Rainfall weather condition prediction based on embedded system and big data financial management

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Received: 4 June 2021 / Accepted: 15 July 2021
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Abstract
This paper analyzes the practical application requirements of embedded systems. According to the analysis, we conceive and develop a general experimental platform composed of embedded processor motherboard, general peripheral equipment, and custom connection board. We completed the selection and design of hardware peripherals, driver creation, and testing and showed how to transplant the basic driver for each module. Then embedded system is used in rainfall prediction, which plays an important role. The distribution of four different types of representative stations is analyzed, and the probability characteristics of different precipitation forecast levels are summarized. Secondly, from the point of view of time and space, we will study the total precipitation and flood index during the Meiyu period in Northwest China, and understand their spatial and temporal characteristics. Finally, the precipitation in the coming Meiyu period is predicted by R/S analysis and stationary time series prediction method. However, in the era of big data, the competition is becoming more and more fierce. For the financial industry, financial risk is an inevitable problem of financial development, especially in the competitive market environment; the abnormal competition behavior of some financial companies is destroying the financial market. Financial management is an important task for financial institutions. Only with good performance in risk management can big data be better applied to and stimulate the financial industry. In this paper, through the establishment of risk management mechanism, the comprehensive analysis of big data enterprises, the identification of risk factors of big data enterprises, the development of preventive strategies, and other measures, we can effectively reduce the risk loss and promote the stable development of big data financial management.

Keywords  Embedded system · Rainfall forecast · Big data · Financial management

Introduction
With the development of communication, microelectronics, and network technology, embedded system is gradually penetrating into every field of daily life. However, as the main part of embedded system, microcontroller chip usually has no suitable platform for development and training experiments. Although different chip manufacturers provide a variety of evaluation kits, most of them have fixed structure, single function, and reusability problems. By creating a general development platform for embedded system, this paper provides an experimental platform that can support various embedded microcontrollers. Peripheral devices are modular and reusable, and module interconnection can be reconfigured to meet the needs of various embedded systems. Embedded research and education are adapting to the rapid development of processors. The embedded system is very reliable in rainfall prediction. In the future trend of precipitation index, the whole flood index series of J station will show an obvious downward trend, while the flood index of other stations will decline slightly (Sajjad et al. 2009). This paper analyzes the distribution law of flood index in Meiyu period and the probability density of eight weather stations in northwest of Z province to understand the distribution of rainfall index and the probability of flood occurrence. Once the characteristics of single station rainfall and flood are mastered, the overall characteristics of rainfall forecast in the study area can be analyzed in time and space, so as to fully understand the rainfall and flood situation in Meiyu period of Northwest J province.
Understand the trend of rainfall and natural disasters in rainy season, identify common and flood prevention areas, and formulate flood control measures accordingly. Finally, the trend of the coming rainfall and flood is studied and analyzed, which provides a theoretical basis for people to predict the rainy season in advance and reduce casualties and economic losses (Stephens et al. 2001). However, economic development and financial management are inseparable; the accelerated development of the financial industry has brought better economic development, but there are always risks in financial activities. The purpose of financial activities is to take risks and get corresponding economic rewards. Financial management risk can be avoided, mainly relying on big data technology to avoid financial risk in financial management. Big data technology is highly professional (Yang et al. 2020). With the help of big data technology, we can conduct a comprehensive analysis of financial activities and identify the potential risks of financial activities (Ugulu and Baslar 2010). Therefore, we take targeted preventive measures to ensure the smooth progress of financial acquisition, improve the status quo of the financial industry, and make good development.

Materials and methods

Overview of the study area

The northwest area of Z Province in this paper mainly refers to the area between 28°00′~30°30′N and 118° 00′~121 °15′E. The administrative scope of the study area includes H City, G City, J City, and Shaoxing City. Each city includes its subordinate counties (cities and districts): H City governs 10 districts, 2 counties, and 1 county-level city; H City governs 2 districts, 3 counties, and 1 county-level city; J City governs 2 districts, 3 counties, and 4 county-level cities; S City governs three districts, one county, and two county-level cities. Most of the counties in the study area belong to Qiantang River Basin. The region is rich in natural resources and diverse terrain, but the economic development among the counties is unbalanced.

The climate in this area is typical subtropical monsoon climate with four distinct seasons, suitable temperature and abundant rainfall. In spring, due to the changes of the continental high and the Pacific subtropical high, rainy weather often occurs. In summer, there are more southeast winds, and the weather is mainly sunny and hot. Spring and early summer are the main rainy seasons, with continuous spring and plum rains. The plum season is the concentrated period of regional rainstorm and flood disasters, and the rainfall in this flood season is quite different in time and space; in autumn, the weather is clear and crisp. In winter, due to the control of Mongolian high pressure, the temperature is low, and the precipitation is less.

Due to the suitable climate, complex topography and abundant water resources, the region is rich in biodiversity. Not only the vegetation grows luxuriantly, but also the forest resources are rich. There are a large number of ferns, gymnosperms, quilts, and woody vegetation (including many rare tree species). There are also birds, mammals, amphibians, reptiles, and other wild animals. In addition, the region is also rich in soil, mineral resources, and tourism resources.

Research data

In this paper, June to July of each year is regarded as the Meiyu period, and the total rainfall of this period is regarded as the rainfall of Meiyu period. The daily precipitation observation data of 8 stations in the study area with relatively long time and complete records are selected, and the daily precipitation observation data of 6 stations around the study area in the same period are used as auxiliary data. The sample length is 47 years.

There are many natural disasters in the region, among which flood and geological disasters are the main natural disasters, most of which occur in the rainy season of Meiyu. After that, the wind and rain in Taiwan will also cause certain flood disasters. In addition, the man-made engineering construction makes the flood disasters more sensitive; drought is mainly in summer and autumn. After the Meiyu, the weather is hot and less rain, which easily leads to summer drought; if there are few or empty plum rains, and there is no influence of typhoon from August to September, it will cause continuous drought in summer and autumn; if there is less rain in winter, there will be drought in autumn and spring.

Research methods

Embedded system

Embedded system has more generality than general-purpose computer, and is far superior to all kinds of general-purpose computer in practical use. Embedded system has very important applications in automobile industry, process control, consumer products, and military equipment. In addition, unlike general-purpose computers, embedded systems usually have certain value and cost sensitivity. In the design of hardware and software, we need to pay attention to efficiency and eliminate redundancy. After intelligent configuration, the system can meet the specific needs of users. This not only helps to manage system costs, but also ensures system security.

Embedded processor is the core component of all embedded system hardware and determines the function and application of the whole system. At present, the widely used embedded processors are divided into the following categories:

Embedded microprocessor (MPU) is the name that comes from the central processing unit of a general-purpose
According to some specific requirements of embedded applications, MPU usually makes some optimization and improvement in cost, EMI shielding, working temperature, reliability, and so on.

The peripheral circuits of embedded system are slightly different according to the type of microprocessor, but usually, they are mainly composed of power management circuit, clock circuit, data circuit, and program storage circuit. The external devices in embedded system are usually different according to the system requirements, such as interface circuit and I/O device, and the external devices are configured according to the needs.

### Rainfall prediction model

The development platform uses general peripheral devices and interfaces of embedded system. The design provides a convenient, flexible, customizable, and compatible interface for the core board and application platform, so that the microcontroller can provide appropriate hardware resources on the application platform, and can be used flexibly and efficiently.

Table 1 lists the peripheral module board resources.

The resource list on the peripheral module board of the experimental platform is shown in Table 2.

The probability of abnormal precipitation reflects the deviation between the precipitation in a certain period and the average precipitation in the same period, and may reflect the drought and flood caused by abnormal precipitation. The formula for calculating the index is as follows:

$$ R = \frac{r - \overline{p}}{\overline{p}} \times 100\% $$  \hspace{1cm} (1)

**Table 1 Resource list of peripheral module board of experimental platform**

| Name                      | Bus (all low level active) | I/O | Use          |
|---------------------------|----------------------------|-----|--------------|
| ADC                       | CS, WR, RD                 | 2   | INT MODE    |
| DAC                       | CS, WR                     | 3   | A/B CLR     |
| Liquid crystal (monochrome)| CS, WR, RD                 | 3   | BUSY INT    |
| Liquid crystal (color)    |                           |     | INT, RESET  |
| DM9000                    | OE, WE, AEN                | 3   | INT, RESET  |
| CH375B                    | CS, WR, RD                 | 1   | INT         |
variable, and realizes the distribution fitting by Monte Carlo simulation. The software can simulate more than 40 kinds of distribution types, including discrete distribution and continuous distribution. The variables involved in this paper are continuous distribution. Through this software, many kinds of continuous distribution can be simulated. Chi square test and Kolmogorov Smirnov test are used to test the distribution in distribution fitting. Among them, Kolmogorov Smirnov is used to test continuous distribution, and the test parameters include test quantity and p value. The consistency between fitting distribution and overall distribution can be reflected through p value. The higher P value is, the better the distribution fits the data. After getting the appropriate fitting distribution, the distribution and its parameters can be used to further analyze the probability density to master the probability level of the event.

### Results

#### Rainfall meteorological law

Figure 1 shows the skewness and kurtosis of each station distribution pattern. Skewness value can represent the direction and degree of skewness in data distribution. The skewness of normal distribution is 0, and the distribution is symmetrical. If the skewness value is less than 0, the data distribution tends to the left, and the data on the left side of the mean is less than the data on the right side. If the skewness value is greater than 0, the data distribution will skew to the right, indicating that there is less data on the right side of the average. In addition, there are steep and gentle differences among different data distributions. Kurtosis is a measure used to describe the steepness of data distribution. A kurtosis of 0 means that the distribution has the same steep slope as the normal distribution; when the value is greater than 0, the distribution is in a peak state; when the kurtosis value is less than 0, it means that the distribution is in a low peak state. It can be seen from Fig. 1 that the skewness of the eight stations is greater than 0, which is positive skewness. This index indicates that the flood index data of each station is mostly located on the left side of the mean value of the flood index of each station, that is, the precipitation anomaly percentage of more years in each station is lower than the mean value of each station, and the long tail of the distribution on the right side is the extreme value of the flood index. From the kurtosis value, the kurtosis of Lin’an and Hangzhou is greater than 0, showing a sharp peak state, the distribution of precipitation anomaly percentage is steep, and the distribution of anomaly percentage is concentrated; the kurtosis of the other six stations are less than 0, showing a low kurtosis, indicating that the distribution of precipitation anomaly percentage is relatively scattered.

From the rainfall situation of each station in Fig. 2 in the recent 47 years, it can be seen that the average rainfall in Quzhou area is the largest in Meiyu period, and the maximum rainfall value in Meiyu period also reaches the highest of the eight stations; secondly, Chun’an area, the average and maximum of rainfall are ranked the second highest, indicating that the rainfall in Meiyu period is the most abundant in the area, and the minimum rainfall is the highest of the eight stations, which indicates that there is abundant rainfall in the Meiyu period in Chun’an area; the lowest rainfall in Meiyu period is s and C area in the eighth

### Table 2

| Name           | Interface | Occupy I/O Number | Use                                      |
|----------------|-----------|--------------------|------------------------------------------|
| AIC23          | SPI       | 4                  | PSEI 0, PSEI 1                           |
| DDS            | SPI       | 4                  | FSELECT (TIMOUT), Reset, INT             |
| CH452          | I2C       | 1                  |                                          |
| SD             | SPI       | 2                  | CANRX, CANTX                            |
| LM75           | I2C       | 2                  |                                          |
| CAN            | I2C       | 2                  |                                          |
| Infrared       | USART    | 5                  | KEY[0..1], LED[0..3]                     |
| Serial port    | USART    | 5                  | TX, RX                                   |
| LED4, button 2 | USART    | 14                 | CANRX, CANTX                            |
| Eight-segment digital tube | USART | 8 SEG [0..7] + 6 bits [DIG0..5] | |
| 4x4 keyboard   | USART    | 8                  | KB[0..7]                                 |

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station, and the mean and maximum of the rainfall in Meiyu period are the smallest in the eight stations. Generally speaking, the average rainfall in Meiyu period in the west and southwest of the study area is higher, and the rainfall is abundant, followed by the northern region and the central part. The northeast area has the least rainfall, which may be related to the terrain factors. The mountainous areas in the west may have some influence on the formation of rainfall.

**Temporal and spatial characteristics of rainfall meteorology**

Taking the annual average Meiyu amount of eight stations as the annual Meiyu amount of the whole study area, the interannual variation map of Meiyu period rainfall in Northwest Zhejiang was drawn. It can be seen from Fig. 3 that in the past 47 years, the rainfall in the northwest of S City during the Meiyu period has shown an increasing trend of fluctuation. M-k test and Spearman rank test were used to test the trend of the series. The results showed that Z value was 1.788 and t value was 1.742. Both of them passed the significance level of 0.1, indicating that the interannual rainfall variation in Meiyu period showed a significant increasing trend under $\alpha = 0.1$. According to Fig. 3, the rainfall in Meiyu period is relatively stable, which is maintained at about 400mm; during the Meiyu period, the rainfall remained at a high value, which was a relatively stable and abundant stage in recent 47 years; during the period with the largest time span and the most significant rainfall variation, the Meiyu amount fluctuated and decreased, and the rainfall reached the lowest point in

![Skewness/kurtosis of distribution pattern of stations](image1)

![Mean and extreme value of rainfall at each station](image2)
the past 47 years, with the rainfall of 180.71mm, which was the year of less Meiyu. Then the rainfall gradually fluctuated and increased, and the rainfall in the Meiyu period reached the highest value in the past 47 years, with the rainfall of 641.66mm.

The m-k trend test and Spearman rank test are carried out on the Rainstorm Day series in Meiyu period in Northwest Zhejiang in Recent 47 years. The results show that the Z value is 2.3243 and t is 2.457. It was judged that both of them passed the significance level test of α=0.05, so the series of rainstorm days showed a significant increasing trend. According to Fig. 4, the number of rainstorm days in Meiyu period fluctuates and increases, and the number of rainstorm days in Meiyu period reaches the maximum value in nearly 47 years, which is 4.6 days; After that, the trend of the number of rainstorm days changed greatly, and the number of days of rainstorm showed a downward trend with fluctuation. The number of rainstorm days reached the lowest value of this large range change period, which was 0.5 days, and then the total number of rainstorm days gradually rose. The number of rainstorm days in Meiyu period is the lowest in the whole process of change, which is only 0.25 days. In the 47 years, the number of rainstorm days in Meiyu period in Northwest China reached about 44.68% and 4.26% of the total days of rainstorm over 4 days.

Figure 5 shows the interannual variation of flood index of each station. It can be seen from the figure that the overall trend of precipitation anomaly percentage of each station in recent 47 years is roughly the same.

From the results of Mann–Kendall trend test and Spearman rank test in Table 3, we know that the test results of the two methods are consistent, at the significance level (α = 0.05); the flood index series of stations showed no significant increase trend; only Jinhua station showed a significant increase trend.
It can be seen from Fig. 6 that the interdecadal precipitation in the central and northwest regions increased more than that in the western and southwest regions; from the precipitation changes of the eight stations, the interdecadal precipitation increase of E station is the largest, reaching 105.2 mm, while the interdecadal precipitation increase of Chun’an station is the least, reaching 12.92 mm. The maximum increment is 288.7 mm, and the smallest increment is 82.5 mm at Lin’an station in the north. According to the spatial variation characteristics of the interdecadal difference of rainfall in Meiyu period, the most significant interdecadal variation of rainfall in the second, third, and fourth decades is mainly concentrated in the west and southwest of the study area, while the change in the north and northeast is small, while the most obvious interdecadal variation of rainfall in the first decade is mainly in the central part of the study area; the interdecadal variation of Meiyu rainfall in the first, second, and fourth years showed an increasing trend except for the obvious decrease in the third year.

**Forecast results of rainfall meteorological conditions**

According to Fig. 7, the more the average rainstorm days in the region, the greater the corresponding average rainfall; at the same time, with the increase of average rainfall and average rainstorm day, the more severe the average flood is (the smaller the value is, the heavier the flood). Based on the analysis, the correlation analysis of average rainfall, average rainstorm days, and average flood state is made.

It can be seen from Fig. 8 that there are monotonic relationships between the average rainstorm days and the average rainfall, between the average rainstorm days and the average flood state, and between the average rainfall and the average flood state. Through Pearson correlation analysis, the correlation coefficient between the average rainstorm days and the average rainfall is 0.892, the correlation coefficient between the average rainstorm days and the average flood state is −0.880, and the correlation coefficient between the average rainfall and the average flood state is −0.990, which is from r = 0.001 = 0.465. It can be seen that the absolute value of the correlation coefficient between the two is far greater than the theoretical value under the level of 0.001, so the correlation between the average rainstorm days, the average rainfall, and the average flood state is significant. Therefore, in the statistical sense, it can be considered that the rainfall in Meiyu period has a direct impact on the flood disaster events.

Firstly, Eviews software is used to test the stability of rainfall in Meiyu period of each station, and the test results are shown in Table 4. It can be seen from the table that after ADF test, the p value of each station is far less than 0.05, and after checking, the T value of each station is less than the critical value of 1% significance level. Through the test, the original hypothesis is rejected, so the rainfall data of each station in Meiyu period are stable time series under 1% significance level as shown in Table 5.

The prediction results of most stations are good, but the prediction results of some stations and years are not good. On the whole, the prediction method can reflect the actual rainfall situation.
Discussion

Forecast and analysis of rainfall meteorological conditions

The more the rainstorm days, the greater the overall rainfall and the more serious the flood. The R/S analysis shows that the total sequence of flood index of Jinhua station in the future Meiyu period will show a significant downward trend, while the total sequence of flood index of other stations in the future Meiyu period will not show a significant downward trend (Ahmad et al. 2018). From the change of flood index series reaching partial flood level or above, it can be seen that the flood index of Lin’an and Yiwu stations in the future Meiyu period will be consistent with the historical change trend, and will continue to rise insignificantly (Divya et al. 2015); the stations in Chun’an, Shengzhou, and Quzhou will be opposite to the historical change trend, thus showing no significant increase trend; The flood index series of Hangzhou and Jinhua stations in the future Meiyu period will be opposite to the historical trend, showing a non-significant downward trend (Cui et al. 2004); because there is no significant trend of the flood index change in the historical Meiyu period of Shangyu station, it can be judged that there is no significant trend in the future. In the next 3 years, the rainfall in the western, southwest, and central regions of the study area may show an overall downward trend, while in the northern and northeast regions, except Shangyu, the rest of the stations may show an overall weak upward trend (Balkhair and Ashraf 2016).

Fig. 6 Spatial characteristics of Interdecadal rainfall difference during Meiyu period in northwest China
Risk analysis of big data financial management

Information security risk

In the network environment, due to the rapid development of network information technology, Internet finance is facing network security risks (Dogan and Ugulu 2013). In the online financial business process, criminals can easily use network technology to steal confidential information generated during the online financial business process, such as user passwords. If the password is leaked, the profit of users may be lost, which is not conducive to financial development.

Credit risk

The so-called credit risk refers to the risk of financial loss caused by the borrower’s overdue repayment of principal and interest. In the current social situation, financial demand...
is growing, financial institutions provide personal loans according to personal loans, but financial institutions usually do not have enough personal credit information. In terms of credit rating, this often leads to the situation that the funds are not returned on time, which is not helpful to the development of the financial industry.

Legal risk

Despite the vigorous development of China’s financial industry, the financial legislation has not yet been finalized, and the restrictions and supervision on financial behavior are not deep enough. Due to imperfect financial laws and regulations, many criminals use legal loopholes to cheat, disrupt the financial market, and threaten financial development.

Capital risk

In modern society, the Internet is used more and more frequently in economic activities, and the Internet has the characteristics of virtuality. If you rely on the Internet for financial services, the information on the Internet may be incorrect. For example, when a company applies for a bank loan, it may use the Internet to create false information. If the bank does not perform its duties, if the company goes bankrupt, it will be difficult to repay the loan, resulting in the loss of bank funds.

Table 4 Test parameters of rainfall stability in Meiyu period of each station

| Site | t statistic | Prob. |
|------|-------------|-------|
| L    | −6.83093    | 0     |
| Hangzhou | −5.36035 | 0     |
| C    | −4.766859   | 0.0003|
| J    | −5.154213   | 0.0001|
| S    | −4.964648   | 0.0002|
| Z    | −4.821224   | 0.0003|
| Y    | −4.781162   | 0.0003|
| G    | −5.394897   | 0     |

Table 5 Actual and predicted rainfall values of each station

| Site | Actual/predicted value | 2018    | 2018    | 2020    |
|------|-------------------------|---------|---------|---------|
| L    | Actual value (mm)/forecast value (mm) | 633.9/625.1 | 415.8/411.0 | 403.4/407.8 |
| c    | Actual value (mm)/forecast value (mm) | 680.3/571.6 | 361.9/285.8 | 384.7/360.3 |
| J    | Predicted value (mm)/actual value (mm) | 442.1/680.7 | 409.9/504.5 | 541.6/542.9 |
| S    | Predicted value (mm)/actual value (mm) | 685.0/525.2 | 418.7/433.2 | 436.4/352.1 |
| Z    | Actual value (mm)/forecast value (mm) | 529.0/487.2 | 365.3/361.8 | 528.2/507.1 |
| Y    | Actual value (mm)/forecast value (mm) | 603.7/551.6 | 388.8/405.1 | 528.1/550.8 |

Big data financial management challenges

Lack of shared data platform

With the improvement of people’s living standards, the financial demand also increases. No matter how perfect the financial institutions are, they cannot meet the personal financial needs of many users. At present, most of the information about the data of financial institutions is relatively confidential, and there is no effective communication between financial institutions, so the exchange of financial data is impossible (Liu et al. 2005). Failure to exchange financial data will increase the cost of financial activities and, in serious cases, increase financial risks.

Inadequate financial services

Finance is a service industry, and the quality of service directly determines the image of financial institutions in the hearts of customers. For financial institutions, the traditional financial service concept they adhere to can stabilize their customers while maintaining close contact with customers. However, in the era of big data, information flow is more free, and people’s choice is more free. In this case, financial competition will inevitably intensify. In this competitive environment, customers attach importance to financial services and focus on financial institutions with higher quality financial services. But at present, the financial services of financial institutions are relatively narrow. The scope of financial institutions is mainly large enterprises and state-owned enterprises, and the services for small and medium-sized enterprises are narrow. Small- and medium-sized enterprises have difficulties in financing, but they are also an important force in social and economic development. If financial institutions cannot provide financial services for SMEs, it will inevitably hinder their development.

Talent problem

The era of big data also puts forward higher requirements for employees of financial institutions. The application of big data
needs special data processing technology and data analysis method to improve data accuracy and provide scientific data link for the development of financial industry (Naser et al. 2009). However, the financial industry is still lack of professional big data talents, and the existing talents cannot meet the needs of big data processing. Due to the lack of professional skills of employees in financial institutions, data distortion will occur in the process of data processing, which cannot promote the development of the financial industry. In addition, for many financial institutions, there is no higher human resource treatment, which will lead to the loss of human resources, thus affecting the development of the financial industry.

**Big data financial management strategy**

In the era of big data, the value of data is gradually used, and the use of big data technology becomes more and more common, and big data has gradually become the main element of financial industry competition. However, big data technology, as a double-edged sword, not only accelerates the development of financial industry, but also puts forward higher requirements for financial industry. If the financial industry wants to develop stably and sustainably, it needs to follow the steps of big data age, innovate demand, and respond positively.

**Accelerate the pace of data acquisition**

In the era of big data, data is the main element of competition among financial institutions. Mastering scientific and comprehensive data is the key to financial activities and financial product research and development of financial institutions. Banks are now starting e-commerce, and banks need to obtain direct data to succeed in e-commerce (Qadir et al. 2015). Therefore, it is necessary to speed up the data collection in the process of financial institutions development. In the process of developing financial business and promoting financial products, it is necessary to collect data comprehensively, analyze data comprehensively, and extract valuable things.

**Attach importance to the application of big data technology**

In the era of big data, financial institutions need to process more and more data, which is the core of financial business. Ensuring data accuracy can lead to better financial business development. In order to ensure the accuracy of data, big data technology must be used. Big data technology has the characteristics of high efficiency, high quality, and high performance. Big data technology replaces the traditional data processing method and improves the efficiency of data processing and financial services. We can provide links to scientific data for development. In addition, financial institutions can use big data technology to create integrated database, realize financial transactions, and integrate customer information into the database, so as to better meet the financial needs of customers.

**Improve the credit evaluation system**

The development of Internet financing has stimulated financial activities. Although it is more convenient for market players to raise funds under the Internet financing mode, Internet financing also has risks. Social credit system is an important way to evaluate a person’s reputation in society. By speeding up the establishment of social credit evaluation system, we can effectively avoid the risk of online financial reputation, although we need to speed up the establishment of credit system, improve the market-based credit rating system, and realize the name system on the Internet. But we must be able to do this, using the Internet to assess the reputation of market participants, and fully understand their reputation, in order to reduce reputation risk.

**Improve relevant financial laws and regulations**

China’s financial laws and regulations are still being improved. In the imperfect legal environment, the violation of laws and contracts in China’s financial market is becoming increasingly serious. Therefore, in order to promote the rational development of big data finance, relevant departments will accelerate the improvement of relevant laws and regulations. Develop big data finance, create a supporting environment for it, revitalize China’s financial market, and provide better services for economic development.

**Strengthen the cultivation of professional talents**

The development of big data financing is inseparable from professional financial talents, but at this stage, the development of China’s financial industry is facing bottlenecks, and the shortage of professional talents makes it difficult to effectively develop big data. Therefore, in the development of big data financing, it is important to strengthen the development of professional financial personnel. On the one hand, it will strengthen the training of existing financial talents, consolidate the demand for big data, and provide financial training to continuously improve the professional ability of existing financial talents. At the same time, we will introduce professional financial personnel to provide better services for financial development.
Conclusion

This paper provides the software demonstration, structure design, connection between peripheral module board and microcontroller board, hardware experiment and main module software driver development, typical application example development, etc. The work plan is well completed. The development of big data finance has many times characteristics. For the financial industry, data is the core of financial development. Only by mastering a data can we further accelerate the development of financial industry. However, with the development of big data finance, there are many challenges, which seriously restrict the development of big data finance. Therefore, in order to promote the sustainable development of big data finance, it is necessary to expand the use of big data technology, do well in risk management, improve financial rules, strengthen the training of professional financial personnel, and provide guarantee for the development of big data finance.

Declarations

Conflict of interest The author declares that he has no competing interests.

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