digital label" libraries, online learning behavior analysis library and learning ability evaluation library, etc.,

to identify the behavioral characteristics of online learning and clustering. The existing problems were diagnosed and the development trend of learning behavior was predicted by slice method. The teaching intervention measures and the balance of teaching resources were provided to promote the scientific teaching management of the service platform. The learner personality chemistry diagnostic report provides the results of the learning process and data. The education service platform visualizes the learner's personality chemical situation diagnosis report cases. The report cases provide wrong questions, examination evaluation reports, development trends, and various analysis reports. Cases reported the characteristics of the learners using bar charts, pie charts, and radar maps and a list of grades show rich visual report, from the horizontal and vertical, static and dynamic aspects of the platform of online education teaching quality, the learner's scientific and detailed statistical analysis, the study status of history feeling contrast, Implementation of learning quality timely and effective monitoring, diagnosis and feedback, convert data into valuable information, forming a digital analysis and summary at the same time, this system also need artificial participation, teachers, parents, and students can be based on the system analysis results give students learning encouragement, psychological counseling, adjust the students' learning path and mental state, Make data collection, analysis and intervention more scientific and reasonable.

6 Conclusion

This paper mainly analyzes the key factors of the implementation of an educational intervention system for learning disabilities for left-behind children and puts forward the strategies to promote the effective learning of students in school. Through the study of the educational intervention system for left-behind children with learning disabilities, the data on left-behind children's learning situation are collected, analyzed, and designed, and a new educational intervention system of intelligent and interactive learning is constructed. The implementation of the education system provides conditions for teachers to teach and manage scientifically. At the same time, it also provides an effective way for parents to know their children's school situation in real time and strengthens parent-child communication. To improve the effectiveness of an educational intervention, we determined the problems of an educational intervention for rural

left-behind children with learning disabilities, analyzed the facts, generated and organized ideas, and explored ways to solve the problems. In the process of determining, defining, exploring, evaluating, applying, and integrating educational intervention problems, educational intervention strategies are formed and optimized in the cycle.

Based on the education big data technology, by combining the system hardware and cloud computing technology, the learning disability intervention system is designed to solve the problem of information collection and intervention strategies based on the analysis results of the learning situation of left-behind children. The system includes data collection, information base, data analysis, visual feedback, early warning and intervention, intervention effect evaluation, and other functions, and the subsystems are interconnected with each other and can carry out real-time data transmission. The use of data mining technology is helpful to mine and analyze the needed useful data, and then the data visualization analysis feedback to parents and teachers can solve the previous problems of manual data analysis, help teachers to communicate with parents and students in their teaching work, and students can overcome learning barriers according to intervention strategies. The design, development, and application of the learning disability intervention system are based on these purposes, which have application significance.

Acknowledgements

This research is supported by Guangdong Coastal Economic Belt Development Research Center, Lingnan Normal University, Guangdong Philosophy and Social Sciences "13th Five-Year Plan" 2020 discipline co-construction project "An intervention study on the educational intervention of learning disabilities in rural left-behind children driven by cognitive intelligence" (Number: GD20XJY06), Lingnan Normal University created a national teacher education innovation experimental zone project "Research on the Optimization of Rural (Island) Education supported by Intelligent Technology: A case study of education intervention for left-behind children with learning disabilities", the Open Project of Mangrove Research Institute, Lingnan Normal University (Leizhou Peninsula Mangrove Science Popularization Service Platform Construction and Marine Awareness Education Practice No: YBXM02).

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