Scholar Publishing Group
International Journal of Educational Innovation and Science
https://doi.org/10.38007/IJEIS.2020.010302
ISSN 2789-7184 Vol. 1, Issue 3: 8-26

Network Communication Based on Embedded Microprocessor Accelerates the Development of Preschool Education

Huiyu Jiang[1, 2*]

[1]*Developed in Harbin Preschool Teachers College Experimental Kindergarten, Harbin, China*
[2]*Major in Preschool Education, Normal University, Heilongjiang, China*

302678180@qq.com
[*]*corresponding author*

Keywords: Network Communication Technology, Embedded Structure, Embedded Microprocessor, Preschool Education

Abstract: Preschool education is the foundation of education, and it is the key for students to quickly enter the learning state before school. How to carry out preschool education for preschool children at a high speed and effectively is the issue that this article will discuss. The main purpose of this article is to accelerate the development of preschool education based on the network communication of embedded microprocessor. This paper proposes a multi-core computing method for embedded microprocessors. By combining the multi-core computing of embedded processors and the basis of the EPA protocol, the template of the embedded microprocessor network communication model can be constructed. Combined with OPC technology, the network communication capabilities of embedded microprocessors can be greatly improved. Experiments have proved that the network communication efficiency of the new embedded microprocessor can reach an increase of 5%-14%, and it is analyzed by collecting information on the use of equipment and receiving new education methods by students in preschool education. A new kind of preschool education method designed in this paper can improve students' thinking ability by 32%, improve students' hands-on ability by 34%, and improve students' EQ by up to 47%. This shows that the new type of pre-school education based on embedded microprocessor network communication in this article is very effective in helping students' pre-school education.

1. Introduction

The home is the weapon of the country, and the child is the hope of the country. As the

Copyright: © 2020 by the authors. This is an Open Access article distributed under the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (https://creativecommons.org/licenses/by/4.0/).

beginning of education and the foundation of national education, preschool education is not only related to the formation of a person's character, but also related to the future of the country and the nation. It is an important cornerstone of national progress and social harmony. With the release of "Chinese students' development of core competitiveness", how to cultivate talents that can adapt to lifelong development and social needs has become a hot topic in the education circle, higher education is also constantly innovating educational methods. With the development of micro-level mobile learning, network information technology continues to penetrate, education and education methods are also changing.

The network communication platform based on embedded microprocessor can more effectively promote the implementation of preschool education classrooms. The design of preschool education teaching activities must absorb the advantages of traditional teaching in order to achieve better results; a multi-evaluation system is conducive to improving students' attention to the learning process; preschool education is conducive to improving students' learning ability, network information acquisition, organization and application ability. Preschool education does not significantly improve students’ network information awareness and network information ethics; the implementation of pre-school education puts forward higher requirements for both teachers and students.

In order to study the reliability of embedded microprocessors, Filipe studied the influence of register file errors on the reliability of modern embedded microprocessors through fault injection and heavy ion experiments. In addition, Filipe evaluated how different levels of compiler optimization modify the use of processor register files and the probability of failure [1]. He is studying the influencing factors of embedded microprocessors. This article mainly studies the influence of embedded microprocessor network communication on preschool education. In order to study how to improve the performance of radiation-resistant embedded microprocessors, Clark LT proposed an embedded microprocessor designed for radiation-resistant. The design uses a variety of methods to minimize the performance degradation due to enhancements, while limiting the power increase [2]. Clark LT's research can improve the performance of embedded microprocessors, but it is of little value for reference in this article. Artificial intelligence is the trending technology in 2018, but only part of it is real. Despite the marketing hype, Halfhill TR's research is on the integration of neural networks and machine learning in embedded processors and FPGAs [3]. He focuses on the research on the integration of neural networks and machine learning in embedded processors and FPGAs, and has little relevance to the research on embedded microprocessor network communication in this article. The goal of the Internet of Things (IoT) is to create an integrated ecosystem for devices to communicate over the Internet. Bello O explores the challenges related to the integration and interoperability of these D2D technologies by focusing on network layer functions such as addressing, routing, mobility, security, and resource optimization [4]. Bello O studies the application of the Internet of Things in the communication network, and this article focuses on embedded microprocessors. The design of an effective and reliable communication network that supports smart grid applications requires the selection of appropriate communication technologies and protocols. The purpose of Bian is to study and quantify the capabilities of smart grids [5]. His research is based on the communication network of the smart grid, but this article is mainly based on the communication network of the embedded microprocessor, the author can refer to the application in the communication network, but it is of little value. In order to study the ability of preschool education and elementary school mathematics skills, Lehrl S investigated the long-term relationship between the quality of preschool education and the development of elementary school mathematics skills, while considering the family and the early and subsequent learning environment of elementary school [6]. Its research in preschool education can be referred to. Although its research is about preschool education and elementary school mathematics, it still has certain reference value. The purpose of Oguz K is to use metaphors to identify the views of mathematics concepts and mathematics education. These teachers play an important role in the early mathematics experience of young children. The research group of this study is composed of 227 pre-service teachers from the Department of Pre-school Education, School of Education, Kukurowa University in 2013-2014 [7]. Cognitive radio-based sensor networks (CRSN) are conceived as a powerful driving force for the development of smart grids (SG) in modern power systems. This can solve the spectrum limitation in the sensor node due to interference caused by other wireless devices operating on the same unlicensed frequency in the Industrial, Scientific, and Medical (ISM) band. Therefore, Ogbodo EU investigated and explored the CRSN conceptual framework, as well as the SG communication architecture and its applications, compared to communication access technology, including implementation design with quality of service (QoS) support [8]. The research is based on the communication network of the smart grid. If it can be applied to the network communication in the smart grid, then the reference value for this article will be even greater.

The innovation of this article is that this article uses the multi-core technology of the embedded microprocessor for multi-core calculation. And through the EPA communication protocol to build the basis of embedded microprocessor network communication, and finally apply OPC technology to the embedded microprocessor communication network to obtain a new type of embedded microprocessor network communication method. This method can have a great influence on students' preschool education, and can comprehensively improve students' thinking ability, practical ability and emotional intelligence.

2. Network Communication Method Based on Embedded Microprocessor

2.1. Embedded Microprocessor

Embedded microprocessor [9] is a processor with a data width of more than 32 bits, relatively high performance, and high price. Its main application areas are shown in Figure 1.

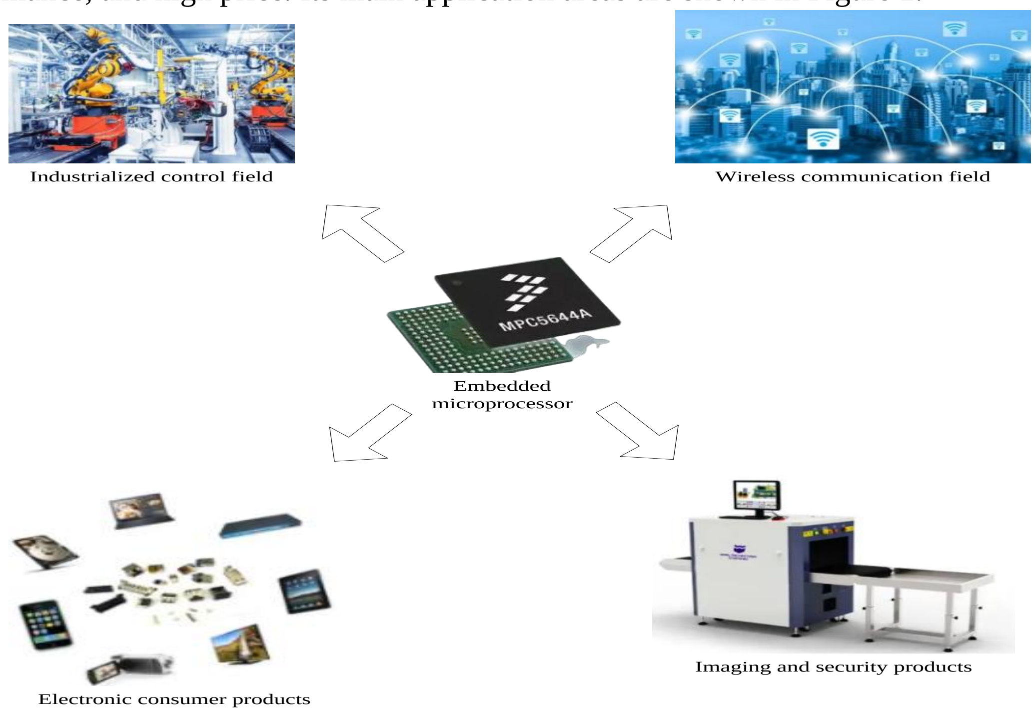


Figure 1. Application areas of embedded microprocessors

The development speed of embedded processors, especially since the beginning of the 21st century, has been astonishing. There are more than 1,000 types of embedded processors. Many architectures sold by ARM [10] are always the mainstream architectures in the market, leading the trend of embedded microprocessors. As shown in Figure 2 of a general embedded microprocessor.

Figure 2. Common embedded microprocessor

ARM is a British company specializing in chip IP[11] design and licensing. Its products are mainly IP core licenses and peripheral equipment interfaces. ARM will provide the most advanced chip design technology it has learned to well-known semiconductor, software, and OEM manufacturers at home and abroad. ARM has thousands of cooperative companies all over the world, and the core of ARM is a 32-bit RISC (Reduced Instruction Set Computer) microprocessor.

(1) Multi-core technology

Multi-core technology can be regarded as CPU processing core integration technology [12]. In other words, a multi-core processor chip integrates multiple cores with full CPU functions.

First of all, because multiple single-track red cores or multi-threaded cores are integrated, the number of threads that a multi-core processor can execute at the same time. Several times of single-core processors, parallel performance is greatly improved.

Then, since multiple cores are integrated into one chip, the connection between the cores becomes shorter. Compared with the multi-core of different computers, the communication delay between the cores of the multi-core architecture is reduced, thereby improving communication efficiency and data transmission bandwidth.

In addition, multiple cores may share some computer resources (such as SMP architecture [13]), which effectively improves resource utilization and reduces power consumption to a certain extent.

One of the most important advantages of multi-core processors [14] over single-core processors is that they are easy to optimize and expand. Some researchers expanded from 9 cores to 16 cores without changing the entire processing logic and flow, and it only took 10 hours.

Although multi-core processors have many advantages over single-core processors. However, multi-core processors should also consider some issues that single-core processors do not need to consider.

Another difficulty is the communication between multiple cores. Although the processes or threads running in the single-core processing structure appear to be executed in parallel, they are actually serial. At a certain moment, only one process or thread occupies CPU resources and is actually being executed. Therefore, the communication between processes or threads is relatively simple under the single-core architecture, and access to critical resources is serial. That is, it will not happen that two processes or threads request critical resources at the same time, so that the synchronization and mutual exclusion of critical resources are easier to achieve. On the contrary, in a multi-core architecture, processes or threads are truly executed in parallel. That is, two processes or threads may request critical resources at the same time. How to ensure the rationality of access and operation of critical resources is crucial.

(2) Multi-core thread communication

With the introduction and extensive research of multi-core technology [15], the problem of multi-core communication is a problem that must be solved, and it is also a more difficult problem.

After a long period of exploration and research, there have been many mature technologies to solve the problem of inter-core communication. Some of these technologies are hardware-based, and some are software-based. There is also a new technology that can complete inter-core communication: the Fast Message Network (FMN) [16].

The above is a view of the communication technology between multiple cores from the perspective of software and hardware, and the communication problem between multiple cores can also be seen from the perspective of process threads. Because generally running on multiple cores is either a process or a thread. These two granular communication technologies have their own advantages, disadvantages and scope of application.

2.2. Network Communication Technology

Computer networks and network communication technologies are important contributions to human science and technology in the 20th century. Nowadays, people all over the world can use computers to communicate directly with other people, and with the help of the Internet, they can quickly obtain information from a variety of places. Their main purpose is shown in Figure 3.

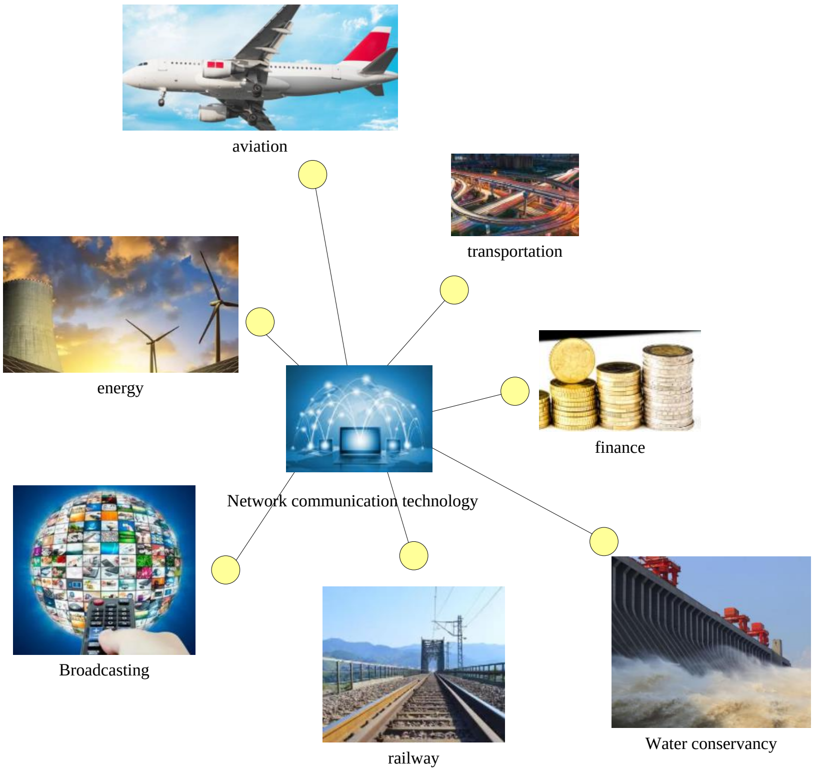


Figure 3. Application of network communication technology

Network communication [17] is the communication basis of the embedded microprocessor system. The server communicates with the embedded microprocessor device via Ethernet to send and receive data and commands. Below the application layer, the system uses the TCP/IP network protocol [18] for transmission. TCP/IP is the most basic protocol of the Internet, and it is also the foundation of the Internet [19]. It has undergone continuous testing and optimization in the long-term development process, and is now very mature, and the protocol transmission is very stable. In order to realize the network communication function of the system, a special communication protocol needs to be designed on the application layer to transmit commands and data between devices.

Data communication refers to the exchange of data information between computers. Generally speaking, as shown in Figure 4, a specific code, format, and bit length digital signal is called data information.

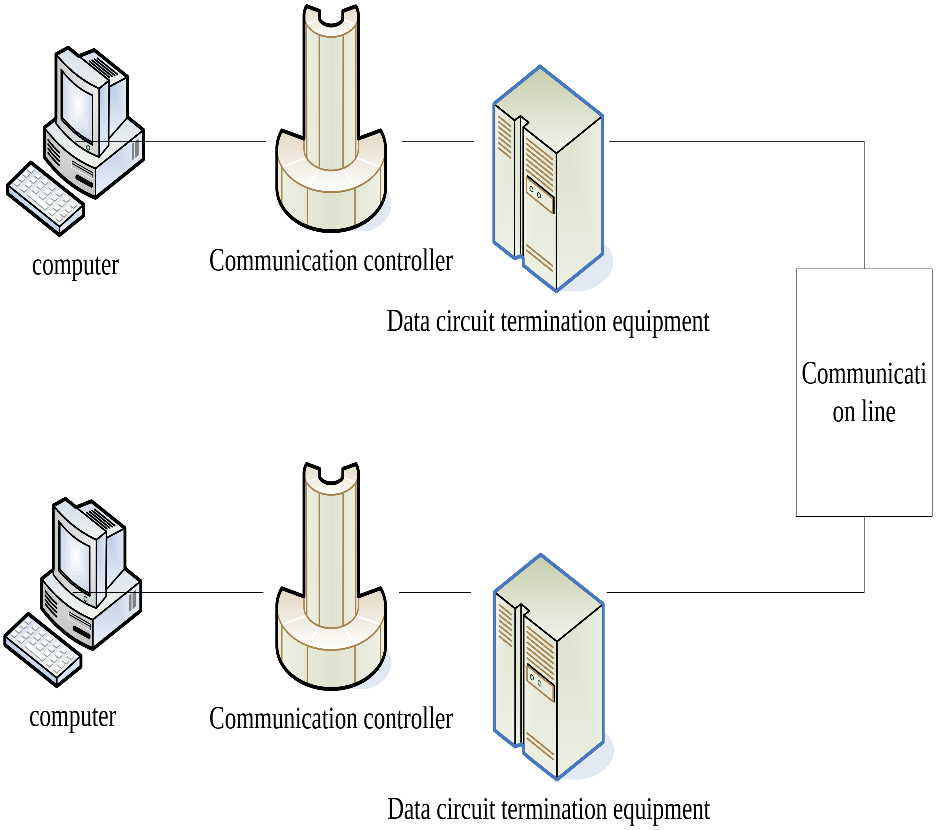


Figure 4. The basic structure of a data communication system

The system is mainly composed of a computer, a communication controller, a data line terminal device [20], and a communication line. Among them, the computer is used to send and receive signals, and the communication controller is used to control the sending of signals, that is, link control, synchronization and error control.

(1) EPA agreement

1) EPA communication protocol model

The industrial real-time Ethernet EPA standard [21] is based on the commercial Ethernet standard, and improves the real-time performance of the network by extending relevant specifications to achieve an industrial network standard that is seamlessly compatible with commercial Ethernet. According to the OSI reference model, the user layer is added to the OSI application layer, the six-layer structure of the EPA communication protocol model in the system is shown in Figure 5.

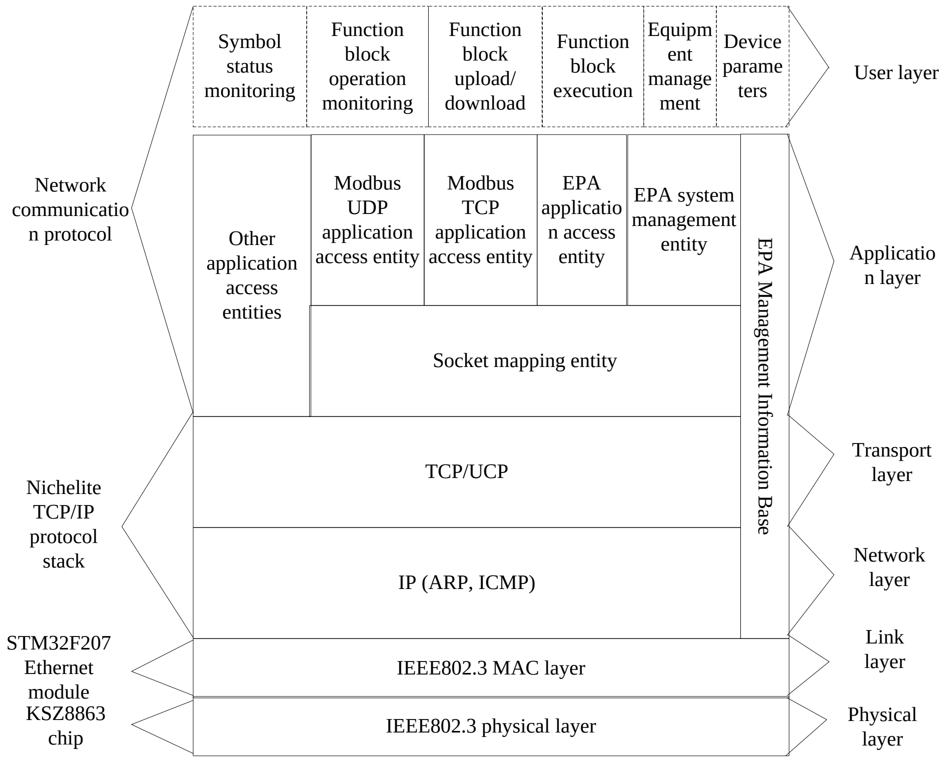


Figure 5. EPA communication protocol model

The physical layer and link layer of Figure 5 are based on the standard Ethernet specification IEEE 802.3, which are implemented by the Ethernet chip KSZ8863 and STM32F 207 processors, respectively. These protocols include IP, ICMP, ARP and other sub-protocols at the network layer, and TCP and UDP protocols at the transport layer. The UDP protocol is suitable for transmitting data with high real-time requirements, while the TCP protocol is suitable for applications where data can be reliably transmitted.

2) ESO nonlinear network forecasting system

Through predictive control, the network-induced delay problem of the non-linear networked predictive control system with ESO [22] is solved, and the size of the transmitted data is reduced by quantification. Its structure is shown in Figure 6.

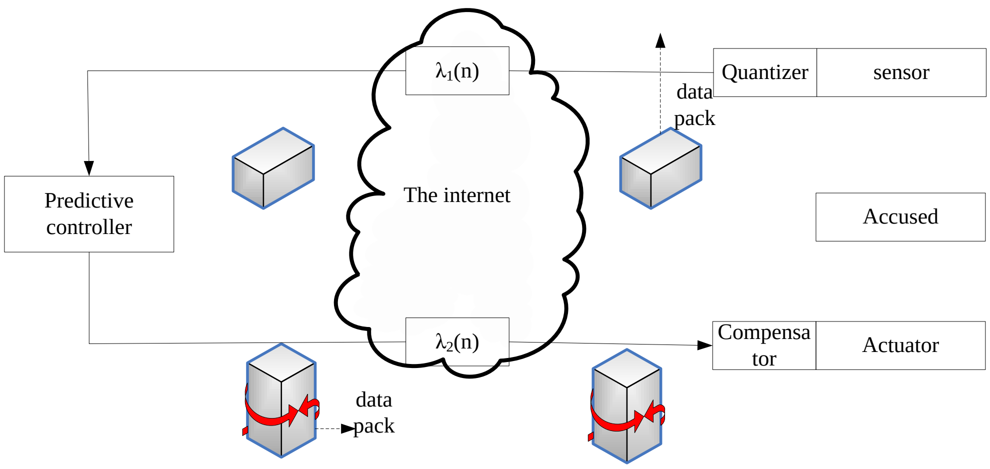


Figure 6. Structure diagram of networked control system

In the Figure 6, $\lambda_1(n)$, $\lambda_2(n)$ respectively represent the network-induced delay of the feedback and forward channels.

This article considers the following second-order system:

$$\ddot{a_t}(s) = f(\dot{a_t}(s), a_t(s), \omega(s)) + yu(s) \tag{1}$$

$$b(s) = a_t(s) \tag{2}$$

Among them, $a_t(s)$, $u(s)$ and $b(s)$ are state variables, input variables and output variables, respectively, $f(\dot{a_t}(s), a_t(s), \omega(s))$ represents the non-linear term, where $\omega(s)$ is the external disturbance of the system. It is worth noting that in this chapter, the nonlinear term $f(s)$ is bounded.

The specific form of the state equation is as follows:

$$\dot{a_1}(s) = a_2(s) \tag{3}$$

$$\dot{a_2}(s) = f(s) + yu(s) \tag{4}$$

$$b(s) = a_1(s) \tag{5}$$

To make

$$a(s) = \begin{bmatrix} a_1(s) \\ a_2(s) \end{bmatrix}, G = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, D = \begin{bmatrix} 0 \\ y \end{bmatrix}, F = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, C = \begin{bmatrix} 1 & 0 \end{bmatrix} \tag{6}$$

Obtain the continuous system state equation:

$$\dot{a}(s) = Ga(s) + Du(s) + Ff(s) \tag{7}$$

$$b(s) = Ca(s) \tag{8}$$

After discretization, the discrete state equation is as follows:

$$a(n+1) = Xa(n) + Yu(n) + Ef(n) \tag{9}$$

$$b(n) = Ca(n) \tag{10}$$

Among

$$X = e^{GS} = \begin{bmatrix} 1 & S \\ 0 & 1 \end{bmatrix}, Y = \int_0^S e^{G\lambda} D d\lambda = \begin{bmatrix} 0 \\ Sy \end{bmatrix}, E = \int_0^S e^{G\lambda} F d\lambda = \begin{bmatrix} 0 \\ S \end{bmatrix} \tag{11}$$

S is the sampling period. When $y \neq 0$, X and Y are controllable.

The quantizer form is selected as follows:

$$E_\varphi(a(n)) = \varphi(n) E\left(\frac{a(n)}{\varphi(n)}\right) \tag{12}$$

Here $\varphi(n) \in R, \varphi(n) > 0$, $E(\cdot)$ satisfies the following conditions:

1. If

$$\|a(n)\|_2 \leq M \tag{13}$$

Then

$$\left\|E(a(n)) - a(n)\right\|_2 \leq \Delta \tag{14}$$

2. If

$$\|a(n)\|_2 > M \tag{15}$$

Then

$$\|E(a(n))\|_2 > M - \Delta \tag{16}$$

Obviously, $E_\lambda(\cdot)$ also meets this condition;

3. If

$$\|a(n)\|_2 \le M\varphi(n) \tag{17}$$

Then

$$\|E(a(n)) - a(n)\|_2 \le \Delta\varphi(n) \tag{18}$$

4. If

$$\|a(n)\|_2 > M\varphi(n) \tag{19}$$

Then

$$\|E(a(n))\|_2 > M - \Delta\varphi(n) \tag{20}$$

Where M represents saturation and Δ represents sensitivity.

(2) OPC technology

The full name of OPC [23] is OLE for Process Control. According to its appearance, it establishes a bridge between Windows-based applications and field processing control applications. So far, in order to access the data information of field devices, all application software developers need to create a special interface function. Due to the continuous upgrade of various field devices and products, users and software developers often bear a heavy workload. Usually, this cannot meet the needs of actual work. At this time, the OPC standard has been created. The OPC standard is based on Microsoft's OLE technology and completes its formulation by providing a set of standard OLE/COM interfaces. OLE2 technology is used in OPC technology. According to the OLE standard, objects such as documents or graphics can be exchanged on multiple computers.

According to DCM technology and OPC standards, it is possible to create and open control system software for mutual operation. OPC adopts a client/server model, entrusts the development of access interfaces to hardware manufacturers or third-party manufacturers, and provides them to users in the form of OPC servers to resolve the conflicts between software and hardware suppliers and improve the system.

(3) Fieldbus

Fieldbus [24] includes process automation, production automation, construction automation, and field intelligent device interconnection communication networks used in other fields of international development from the late 1980s to the early 1990s. This comprehensive technology based on intelligent sensing, control, computer and digital communication will attract worldwide attention and become a hot spot in the development of automation technology, which will bring tremendous changes to the mechanisms and equipment of the automation system.

As a new generation of control system, the Fieldbus Control System (FCS) breaks the limitations of the traditional distributed control system (DCS) that uses a special communication network on the one hand, and uses open standards-based solutions to overcome user interaction. Due to the limitation of the dependency of a single manufacturer, the system will truly open. On the other hand, the I/O of DCS is completely decentralized, becoming a new completely decentralized structure, and the control functions are completely dispersed in the scene. This fully realizes the traditional intention of DCS to manage centralized control and decentralized control.

2.3. Embedded Multi-CPU Communication Principle

Multiple embedded CPUs can be connected to each other through various methods, such as dual-port RAM, Ethernet, PCI bus, USB, I2C, and so on.

In the communication between adjacent CPUs, it is only necessary to write data into the shared memory, but in the communication between non-adjacent CPUs, in order to support data replication, an intermediate CPU is required. After the communication frequency becomes higher, the intermediate CPU is always busy due to data transmission, unable to perform other tasks, and the overall system performance is greatly reduced. Another disadvantage of this system is the cost issue. The manufacturing cost of dual-port RAM chips is much higher than that of single-port RAM.

Whether in the field of desktop computing or server, bus-based interconnection is the most widely used solution on Meny's core platform. PCI, CAN, SPI, UART, I2C, USB, and Ethernet are generally used in embedded systems. In theory, embedded multi-processors can be connected to each other through any bus, but in reality, factors such as bandwidth, bit width, operating frequency, programming interface, and cost are usually considered for selection. For applications with less control information exchanged between multiple processors, SPI and I2C are the best. But for applications that can send real-time audio and video data between CPUs, such as high-bandwidth buses PCI [25], USB and Ethernet.

Network protocols are usually developed at different levels, and each layer is responsible for various communication functions. The protocol family is a group of multiple protocols at different levels. TCP/IP is generally regarded as a 4-layer protocol system, and each layer is responsible for various functions.

1) Link layer

It can also be called the data link layer or the network interface layer, which usually includes the device driver of the operating system and the network interface card corresponding to the computer, together they deal with the details of the physical interface to the cable (or other transmission medium). Ethernet follows the CSMA/CD protocol, so that multiple computers on the same LAN can share the same physical transmission medium.

2) Network layer

Also known as the Internet layer, it handles datagram activity within the network. The IP protocol is the core protocol of the TCP/IP cluster, which can communicate between different networks. Therefore, when the embedded Internet communicates between different networks, the IP protocol needs to be implemented.

3) Transport layer

This mainly provides end-to-end communication to two host applications. The transport layer has two different protocols, TCP (Transmission Control Protocol) and UDP (User Datagram Protocol). TCP provides connection-type, highly reliable, and non-repetitive two-way data stream sending services to two hosts.

4) Application layer

It is responsible for handling the detailed content of a specific application. Because the system needs to send a small amount of data, the application layer is relatively simple. When sending data, the marking system will be used as an active partition, and the data or commands will be sent to the interface board through the serial port to get in touch with the remote server and receive the data. The interface board triggers a serial port interrupt, marking that the system only receives data, and directly discards the data that is incorrectly verified. Once this happens, the remote server will resend the data.

2.4. Pre-school Education

At the International Preschool Education Consultation Conference in 1981, it was explained that "preschool education" is an experiential activity that children (children from birth to elementary school) learn and can contribute to the development of the whole. This is divided into social education before school and family education before school. In "Cihai", pre-school education is defined as the education (generally referred to as 3 to 6 years old) that children receive in correctional facilities before entering elementary school. Pre-school education refers to educational activities conducted in special pre-school educational places, that is, educational activities conducted in nursery schools, kindergartens, and other pre-school educational institutions in society.

In China's "Private Education Promotion Law", "private education" is defined as "the use of non-state financial funds by individuals other than social organizations and state agencies to organize the activities of schools and other educational agencies." Among them, "utilization of non-state fiscal funds" refers to the case where the business expenses do not contain stable state fiscal funds, the school mainly relies on fees to run schools, and the infrastructure costs only include a small part of the fiscal fees at most.

Preschool education safety management refers to the management of the safety of children in the preschool education stage. Early childhood is the budding period of life and is a key link in human growth and development. Many things are learned at this stage, therefore, preschool education safety must be paid attention to and carefully managed. Because the scope of pre-school education security is too wide, it is difficult for the author to conduct a comprehensive and in-depth study with only one paper. Therefore, this article mainly selects several aspects of preschool education safety to conduct safety management research, including three aspects: environmental safety management, food safety management, and personnel quality safety management.

3. Embedded Microprocessor Communication Network Test Experiment

3.1. EPA Application Layer Specification

The read and write services in the EPA protocol are distinguished by the message category code ServiceID in the EPA message header. The message header of the EPA protocol is shown in Table 1.

Table 1. EPA header

data	type of data	byte	describe
ServiceID	Unsigned8	1	Message category code
Reserved	Ocetstring	3	Reserve
Length	Unsigned16	2	Message length
MessageID	Unsigned16	2	Message number
SourcAppID	Unsigned16	2	Device source application ID
DestinationAppID	Unsigned16	2	Destination application identifier
DestinationObjectID	Unsigned16	2	Destination object ID
SubIndex	Unsigned16	2	Sub-index of the object

The EPA read or write service message is the information that needs to be confirmed. When the requester receives a read or write service message, the requester's EPA application layer service uses the target application identifier APPID in the message header, the information is analyzed accordingly. If the object specified in the message exists in the EPA application layer service, the requesting party will send a confirmation message, if it does not exist, a negative response message is sent. Table 2 and Table 3 show the specifications of the confirmation and negative response messages corresponding to the EPA read service request.

Table 2. EPA reading service is responding

data	type of data	Offset/byte	describe
0*4D	Char	0	Write error response flag
Reserve	--	1-3	Reserve
0*0A	Unsigned16	4-5	Message length
MessageID	Unsigned16	6-7	Message number
DestinationAppID	Unsigned16	8-9	Intended application representation
DestinationObjectID	Unsigned16	10-11	Destination object ID
--	--	Over 12	Corresponding data

Table 3. Negative response of EPA reading service

data	type of data	Offset/byte	describe
0*4D	Char	0	Write error response flag
Reserve	--	1-3	Reserve
0*0A	Unsigned16	4-5	Message length
MessageID	Unsigned16	6-7	Message number
DestinationAppID	Unsigned16	8-9	Intended application representation
DestinationObjectID	Unsigned16	10-11	Destination object ID

Similarly, if the requested party receives an EPA write service request message, the requested party first analyzes the write service request message. Then it is determined whether the access object specified in the write service request exists in the EPA application layer service, and the service request response message is written according to the determination result. Table 4 and Table 5 show the specifications of the acknowledgment and negative response messages corresponding to the EPA write service request.

Through the EPA protocol implemented in the controller, the communication function block in the source controller can use the EPA protocol to send a read or write service request message to the destination controller, and the destination controller performs analysis on the received request message. Then reply EPA read, write service positive response or negative response message, thus complete the data exchange between controllers.

Table 4. EPA write service positive response

data	type of data	Offset/byte	describe
0*4D	Char	0	Write error response flag
Reserve	--	1-3	Reserve
0*0A	Unsigned16	4-5	Message length
MessageID	Unsigned16	6-7	Message number
DestinationAppID	Unsigned16	8-9	Intended application representation

Table 5. EPA write service negative response

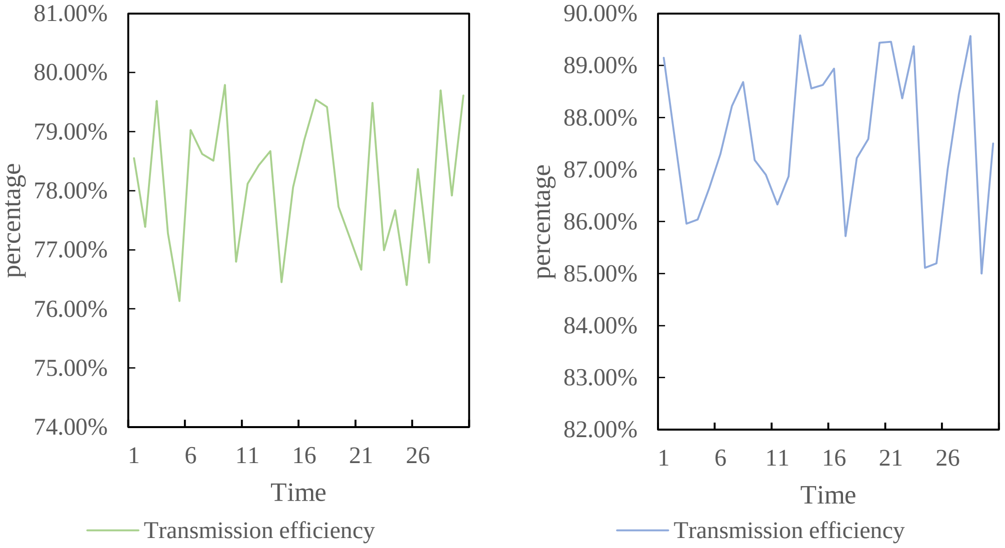
data	type of data	Offset/byte	describe
0*8D	Char	0	Write error response flag
Reserve	--	1-3	Reserve
0*0E	Unsigned16	4-5	Message length
MessageID	Unsigned16	6-7	Message number
DestinationAppID	Unsigned16	8-9	Intended application representation
Reserve	Unsigned16	10-11	Reserve
0*64	Unsigned16	12-13	Error identification

3.2. Embedded Microprocessor Network Communication Test Experiment

The design function that the integrated system needs to realize, the communication protocol needs to send two kinds of data frames, the control command frame and the data stream frame. The communication protocol design refers to the IP data packet, and adopts the classic data frame composition mode of packet header and data block, without packet tail. The data frame parameters are stored in the packet header, and the data block follows it. The parameters that the packet header needs to include are packet length, data packet sequence number, data packet command and other options.

Due to the limitation of the maximum transmission unit in the transmission of the TCP/IP protocol, the protocol will automatically divide the data block exceeding the maximum transmission unit into several small segments for transmission. The LWIP protocol stack stipulates that each segment of data has a maximum of 1500 bytes. When the chip communicates with the server, control commands and data streams are transmitted on ports 579 and 5680 respectively, which means that the data frame received by the chip may not be a continuous same data frame. If the received data frame is directly forwarded to the main control CK610 chip, it is difficult for the main control to identify the port source of the data frame. So this text carries on the test to the communication system of the improved embedded microprocessor, the experimental result of the two transmission efficiency is shown as in Figure 7.

It can be seen from Figure 7 that the communication transmission efficiency of the improved embedded microprocessor is significantly higher than that of the traditional microprocessor, and there is a nearly 5%-14% increase. This shows that the new embedded microprocessor has great advantages in communication transmission efficiency.



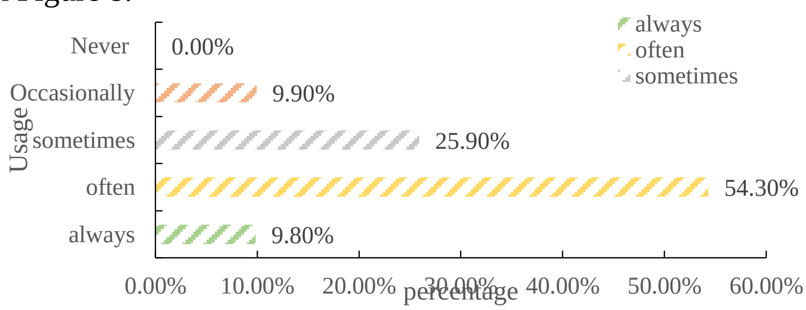
A. Traditional microprocessor communication transmission efficiency
B. Improved embedded microprocessor communication transmission efficiency

Figure 7. Comparison of improved embedded microprocessor and traditional microprocessor

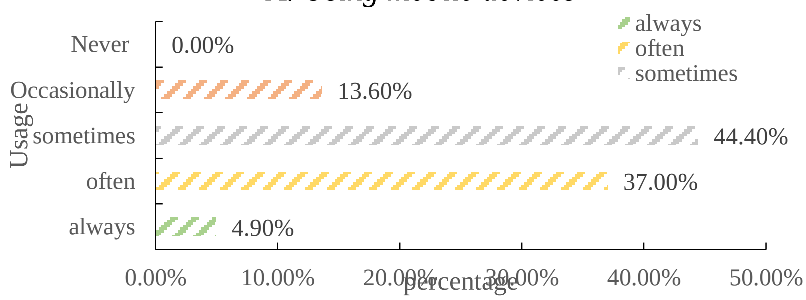
4. Investigation of Preschool Education Based on Embedded Processor-based Network Communication

4.1. Survey of Pre-school Education and Learning

In order to study the methods of acquiring student information, this article analyzes the learning situation of students from the perspectives of the ways and types of learning resources, the use of mobile learning tools, and the teaching methods. The survey of students on mobile learning methods is shown in Figure 8.



A. Using mobile devices

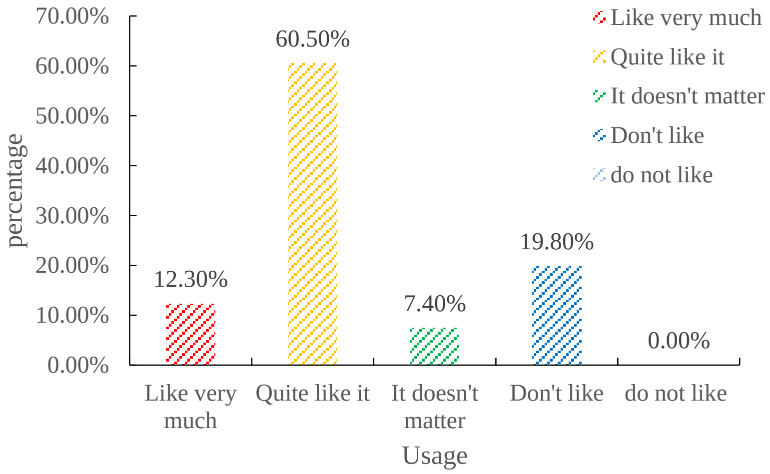


B. Using fragmented resources

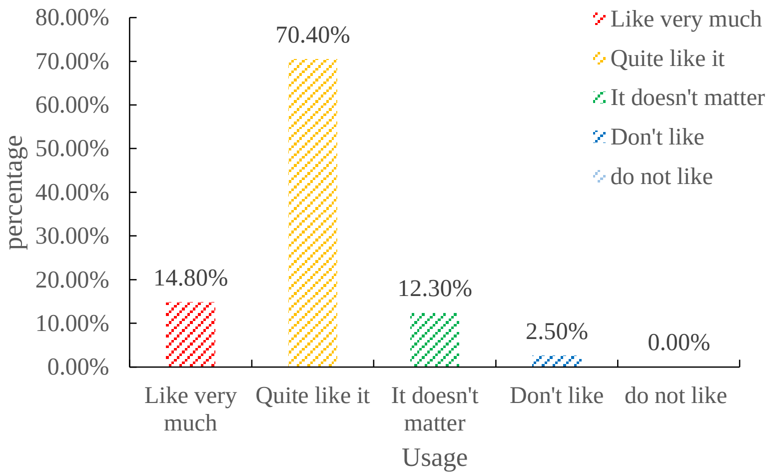
Figure 8. Survey of students' learning using tools

It can be seen from Figure 8 that 64.2% of students always or often use mobile learning devices such as mobile phones or tablets, and 42.0% of students always or often browse fragmented learning resources. These indicate that students' mobile learning habits are more prominent, and they can quickly adapt to the mobile learning environment. 44.4% of students sometimes choose fragmented learning resources in their studies, which shows that students do not get fragmented resources through WeChat/Weibo very frequently, and students may choose more systematic learning resources in course learning.

Therefore, this article carried out an experiment on which students would prefer the new classroom education compared to the traditional one. The data of the experimental feedback is shown in Figure 9.



A. How much do students like traditional courses



B. How much students like the new type of education

Figure 9. Comparison of students' preference for the two educational methods

4.2. Test of Preschool Education Method Based on Network Communication in Embedded Processor

In order to study the effect of network communication in the embedded processor on accelerating pre-school education, this paper designs experiments with traditional pre-school education methods to improve the degree of ability. The experiment is divided into two groups, one group is pre-school education methods designed for middle-aged network communication using embedded processors to conduct pre-school education for students, and the other group is pre-school education for students using traditional pre-school education methods. The degree of improvement is judged by comparing the results of the two improving students' various abilities. The experimental results are shown in Figure 10.

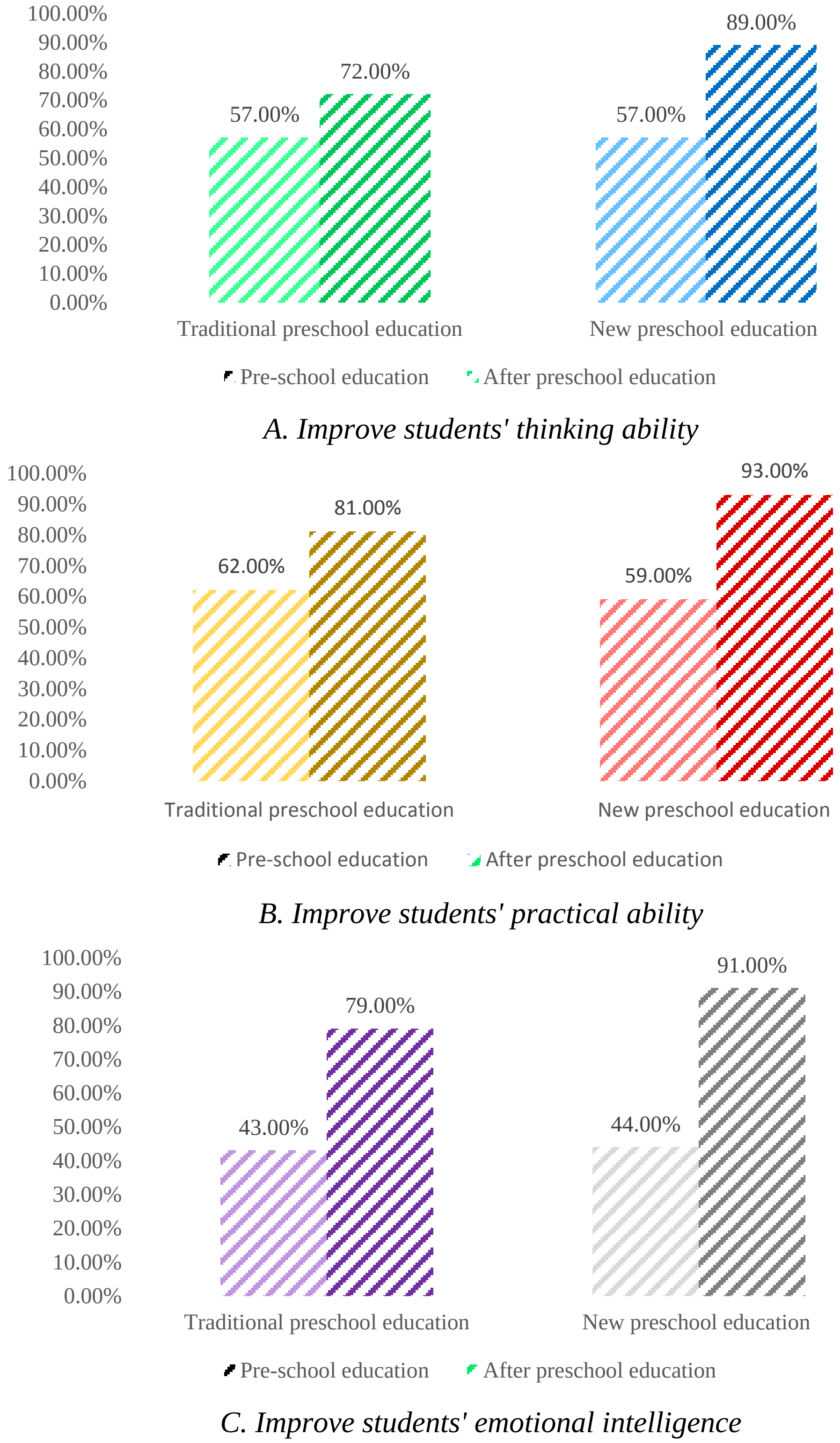


Figure 10. The extent to which the two groups of educational methods improve students' various abilities

It can be seen from Figure 10 that the preschool education method based on the network communication in the embedded microprocessor can very effectively improve the students' thinking ability, practical ability and emotional intelligence. This new kind of preschool education method can improve students' thinking ability by 32%, can also improve students' hands-on ability by 34%, and can improve students' EQ by 47%.

5. Conclusion

This article mainly studies the application of network communication based on embedded microprocessor in preschool education. First of all, this article collects information about embedded microprocessors and network communication protocols, and then designs a new preschool education method based on the processing capabilities of embedded microprocessors and the communication capabilities of network communication protocols. In order to design this method combined with the multi-core technology of the embedded microprocessor, this paper constructs the basic conditions of network communication through the EPA protocol, and combines the OPC technology to construct the communication mode of the embedded microprocessor, and finally builds the communication of the embedded CPU. This paper also designs a comparative experiment to explore the communication efficiency based on embedded microprocessors and traditional communication efficiency. The experimental results prove that embedded microprocessors can improve the efficiency of 5%-14% on the traditional basis. And this article analyzes the data collected in the survey experiment of preschool education, and obtains a new type of preschool education method. Finally, through experiments, it is concluded that this new kind of preschool education method can improve students' thinking ability by 32%, practical ability by 34%, and emotional intelligence can be increased by 47%.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Filipe, M, Lins, et al. Register File Criticality and Compiler Optimization Effects on Embedded Microprocessor Reliability. IEEE Transactions on Nuclear Science, 2017, 64(8):2179-2187.

[2] Clark L T, Patterson D W, Ramamurthy C, et al. An Embedded Microprocessor Radiation Hardened by Microarchitecture and Circuits. IEEE Transactions on Computers, 2016, 65(2):382-395.

[3] Halfhill T R. Embedded Processors Embrace AI. Microprocessor report, 2018, 32(12):29-35.

[4] Bello O, Zea Da Lly S, Badra M. Network layer inter-operation of Device-to-Device communication technologies in Internet of Things (IoT). Ad Hoc Networks, 2016, 57(MAR.):52-62.

[5] Bian, Desong, Kuzlu, et al. Performance evaluation of communication technologies and network structure for smart grid applications. IET Communications, 2019, 13(8):1025-1033.
[6] Lehrl S, Kluczniok K, Rossbach H G. Longer-term associations of preschool education: The predictive role of preschool quality for the development of mathematical skills through elementary school. Early Childhood Research Quarterly, 2016, 36(Complete):475-488.
[7] Oguz K, Isil T, Durmus A. Metaphor Perceptions of Pre-Service Teachers towards Mathematics and Mathematics Education in Preschool Education.. Educational Research & Reviews, 2016, 11(14):1338-1343.
[8] Ogbodo E U, Dorrell D, Abu-Mahfouz A M. Cognitive Radio based Sensor Network in Smart Grid: Architectures, Applications and Communication Technologies. IEEE Access, 2017, 5(9):19084-19098.
[9] Hida I, Takamaeda-Yamazaki S, Ikebe M, et al. A High Performance and Energy Efficient Microprocessor with a Novel Restricted Dynamically Reconfigurable Accelerator. Circuits & Systems, 2017, 08(5):134-147.
[10] Berdahl E, Blessing M. Physical modeling sound synthesis using embedded computers: More masses for the masses. The Journal of the Acoustical Society of America, 2016, 139(4):2204-2204.
[11] Sato R, Hatanaka Y, Ando Y, et al. High-Speed Operation of Random-Access-Memory-Embedded Microprocessor With Minimal Instruction Set Architecture Based on Rapid Single-Flux-Quantum Logic. IEEE Transactions on Applied Superconductivity, 2017, 27(4):1-5.
[12] Boussadi M A, Tixier T, Landrault A, et al. HNCP: A many-core microprocessor ASIC approach dedicated to embedded image processing applications. Microprocessors & Microsystems, 2016, 47(NOV.):333-346.
[13] Tom, R, Halfhill. Epyc Embedded 3000 Family Adds Ethernet, South Bridge. Microprocessor report, 2018, 32(2):19-24.
[14] David, Kanter. Everspin MRAM Targets Enterprise New Nonvolatile Memory Attracts Storage and Embedded Customers. Microprocessor report, 2016, 30(12):15-18.
[15] Chen J. Composition Rule Perception Algorithm of National Art Plane System Based on Wireless Sensor Network Communication Technology. International Journal of Wireless Information Networks, 2021, 12(2):1-9.
[16] Zeng J, Sun J, Wu B, et al. Mobile edge communications, computing, and caching (MEC3) technology in the maritime communication network. China Communications, 2020, 17(5):223-234.
[17] Farnsworth C, Clark L T, Gogulamudi A R, et al. A Soft-Error Mitigated Microprocessor with Software Controlled Error Reporting and Recovery. IEEE Transactions on Nuclear Science, 2016, 63(4):2241-2249.
[18] Tom, R, Halfhill. MT3620 Runs Azure Sphere for IoT: MediaTek Adopts Microsoft's Security Engine and Embedded OS. Microprocessor report, 2018, 32(5):22-27.
[19] Halfhill T R. More Embedded Mergers in 2016 Consolidation Creates New Giants, but Some Products Suffer. Microprocessor Report, 2016, 30(12):9-14.
[20] TR Halfhill. Splashdown for Intel's Apollo Lake. Microprocessor Report, 2016, 30(11):23-27.
[21] Bian D, Kuzlu M, Pipattanasomporn M, et al. Performance Evaluation of Communication Technologies and Network Structure for Smart Grid Applications. IET Communications, 2019, 13(8):1025-1033.
[22] Amiripalli S S, V Bobba. An Optimal TGO Topology Method for a Scalable and Survivable Network in IOT Communication Technology. Wireless Personal Communications, 2019, 107(2):1019-1040.

[23] Benites L, Benevenuti F, Oliveira A, et al. Reliability Calculation With Respect to Functional Failures Induced by Radiation in TMR Arm Cortex-M0 Soft-Core Embedded Into SRAM-Based FPGA. IEEE Transactions on Nuclear Science, 2019, 66(7):1433-1440.
[24] Peng W, Zhang Y, Dan J, et al. ARM-based Embedded Detection System of Cardiovascular Function Parameters. Zhongguo yi liao qi xie za zhi = Chinese journal of medical instrumentation, 2017, 41(2):79-83.
[25] Konopko K, Janczak D. Nonlinear signal processing with minimization of spectral distortion for embedded systems - ScienceDirect. IFAC-PapersOnLine, 2018, 51(6):450-455.