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Research and Development of Braille Translation Kit with Hardware Output

Xu Qingqing,Lu Xueyi,Zhu Anhong,LiuLi

School of electronic information,Jiangsu University of Science and

Technology,China Jingkou District of Zhenjiang city of Jiangsu Province Meng Xi Road No.2

Abstract:

Blind people are the vulnerable groups that need attention. According to the survey,the education level of the blind people is generally low, so it is imperative to raise the cultural literacy of the blind people and grant them equal rights to education. In addition,due to the small amount of available Braille resources and the over-publishing of publications, it has caused a lot of inconvenience to the blind readers. Taking the attention of blind reading as the starting point, this project aims at provide easy access to reading materials for visually impaired persons and give them better access and online resources to study. The project plans to develop a Braille scan suite that enables translation, haptic output and real-time printing, based on a study of the basics and translation needs of Braille and API graphic translation algorithm.

Keywords:Braille;graphic translation;API; real-time printing

1 Introduction

Based on the statistics of the state authorities, China is one of the largest country withthe largest number of blind people,accounting for about 18% of the world's total blind people[1].With the rapidly development and progress of society, many blind people have the opportunity to enroll in the university to receive education, for this reason the educational levelof disabled students is also increasing.

Nevertheless, the whole situation of blind's right is not optimistic. Althoughin the course of plenty of instances, professional translation is significant,it is impossible for all people to master the skills of Braille writingdue to a few constraints.As we all know, a good education is an asset we can fall back on for the rest of our life[2], but even worse, Braille translation practitioners make up a very small portion, which makes blind education be caught between a rock and a hard place.

The blind touch blind spots in books to read which exactly are generally 25 × 30 cm size specifications with many uneven blind spots in the designated paper[3].However,a thin book,if printed with Braille,the volume and thickness will increase by 10 times resulting from the particularity of Braille.

When a book contains about 80,000 words is translated into Braille, the thickness is up to about two or seven hundred centimeters. In the meantime, with the high price of Braille paper, time-consumingproofreaderand complex printing process and other factors,the priceof such productions is correspondingly going up[4].

Accounting for these, it stands to reason that the cost of Braille publications is several times higher than that of general publications. Consequently, even though the works translated into Braille do not need to pay premium, royalties, etc. to the author[5], the price of Braille publications is still considerably prohibitive which aggravate the economic burden of the blind. It can be said that special education is more dependent on technology than general education[6].

Taking all situations into account, based on the development of an API-based graphic translation algorithm, the project realizes the function of converting Chinese and English images or PDF files into Braille, and real-time access to information for visually impaired groups.

2 Market analysis

2.1 Market demand

At present, the variety and number of Braille publications in our country are very scarce[7].Because printing on Braille books requires special workmanship and high demands on paper and printing technology, it is not only cumbersome but also bulky compared to ordinary books. Braille books, high prices, large size, less variety, resulting in difficultyin finding traces of bookstores throughout the country. Braille books, for example, have specific consumer groups, most of whom have a lower standard of living and no purchasing power. To

this end, the Braille Society generally low-cost sales, making buckle and tongue hard to meet, only to reduce the number of books.

As a result, the number of varieties of Braille publications in our country is seriously insufficient. Starting from the first Braille book "Who is the cutest person" in 1953, there are now more than 6,000 kinds of books and periodicals in all kinds of braille that are far from satisfying the ever-increasing demand for reading of blind readers[7].

With the development of social information technology, the limitation of Braille information service has become a more prominent social problem. The key to solving this problem is to vigorously develop and popularize Braille information. To be precise, the construction of an easy-to-use Braille Information Platform provides dedicated accessory tools for the blind to provide a decentstandard of working, learning and living and to facilitate the spread of knowledge between this special group and tokeep abreast of social dynamics.

2.2 Targeted market

Blind teaching aids should be devoted to promoting the development of special education, helping special education practitioners to quickly create various kinds of teaching materials, update education resources in a timely manner, change the plight of shortages of previous educational resources, and improve the quality of special education in a broad sense. To a certain extent, it eventually meets the blind desire for knowledge, helping them to understand social trends and better integrate themselves into society so as to achieve the vision of promoting the development of education for the blind.

3 Market competition analysis

3.1 Domestic Braille Translation Status Quo

Braille translation is based on the Braille point, spelling grammar, the Mingyan language into Braille, or Braille translated into a clear-eyed behavior. Because each country has its own Braille, there are a wide variety of Braille translation software. Through the survey, we found thatChinese Braille is similar to Chinese Pinyin(each syllable is written with up to three Braille characters (known as cells), respectively representing the initial, final andtone[8])thatgenerally accessible Braille translation refers to both Chinese-English translation and blind-blind translation, and requires a braille translator with good professional knowledge and long-time Braille experience to complete higher Quality Braille translation work, and the braille translation process needs people to do it manually. The current software has a high probability of error in Braille's special grammar, participle break, polyphone recognition, and humanity.

3.2 The same type of hardware equipment at home and abroad

Currently, there are already some similar peripheral hardware devices on the market. Braille display is one of them. Braille display or Braille terminals, Braille displays, are electro-mechanical devices that output in Braille. In general, the device achieves dot matrix performance by drilling holes in a flat surface. With the help of this device, blind users who cannot use the usual display devices can read the text as well. In addition, there are ways to use screen readers and speech synthesizers. Visually impaired can choose their own convenience device from two different ways.Braille display machineconsists of two groups of three keys and blank keys formed similar input device and Braille display device similar to the current output device is composed of the use of QWERTY keyboard, or special input and output of the machine. In 1951, David Abraham, a former Perkins blind school woodworker, developed the first portable braille terminal. In 2000, the National Institute of Standards and Technology developed a Braille display based on a whirlpool. ASK Japan developed in 2003 ASK turn is a disc braille display.

3.3 Domestic printing equipment in general

A long time ago, Braille printing technology already existed in the market, however, the process was complicated and inefficient. With the development of science and technology, Braille printing machines, Braille printers and other Braille printing machines have appeared on the market one after another.Taking into account the versatility of printing equipment, the printing equipment our work support is: general printers, 3D printers and engravers. The use of ordinary printers can be translated braille pictures easy to save and spread. The use of 3D printers or engravers can quickly become Braille in-kind, to achieve what you see is what you get. It is very convenient for special education

workers to make teaching plans and carry out educational work. At the same time, its wide range of applications, the correct rate, easy to operate, even if there is no braille-based ordinary people, you can quickly use.

4 System architecture

This project needs to reach the goal of translating the information on the webpage into Braille first and then outputting it through the peripheral hardware. At the same time, it is also required to output the translated image or document information by printing equipment such as printers and engraving machines. In the meanwhile, what has been developed by the project should follow the forefront of modern science and technology and reflect the intelligence and humanity. Therefore, The system is divided into four modules , the structure and flow chart are shown in Figure 1.

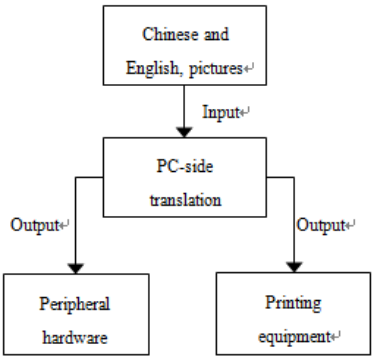


Figure 1. Structure and flow chart of the system

4.1 Image recognition module

This module will identify the text and picture in the input picture, so that the text and picture can be translated from text to Braille through translation software. This is a difficult point in the design, and there are many researches on image character recognition algorithms. In Braille reading, it is usual to transform the image into the corresponding text before the sample character image is classified according to the stroke, the establishment of the font, the image processing and transformation, and the feature extraction[9]. In order to realize the direct translation and real-time printing and output of picture to Braille, it is necessary to consider what kind of translation algorithm is used, so that the characters can be extracted into a character stream that can be used by the machine by using the corresponding character recognition technology.

4.2 Braille translation module

This module mainly solves the problem of translating the text which can be understood by ordinary peopleinto Braille. It directly translates the text by using the braille graphic translation algorithm to achieve efficient translation. The translation software adopts the Oxford program to translate Chinese and English images and PDF files directly into Braille which realizes the high rate of accuracy and supports proprietary protocol-based Braille peripherals.

4.3 Portable and effective Braille peripherals

Braille readers currently on the market are expensive, but taking use of 3D printing technology, this kind of Braille peripheralhas the ability to produce a mechanical contact with the international Braille standards and taking advantage of mechanical structure up and down movement to display Braille, additionally, according to MSP430F149 chip features, with four output devicesas a module to effectively control costs, users can also cascade modules as needed to improve the efficiency of information input. With the use of software, pictures can be translated into Braille and the output can be directly read and output in real time.

4.4 Physical output module

This module is a module not normally available in this kind of project. Through the connection of ordinary printer, 3D printer and engraving machine with the product, the Braillethat has been translated can be printed and output in kind so that the Braille information of the picture changes from one output of the contact to physical objects which can be touched to read at any time, is conducive to the Braille material preservation and circulation.

5 Key technologies and implementation of the system

5.1 Hardware implementation

After determining the various modules, we targeted the system host hardware platform for screening. In order to make the image be effectively recognized and can be seen directly through the display screen to identify the textand not only that, the text which is translated into Braille through the software should be output through the Braille peripherals, accounting for this, a chip which owns a perfect control ability is needed, so is a peripheral display, and a device

that is capable of interconnecting the Braille peripherals. In addition, the main control platform needs to be connected with a plurality of peripheral devices in a matching manner. Therefore, a chip with relatively abundant on-chip resources is needed.

The MSP430 family of microcontrollers is a 16-bit, ultra-low-power, mixed-signal processor with reduced instruction set (RISC) that Texas Instruments has been shipping in 1996. It has the advantages of strong processing power, ultra-low power consumption, abundant on-chip resources and convenient and efficient development[10]. Accordingly, this design selects MSP430F149 one-chip computer as the main control chip, and the LCD12864 display screen to carry on the image to the text change demonstration and the electromagnetic relay to contact the main control platform and the mechanical contact, the hardware implementation flow chart is shown in Figure 2.

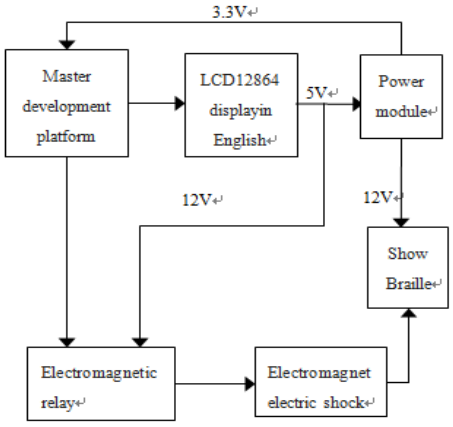


Figure 2. Hardware implementation flow chart

Through the chip call LCD12864 real-time display to be translated in English. On the other hand, according to the Braille database, each text is compared with the Braille, and the result is fed back to the main control platform. The main control platform controls the electromagnetic relay accordingly, so that the electromagnet contacts in the corresponding positions of the Braille peripheral move up and down, letting corresponding braillebe sensed by users through touching the iron contacts. In order to make the electromagnetic relay realize the function of control the corresponding contact during operation, the lower part of the contact is designed as a bevel, the mechanical structure is shown in Figure 3. With the main control platform connecting with the printer, physical output of Braillecan be achieved.

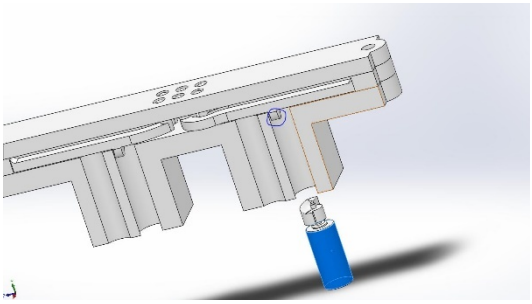
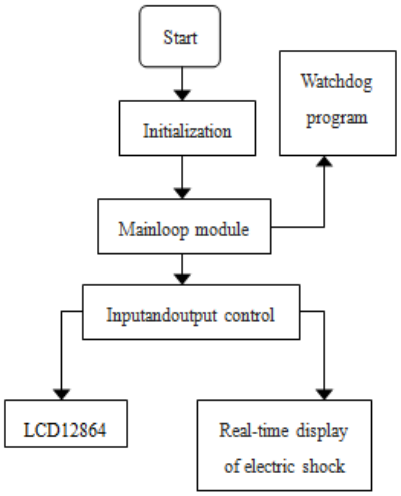


Figure 3. Mechanical structure

5.2 Software implementation

Due to the high real-time control ability of requirementsof the system, it is selected in the IAR5.30 software environment, making use of C language programming, and the design of the software employs ideasof cycle + interrupt programming.Appropriate ideais used to meet the demands of programs that require different real-time demands, making the software more efficient operation. In the main program, orderly cycle less demanding real-time programs; in the interrupt program, the implementation of real-time requirements of the higher procedures is realized. Program uses modular programming ideas, "high cohesion, low coupling," easy to transplant and modify programs, high readability. Software implementation flow chart shown in Figure 4.



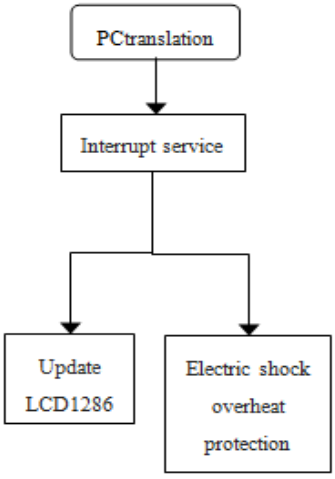


Figure 4.Software implementation flow chart

After initialization, system will enter the main loop module for input and output control, including LCD liquid crystal display and mechanical contact real-time display. By achieving communicationwith PC-side translation software, mechanical contacts can display Braille content in real time. Not only that, taking into account the case of system crashes, the main loop module also controls the watchdog program, when the system go into the wrong state cannot be restored, the system restarts to prevent the system into an infinite loop to prevent the program break down. Using PC translation software to control the interrupt service module to update the LCD so that the LCD12864 screen can display the Chinese and English corresponding to the mechanical contacts in real time. In addition, the module can be used to monitor the contact temperature to prevent overheating.

5.3 Braille translation

The realization of the technology is based on the Oxford Project API which has a unique braille graphic translation algorithm, web crawler is also used to translate independently, improving the translation accuracy and the fault tolerance rate.Taking use of the distributed architecture to carry out data mining and processing. As a result, Large and decaying issues can be figured out, so that barriersbetween different languages and platforms are no longer blockthe exchange of systems and improve the efficiency of the program in dealing with the transition between plaintext and Braille, in the consequence, the Braille in the database can be called more convenient. Utilizing distributed database storage to reduce equipment prices and maintenance costs. Applying the use of virtualized cloud storage technology to continuouslyupdate the Braille database and make sure that data will not lose even if errors happen in the system.

6 Conclusion

This projecthas basically realized the pursuit of the function: convert the paper image and text data into electronic pictures by scanning, or directly upload picturesfrom the Internet or local position orinputtext. Translation functioncan be achieved through the Oxford program API based software algorithms,combined with the self-built simple database. The peripheral hardware device to display the Braille information for the blind to perceive. In addition, the external printing equipment can also be used to output braille information through the laser engraving anda miniature picture can be built by 3D printer which not onlyis easy to circulate, but also conducive for visually impaired blind people to read contents.

But due to our limited capabilities, it is still not yet possible to establish and improve the complex Chinese-to-Braille database. There are many experts discussing the establishment of Chinese-to-Braille database. With the help of prospective database and this technology, it won’t be long before virtually impaired people can have a better environment of education.

Reference

[1]Yao Liang,Yang Bing,Ma YuGuang. Progress in next-generation organic electroluminescent materials:material design beyond exciton statistics[J]. Science China(Chemistry),2014,57(03):335-345.

[2]KHADIJA M.Y.SOLYMAN. Multinational Corporations' Responsibility for Violation of Human Rights[D].China University of Political science and Law,2014.

[3]Feng Yang. Design and Realization of Static Important Object Recognition in Intelligent Environment Detection Guide Rod [D].Harbin Institute of Technology,2014.

[4]Liu YaJuan.Understanding and Practice of Visually Impaired Maths Teaching [D].Hunan Normal University. 2009:9-10.

[5]Zhang FuRong.A Study on Zhang Peiji's Translation of Modern Chinese Prose from the

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www.ijiset.com

Perspective of Translator's Subjectivity[D].Master's thesis of Xi'an International Studies University,2011.

[6]Yu WenJuan. Study on the Development of Teaching Technology in Special Education [D].Master's thesis of Beijing University of Posts andTelecommunications. 2015:1-2.

[7]Zhang YingDi, Zhang XiaoWei. Who cares about blind reading needs? [M]. People's Education Press. 2007:15-16 .

[8]Wang XiangDong, Yang Yang, Zhang JinChao, Jiang WenBin, Qian YueLiang. Chinese to Braille Translation Based on Braille Word Segmentation Using Statistical Model[J]. Journal of Shanghai Jiaotong University(Science),2017,22(01):82-86.

[9]Liu YunMan, Wang Lei. Research on Image Character Recognition in Blind Reader[A];2013 Annual Conference Summary[C];2013.

[10]Zhu PanFei. Design and Research of Control System of Electromagnetic Braille Point Display Device[D]. Master's thesis of Zhejiang University of Technology,2015:12 -24.