

Design of Computer Bar Code Detector Based on Single Chip Microcomputer

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Abstract. Barcode technology is the technical foundation for implementing POS systems, EDI, e-commerce, and supply chain management. At the same time, it is also an important technical means for the modernization of logistics management. This design is based on ST89C52RC microcontroller, using YHDAAM100 barcode scanning sensor for data acquisition, and finally displaying barcode data through LCD1602 liquid crystal. This design realizes the scanning code function under the condition of extremely low cost. The device is small in size and low in power consumption. Not only can it be used in portable barcode acquisition applications, but also has broad application prospects.

Introduction

This design uses STC89C52RC MCU as the main control chip of the system. The barcode scanning code module adopts the finished product YHDAAM100, the data imaging side adopts LCD1602 display screen, the communication between the scanning code module and the single chip microcomputer is realized by MAX232 circuit, and finally realizes 16-bit barcode. Accurate identification[1].

The Working Principle of the Bar Code Acquisition System

Principle of barcode encoding. The barcode used in this study is a one-dimensional barcode. Its encoding principle is to convert some strings (that is, a combination of numbers and letters, such as A1247C) into a strip and a space-spaced pattern. The purpose of the label printed by the printer is to implement a process of converting strings and barcodes, which are recognized and converted into a string by a scanning device. The MCU is responsible for analyzing this process, and performs corresponding hex conversion on the string[2]. After a series of logic processing, it is transmitted to the display device through high and low levels, thereby obtaining barcode encoded data.

Principle of barcode decoding. First of all, the bar code is composed of a row of regular symbols, and some "bars" and "empty". In the physical explanation, the "bar" represents the part that absorbs light more strongly, and the "empty" refers to The part that absorbs the light more is precisely because of the arrangement and combination of these "strips" and "empty", which makes them extra valuable in the storage of information. The widths of "bar" and "empty" are different, and the duration of the corresponding electrical signal is also different[3]. However, the bar of the bar code output by the photoelectric converter and the corresponding electric signal of the space are generally only about 10 mV, which cannot be directly used, so the photoelectric must be used first. The electrical signal output by the converter is amplified by an amplifying circuit[4][5]. The amplified electrical signal is still an analog electrical signal. In order to avoid the error signal caused by defects and stains in the barcode, a shaping circuit is added after the amplifying circuit to convert the analog signal into a digital electrical signal. It is ultimately converted by electronic devices into binary code that the computer can recognize[6].

Scanner internal structure and working principle. The internal structure of the barcode scanner is mainly composed of the following parts: an optical scanning circuit, an amplification shaping circuit,

a decoding interface circuit, etc., when the light emitted by the barcode scanner light source passes through the lens 1, it is irradiated onto the barcode, and the reflected light passes through another lens 2. The focus is irradiated onto the photoelectric scanning circuit, and converted into a corresponding 0,1 digital signal by the amplification shaping circuit[7]. The decoding circuit converts it into corresponding digital and character information according to the corresponding coding principle, and sends the data to the STC89C52RC MCU through the interface circuit. Processing and management, the process of barcode recognition is completed, as shown in Figure 1.

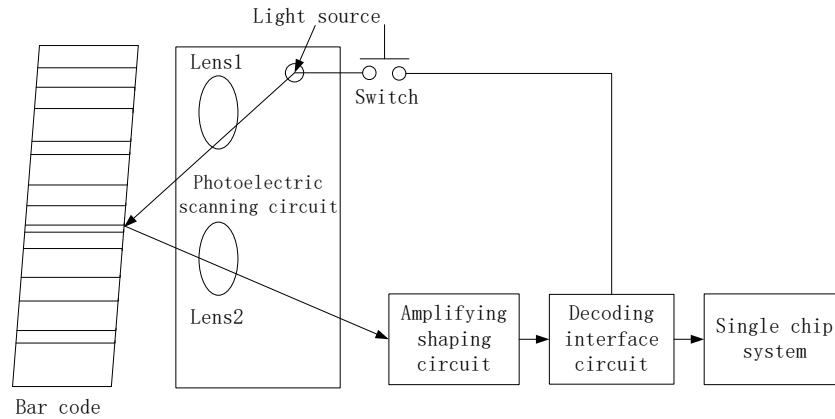


Figure. 1 Scanner internal structure diagram

The Overall Design Plan

This design is based on 51 single-chip microcomputer using STC89C52RC microcontroller as the main control chip, LCD1602 liquid crystal as the data display part, YHDAAM100 barcode scanning module is the scanning special sensor[8]. The overall hardware block diagram is shown in Figure 2.

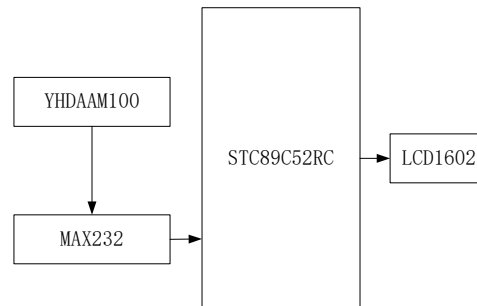


Figure. 2 Overall hardware block diagram

After each module is powered on, the scan code module faces the barcode and decodes it. The data is transmitted to the single-chip microcomputer through the serial port. After the data processing by the single-chip microcomputer, the type of the code and the included data are displayed on the LCD1602 liquid crystal. The entire system is simple to use, compact and accurate, and fast in response.

The Hardware Circuit Design

The P0 (P0.0-P0.7) of the STC89C52RC MCU is connected to the (D0-D7) pin of the LCD1602 liquid crystal display. In this circuit, a pull-up resistor is required, and P3.0, P3.1 and MAX232 chip are connected. Circuitry, 13 (R1IN) and 14 (T1OUT) of the MAX232 circuit are respectively connected to pins 7 and 8 of the 9-pin of the scanner, and pins 18 and 19 of the STC89C52RC are dedicated to the external crystal. Crystal oscillator circuit connection. The 9th pin of the STC89C52RC is a reset circuit dedicated pin (REST), so it is connected to the reset circuit. The

download interface circuit is connected to the P3.0 and P3.1 pins of the microcontroller. The overall circuit design block diagram of this design is shown in Figure 3.

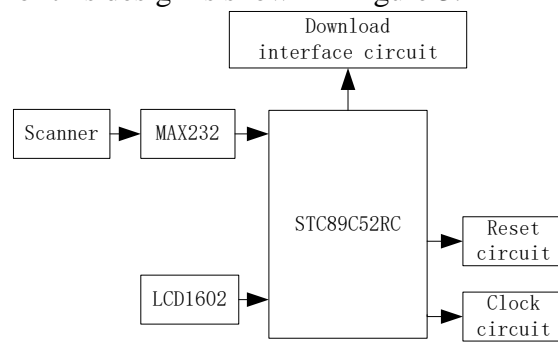


Figure. 3 Specific circuit design block diagram

Software Program Design

This program uses C language programming, Protues software simulates the hardware, and finally burns the single chip through STC-ISP, and finally completes the software design of the whole system. The overall program flow chart is shown in Figure 4.

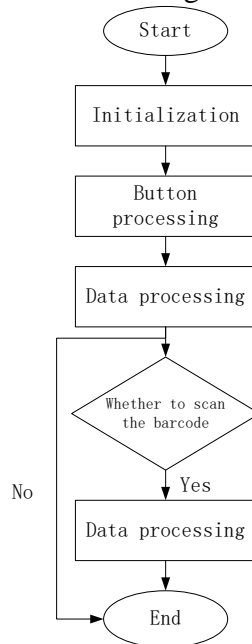


Figure. 4 Software Flow Chart

The program mainly consists of three major components: the button processing part, the data part, and the display part. After the power switch is pressed, it is responsible for detecting the program control and starting normal operation. The button processing part determines whether the button is pressed by the high and low level mode[9]. If the button processing part judges to press, the data processing part analyzes whether the bar code is scanned, and the scan is performed. After the photoelectric scanning circuit, the amplification shaping circuit and the decoding interface circuit of the encoder are converted into binary codes that can be recognized by the single chip microcomputer, the program processes the data according to the preset judgment value, and then controls the high and low levels through the binary code. The mode is output on the display device.

System Testing and Results Analysis

Connect the scan code module to the 9-pin connector on the PCB. After the system is powered up using the conventional USB interface, the YHDAAM100 module starts working. The YHDAAM100 barcode scanning module is used to scan the barcode (6938706207758). The LCD1602 display is displayed in two lines. The line displays the barcode data type and the second line displays the barcode data characters. When the scanner scans the barcode with the barcode of 6938706207758, the display device can also be displayed completely and correctly, achieving the purpose and requirements of the design[10].

Conclusions

In this paper, a large-scale and inconvenient problem of the connection between the barcode scanner and the PC is proposed. A design scheme of a portable barcode acquisition device based on single-chip microcomputer is proposed. This design is based on YHDAAM100 barcode acquisition module for data acquisition, data processing through STC89C52RC, LCD1602 LCD display barcode data. Through the testing of the bar code acquisition system, the display device can be displayed without errors. This design realizes the scanning code function which is not constrained by PC, and has the advantages of small size, low cost and low power consumption, and has certain application prospects.

References

- [1] QinH, Cong L, Sun X. Accuracy improvement of GPS/MENS-INS integrated navigation system during GPS signal outage for land vehicle navigation[J]. Journal of Systems Engineering & Electronics, 2014, 23(2): 256-264.
- [2] Koyama Y, Tanaka T. The high-precision measuring method for motorcycle trajectory using GPS[J]. ICCAS-SICE, 2009: 3961-3965.
- [3] Klaus Betre. Transmission Characteristics of Marine Differential GPS (DGPS) Stations [EB/OL].<http://www.nensch.de/>.
- [4] Massimo Banzi. Getting Started with Arduino. Edition 2. O'REILLY, Beijing. 2013.
- [5] Subhan F, Hasbullah H, Ashraf K. Kalman Filter-Based Hybrid Indoor Position Estimation Technique in Bluetooth Networks[J]. International Journal of Navigation & Observation, 2013, 2013(1).
- [6] Buck Rogers. AG-NAV 2 GPS/DGPS GUIDANCE SYSTEM. Ag Pilot International, 1997, 20(3).
- [7] Congwei Hu, Wu Chen, Shan Gao. Data Processing For GPS Precise Point Positioning. Transactions of Nanjing University of Aeronautics & Astronautics, 2015, 22(2).
- [8] Qadeer M A, Chandra A, Jain S. Design and implementation of location awareness and sharing system using GPS and 3G/GPRS[J]. International Journal of Multimedia and Ubiquitous Engineering, 2014, 7 (4): 125-140.
- [9] Dinkar A S, Shaikh S A. Design and Implementation of Vehicle Tracking System Using GPS[J]. Journal of Information Engineering and Applications, 2011, 1(3):1-6.
- [10] Leiek A. GPS satellite surveying[M]. John Wiley and sons, 2014:13-18.