About Barcode Technology
Case study: Computerization of a Library

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Abstract

Access to information and knowledge is fundamental to the education and development, and also a prerequisite requirement for improving the quality of life for people living in regions where the population has not yet reached a high level of economic and social development .Libraries play an important role in education and research .A computerized library can considerably reduce the overall costs of the library and librarian scan stream line efforts and economic institution.

The main purpose of the paper was to present an overview on barcode technology with application in the computerization of a small library.

Computerization should not be regarded as an alternative to traditional library or option, but as a necessity, because it offers a lot of advantages for both the library and the librarians ,especially for users ,as services are more prompt and appropriate requests.

Key words: *barcode, electronic product code.*

Introduction

The barcode is a representation of data intended to be read on the optical path. Bar codes can be used in any society and in all industries and markets. A series of black bars on a white space give rise bar code, this code "optical Morse". The black bars on a white background are read and decoded using scanners that measure reflected light and interprets the code into numbers and letters and send them to the management of a computer that interprets and displays the message encoded in the barcode. Due to the multiple formats of barcodes it was reached that a scanner to recognize several linear and two-dimensional formats. If symbology is relatively unique, the composition of a barcode varies from format to format. For example, all the bar codes are the X and Y axis and X axis are orthogonal to the size of the bar code's axis X that is the length code. All bar codes have a character of start / stop that allows reading from left to right and from right to left. By convention, the character to the left is considered the start characters and the character to the right is considered the stop character. In essence, barcodes are a set of symbols used to represent alphanumeric information, so that instead of the number "1" or the letter "A", you will see a string of bars, thin or thick used to represent therefore the number or letter.

A barcode reader uses an optical sensor to convert barcode into an electrical impulse, as the fascicle passes over the code. Then, the reader measures the relative thickness of the lines and

spaces encountered, decode these sequences, and transmit them to a computer or portable terminal [8].

The Advantages of Using Barcode Technology

One of the obvious advantages of this technology is to increase operational efficiency because the bar codes allow fast and highly accurate registration information, data processing and a very quick identification. The time spent to find the location or development of certain projects, files, tools or books decreases obviously. Bar codes can one help keep a better track, enabling to respond promptly to any requests or changes that may occur.

Another advantage is the reduction of the time which, depending on the field of application of the bar code technology, is significant. A good example of this is the preparation of the inventory. Normally, to do the inventory for a period of six months, there are required 25 employees who work during a whole week; using bar codes, there are only required four employees who work only 4-5 hours. Even in the daily routine operations, lowering their allocated time by using barcodes increase and improve productivity. If we consider a shipment containing 10 packages, writing codes and series takes at least two minutes, compared to the time it takes to scan their barcodes that is 10-20 seconds. Extrapolating these data to the operation of a larger scale, this seemingly in significant reduction of time becomes all-important.

Barcodes are very effective tools that can be used to locate specific problems within an organization or can be integrated into corporate information systems. If used on a well thought out plan, which will result in a significant reduction of time spent in operations for which they were designated.

When using this technology in a library, generally obvious benefits are those related to reducing the time to lend books so that accessing information is much faster. It also benefits the overall system efficiency of the library collection by allowing fastest information on a borrowed book and penalties that a student has to pay for a late returning of the book.

Barcode Technology

Symbols and symbolism

Barcode symbolism is defined by the technical details of the types of barcodes i.e. line width, char set, encoding method, details of digital computer control. Therefore, based on this premise we share barcodes into 3 categories : *numeric only barcode* (EAN-13: International Barcode retail product "European Article Numbering", EAN-8 barcode compressed version "EAN" product-specific small, UPC-A: Universal product code seen on almost all retail products in the U.S. and Canada, UPC-E: compressed version barcode "UPC" product specific small),*alphanumeric barcode* (Code39: barcode general purpose use throughout the world, Code 93: type of compact barcode similar to "Code 39", Code 128: barcode effective with excellent density, very reliable used throughout the world), and *dimensional bar codes* (PDF417: excellent barcode for encoding large amounts of data, Data Matrix: barcode that can support large amounts of data concentrated in tight spaces, Maxi Code: Barcode fixed length used by United Parcel Service for automatic sorting of packages, QR Code: Barcode used for materials management and confirmation of orders, Data Code, Code 49)[5].

Reading barcodes

Barcodes are read and decoded using scanners that measure reflected light and interprets the code into numbers and letters and send them to a computer for management. Depending on the technology used to measure light reflectance, there are several reading technologies.

Barcode readers with LED

One-emitting diodes illuminate a small part of a barcode and a photocell measures the amount of reflected light. As the LED and photocell is moved along a bar code, a pattern composed of lines and spaces is captured and decoded. In the case of a reader in the form of a rod, the light is focused by a transparent bead located at the top of the reader; to read, the user must pass the baton over to a bar code. Generally, rod-shaped tip reader must reach surfaces printed with barcodes. Readers slot looks like the credit card reading; in this case, the LED and photocell are fixed, the reading being made to pass through the slot surfaces printed with barcodes [4].

Readers using CCD technology

The name CCD comes from the Charged-Coupled Device; it refers to a single row of photocells on a single semiconductor chip. Unlike the case of a single photovoltaic cell that can only see a part of the barcode, a CCD reader can see the entire bar code at once. The bar code is illuminated by a line of light-emitting diodes incorporated in the reader, like in figure 1.
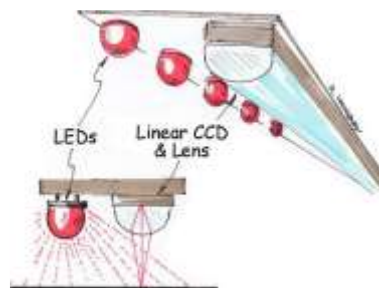

Fig. 1. CCD technology

CCD scanners are available in two-dimensional models; these types of readers are like miniature cameras and can capture a two-dimensional image (a square). This type of reader is often called "Imager" and is used for reading two-dimensional barcodes that "PDF-417", "Data Matrix" or "Maxi Code" [4].

Readers laser technology

Laser scanners use a single read headphone to illuminate the barcode and a single photo detector for receiving light reflected. Most of these readers swing the laser beam horizontally using an electronically controlled mirror. Laser scanners are fast and accurate and can often read denser barcodes that can be read using other technologies. The first advantage of a laser scanner is the working distance; as the laser beam diverges very little with the distance, readers of this type have a working distance in the range2.54cmand30.48cm. Increasing the laser power and beam sharpening angle rocking, special readers can read barcodes from considerable distances (9-12cm).
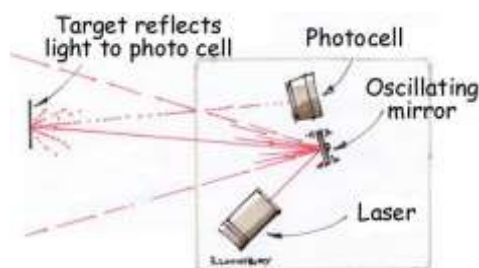
Fig. 2. Laser technology

Since the beam is balanced horizontally at a fixed angle, length barcode that can be read increases with distance; if a barcode is too flat for the laser beam, then the reader has little removed from the barcode (figure 2) [4].

Image capture

By using special software for decoding, it is possible to read the barcode from a digital image that was scanned by a common scanner of documents. It would be a very slow and awkward barcode reading, but it is excellent for applications where documents are scanned into the computer for archiving and whether documents can be identified by a bar code, the software can index automatically the image of document using data from barcodes [4].

Printing barcodes

In order to decode a bar code, one has to first print it on paper which will later be attached directly on the product or put on the product. For this, there have been developed two specialized printing methods: direct thermal printing and thermal transfer printing.

Direct thermal printing technology: involved the manufacture of thermal label made of paper or from synthetic materials tempered that blacked when heated. A drum pulls labels and pressed them on the head writing containing mini heating elements arranged in line. The processor integrated in the printer activates and deactivates elements to form the image on the label.

Thermal Transfer Print Technology: thermal transfer printing is done by a thermal printer; its print head consisting of 200 to 600 per cm linear thread like heating resistors that produce heat. They are covered by a "shell" or coating that protects it from damage when the ribbon comes into contact with the heat.

Types of Barcode Interfaces

The modern barcode readers operate in wireless networks using IEEE 802.11(WLAN) and IEEE 802.15.3 (Bluetooth) protocols. Battery (rechargeable or not) is what determines the duration of operation of a scanner. Usually, a battery lasts for8 hours (a work shift). Most barcode reader uses cables PS/ 2 or USB to connect to the host**.** The scanners are equipped withRS-232 connectors. Most common resolution among scanners is 13mil (0.3302mm). [5]

Keyboard Wedge~ PS/ 2 (keyboard serially)-the reader is connected between the computer and keyboard using a Y-cable. Data from the reader appear in the computer at the place where the keyboard prompt is as if it were entered manually. This type of interface is used for independent applications, as long as you do not need to install any other software module.
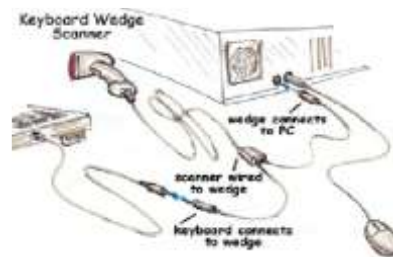
Fig. 3. Keyboard Wedge ~ PS/2 connection

Serial/USB- data from the reader is transmitted to a computer serial port. The software should have provided a way to capture data from serial port**.** As data is transmitted on channels other than those introduced by the keyboard, the application can directly control the data to be accepted at that source; this can be beneficial to production tracking systems where error checking is vital. [5]

Mobile readers with small radius known as short-range RF readers – include basic RF communication that connects the serial port with general computer keyboard. Usually, the reader sits on the basis of communication, which also serves as a charger. In order to scan, the operator raises the bar code reader and reads; acquired data are sent to the base and from there on to the computer. Such readers are excellent for an use in a given are around the computer, where a cable would be cumber some or even impossible to operate.

Fig. 4. Mobile readers

Portable terminals – this reader has, in most cases, the keyboard and screen, and can be programmed to guide the operator through the various menus and to assist in entering information. Some models are equipped with a keyboard, screen and are not programmable as desired to obtain very small reader (such reader is actually a curved-tip pen with a wand-shaped scanner built into the top). The data are stored in the reader, which can be connected to a server through a cable based communication or a data cable, thus realizing the transfer of data to the server. Overall, the data are transferred to a text file, separated by commas, to be easily imported into databases. [5]

RF portable terminals - This type of reader requires the existence of a mobile network. A central server is attached to one or more nodes of the RF (transceivers); the number of the required nodes depends on the size of the space that is intended to be covered. Also, the building properties can influence the RF transmission. One or more RF portable terminals communicate with the server on a continuous basis. Generally, these kinds of terminals have keyboard and display to allow the operator to obtain and transmit data to and from the computer in an easy form. In this equipment, one can install custom applications or can choose for each terminal variant part acts, as a workstation emulating a part of the existing application on the computer [5].
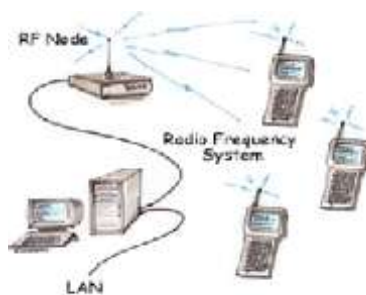
Fig. 5. RF portable terminals

Library Book Fund Management of ACE Department using Barcodes

"Library" is basically an information center, which extends the research areas to users belonging to the targeted segment, in our case students from the faculties of "Computers and information technology." It is an important aid to the students, but it especially helps librarians to substantially relieve their job, and also minimize their efforts.

The application is called "Library UPG" and is performed using *php, html, sql my admin* and *Wamp Server*. The application does not require large hard ware resources, being performed in order to beal so transfer red to another annex to the library without requiring the purchase of a new system performance in case of a longer exceed [2].

Software requirements are minimal; it requires only the existence of two software programs, namely: *WampServerVersion2.0*-needed to make the database and the application and *Mozilla Firefox version3.6.3*or higher –required for compatibility reasons.

Database design

The database contains 8 tables: table "*administrators*" that contains general information about those entitled to administer a database, table "*librarians*" which contains general information about the laws to achieve specific functions of a library (book lending, returning books, display the list of library books, etc.), table "*book*" contains information about the book, the ISBN being the most important (here are the positions of the book in the library for easy finding the book you're looking for), table "*sheet*" that provides a full view of the student (here there are retained information about all operations carried out by a student), table "*loan*" where is counted every successful loan (loan is automatically deleted from the table when the return is made), table "*penalty*", one of the most important tables because there are penalties imposed to students who were late returning the borrowed book, table "*return*" counts all returns that have penalty; other are automatically deleted, table "*student*" contains general information about the student [3].

Implementation code

The site contains PHP scripts to connect to the data base and also using HTML, CSS and some JavaScript. The code was designed using Notepad and calling on specialized sites from where the information was collected.

Fig. 5. Home page

Index (*home*) is the first page. This site adapts to user, in the sense that initially when nobody is logged the following buttons are active:

¬*Help* - initially offering help for both the administrator and the librarian. It is comprehensible to anyone.

¬*Useful Sites* - some useful websites about UPG.

If you log in as an *administrator*, then the first page provides other information:
¬*Help* - offering more advanced help for administrators. Home access is ajutor2.php.
¬*Staff* - indicate all employees, both administrators and librarians. Home access is personal.php.
¬*Useful Sites* - Some useful websites about UPG. Home access is siteuriutile.php.

If you connect as a *librarian*, then the first page provides other information:
¬*Help* –offering more advanced help for librarians. Home access is ajutor1.php.
¬*Useful Sites* - Some useful websites about UPG. Home access is siteuriutileb.php.

Administration librarian

Logout- performs log off and give the page *delogarea.php*;

Search–this option is most useful for the student librarian and because this option facilitates the search process for other libraries, it is done by looking that book through the library files. When a student comes to borrow a book, he first asks whether it is among the volumes of the library, if any, the librarian can direct him exactly to where it can be found, because it exists a field that contains information on the position of the book in the library (Row, shelf). A book can be searched by name, author or publisher. This search easier student job by showing the position of the book in question and the librarian who is forced to may search through there cords if any book or not. Home access is *cautare.php*;

Outstanding payments- it is an option offering special respect to the library from students because once get the name of a student here it means that he is not followed the law library. - What is the law? -It is a common sense law which encourages the student to return the book after 14 days of the loan, if it fails, and then it will be penalized 0.2% per day of the price of the book. The penalty comes in the library help because that can purchase with that money other educational materials eventually**.** Home access is *penalizareadminform1.php;*

Returns Book –Here is the book return, both for those that return a book on time, and for those who work late. As it was previously mentioned, a student must bring the book deadline by management to not be penalized. If the student brings the booking due time, then there turn and penalty in formation are deleted, leaving only the score sheet; if it is delayed, then it stays and return in formation and the penalty to pay up arrears. If the two fields are not filled in correctly, it will appear an error message "This loan does not exist." Home access is *returnareadmin.php*;

Loan book-Here is the loan. If the student has to pay the penalty, he cannot borrow a book until he pays the rest. If everything is correct, then the student can borrow a book without any problem. Fields must also be completed correctly because otherwise error messages will occur. Home access is *imprumutadmin.php*;

Home– it is the option to send to the home page *index2.php*.

Conclusion

The aim of this paper was to expose the advantages of modern computer-based library management barcodes, how can it expand library services and how to provide library management in ways that can keep a strict record of inventory and the books borrowed. At the same time, this system can better facilitate active collaboration between the two sides: the student and the library, harmonizing the interests of both of them. Considering method of design, implementation and testing of this type of application, the hardware resources, software, time, the human and material are reduced. It may be considered that this project will become a platform to promote the development of students' communication skills and meet their educational needs, in a world that is currently facing the media content.

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Despre tehnologia codurilor de bare. Studiu de caz: Administrarea fondului de carte al unei biblioteci

Rezumat

Prin intermediul acestei lucrări a fost realizată o prezentare a avantajelor sistemului informatic modern de gestiune a bibliotecii bazat pe coduri de bare, modalităţile în care acesta poate extinde serviciile oferite de bibliotecă şi cum poate să ofere conducerii bibliotecii posibilitatea de a ţine o evidenţă strictă a cărţilor din inventar şi a celor împrumutate. Totodată, acest sistem poate facilita o mai bună colaborare între cele două părţi active, pe de o parte biblioteca, iar de cealaltă studentul, armonizând interesele ambilor.