



BUILDING OF BARCODE AND QR CODE READER DEVICE

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ABSTRACT: *This study focuses on building a QR and barcode reader device to scan the barcode or QR code (1D/2D) and display the read information on the Liquid Crystal Display (LCD). With this device we can scan and read all the barcode and QR codes through an OLED display. The proposed device can work in the dark, have a stable performance as well as fast decoding speed. It can easily capture barcodes 1D, 2D on labels, paper, and mobile phone or computer displays sensitively and accurately.*

KEYWORDS: Arduino, Barcode, Scanner, QR, 1D/2D.



INTRODUCTION

With the intention of developing symbols with enlarged capacity and reduced size, two-dimensional codes were invented as an advancement of the common one-dimensional barcodes. Different approaches can be classified into composite codes, stacked codes, dot codes and matrix codes. QR codes are a variation of matrix codes. Further advancements are 3D codes with the additional dimension colour-depth and 4D codes with multi-sequential display (Langlotz & Bimber, 2007).

Choosing a particular code type depends on the requirements of the application scenario. This paper will focus on QR codes, due to their technical advantages (i.e., combining positive characteristics of several code types) and degree of standardization. QR codes are similar to bar codes used by retailers to track inventory and price products at the point of sale. The significant difference between QR codes and barcodes is the amount of data QR codes can hold and share. QR codes have high encoding of data, small printout size, resistance to dirt and damage, readable flexibility, structured appending and high level of creativity (Garg & Singh, 2013). QR code is still considered a relatively new tool still gaining popularity in commercial markets; hence, scholarly articles of QR codes in the area of marketing are few. A significant contribution is that of Okazaki et al. (2011a; 2011b) who co-authored with other researchers and concluded in their study on the importance of increasing awareness and familiarity of QR codes and thus driving its user acceptance. The aim of this research work is to design and implement barcode and QR code reader devices using Arduino. With this device we can scan and read all the barcodes and QR codes through an OLED display.

REVIEW OF RELATED WORKS

Mobile Phone and Barcode Scanner (Mohanad Abdulhamid & Achiki Matongo, 2020)

The scope of this paper is basically to make a mobile phone application and how to interface the mobile phone to the scanner. The mobile application is to be developed in the Linux-based android platform. An algorithm based on the operation principles is also to be developed during the work. In the design, the android mobile phone is to be interfaced to the barcode scanner with the help of a universal serial bus (USB) cable. The USB is designed with the goal of being simple to use and with low cost of implementation. The USB is previously regarded as a high-speed serial bus. Serial configuration is generally preferred as compared to parallel configuration owing to cheap cables and easier.

A Review on QR-Code Based Ticket Booking System (Ravindra Jogekar et al., 2020)

The system enables the passengers to register for the metro tickets. It also enables the passengers to get the ticket within two or three clicks on their android device. The ticket checker scans the QR-code through the android application and accordingly validation will be checked through it. The proposed system also used the GPS for tracking passengers. It can view the upcoming station name while traveling in the metro.



Smart Shopping Using QR (Meenarshi Jangid et al., 2018)

This paper presents a proposal of a shopping guide service using smartphones as the carrier. The system developed was implemented using an Android application. In offline mode, the customer needs to scan the product which he/she wishes to purchase. The application mentioned here would read the scanned QR Code of the product(s) and add it to the shopping cart in the application.

ISBN AND QR BARCODE SCANNING MOBILE APP FOR LIBRARY (GRAHAM MCCARTHY & SALLY WILSON, 2011)

This article outlines the development of a mobile application for the Ryerson University Library. The application provides for ISBN barcode scanning that results in a lookup of library copies and services for the book scanned, as well as QR code scanning. Two versions of the application were developed: one for iOS and one for Android.

Barcode Reader Using the Camera Device in Mobile Phone (Hiroshi Hanaizumi, 2004)

This project describes the hardware system architecture for implementing the barcode reading system in mobile phones and its processing flow. The application processor is needed to implement the camera interface, LCD controllers for image processing and application host CPU for real-time computations. The application processor works for displaying the menu and preview in the display and computing code recognition and decoding in real time.

METHODOLOGY

Materials Used



Barcode and QR code scanner module



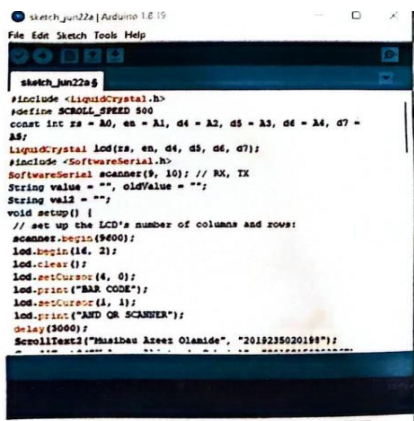
ARDUINO NANO



Liquid Crystal Displays (LCD)

PROJECT CONSTRUCTION

Construction of the project starts with sketching and designing. The barcode and QR device were worked on first by writing codes using Arduino Integrated Development Environment (Arduino IDE) as well as loading the firmware on the Arduino Nano board. A 6v, 2000ma power supply was designed for the project; this was because all units of the project required a minimum of 5vdc regulated power supply.



```

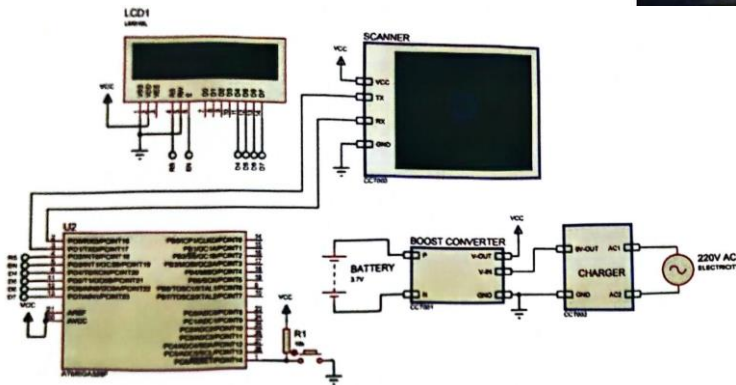
sketch_jun22a | Arduino 1.8.15
File Edit Sketch Tools Help
sketch_jun22a.g
#include <LiquidCrystal.h>
#define SCROLL_SPEED 500
const int rs = A0, en = A1, d4 = A2, d5 = A3, d6 = A4, d7 =
A5;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
#include <SoftwareSerial.h>
#include <SoftwareSerial.h>
SoftwareSerial scanner(9, 10); // RX, TX
String value = "", oldValue = "";
String val2 = "";
void setup() {
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  lcd.begin(16, 2);
  lcd.clear();
  lcd.setCursor(4, 0);
  lcd.print("BAR CODE");
  lcd.setCursor(4, 1);
  lcd.print("1D OR SCANNER");
  delay(3000);
  ScrollText2("Masibau Azeez Olanide", "2019235020198");
  }
  
```

Arduino Ide Interface

The code above was compiled and firmware to the Arduino Nano Development Environment (IDE) board.

Firmware Process

Device Building Process



Schematic Diagram

A regulated 5vdc power supply and microcontroller board with some components was used in the design and construction of the design using a well-known pc software (Proteus) to design the schematic diagram.

TESTING

In the implementation stage, whether a barcode or QR code can be scanned successfully using a device barcode and QR scanner depends on the following factors: the physical properties (weight, shape) of the product, the attributes (size, type, contrast, reflection) of the barcode to be scanned, external factors (since scanning is an optical procedure, the light conditions play a major role), the hardware and software used (especially the scanning module has a major influence on the results), and the scanning person. We have catered for these factors and selected the following setup for the study:

Item and Tag

For the experiment, we deliberately selected five products (see picture below) with differing physical properties from more than 20 items available for scanning: one item was rather heavy in weight and bulky (Nivea cream), one rather small item (Nivea roll on), and one rather difficult to scan (Black Magic hair cream), (Oraimo Airpod), (student identity card) with some light reflection from the package. Three items were equipped with EAN 13 barcode tags and 2 with the 2D barcodes, which are most common in retail stores.



Scanning of Five Items





The proposed product will be easy to use; it is economical and does not require any special training. Further research can be conducted to improve the efficiency of the constructed barcode and QR code reader device by adding indicators to the device when the battery is full and low. This project is designed to be used in libraries, retail stores, offices and industries where there is a need for barcode and QR code scanning. It should be used and maintained by qualified personnel.

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