SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

Batch No : 19

Project Name : Compact Bar code and QR code reader system

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Problem Statement No 6

Compact Barcode and QR Code Reader System

AIM OF THE PROJECT:

The aim of this project is to develop a compact, efficient, and reliable barcode and QR code reader system that can be easily integrated into various applications such as retail, healthcare, and industrial environments

PROBLEM STATEMENT AND SOLUTION:

The current barcode and QR code reader systems are often bulky, expensive, and not easily adaptable to different environments. There is a need for a more compact and versatile solution that can handle various types of barcodes and QR codes with high accuracy and speed.

PROJECT DESIGN SPECIFICATION:

1 .Components:

- **Microcontroller:** Arduino Nano or similar.
- **Scanner Module:** Maikrt Embedded QR Code Scanning Module (supports both USB and UART Serial communication).
- **Display:** OLED display for output.
- **Power Supply:** Battery or USB power source.
- **Connecting Wires:** For interfacing components.

2. Functional Requirements:

- **Scanning Capability:** Ability to read both 1D barcodes and 2D QR codes.
- **Data Processing:** Efficient decoding of scanned data.

- **Display Output:** Display scanned data on an OLED screen.
- **Communication:** USB or UART for data transfer.

3. Technical Specifications:

- **Scanner Module:**
  - **Resolution:** High enough to read small barcodes and QR codes.
  - **Speed:** Fast image processing and decoding.
  - **Durability:** Robust housing to withstand drops and harsh environments.
- **Microcontroller:**
  - **Memory:** Sufficient to handle image processing tasks.
  - **Speed:** Adequate processing speed for real-time decoding.
- **Display:**
  - **Size:** Compact, yet readable.
  - **Type:** OLED for clear visibility.

4. Software Requirements:

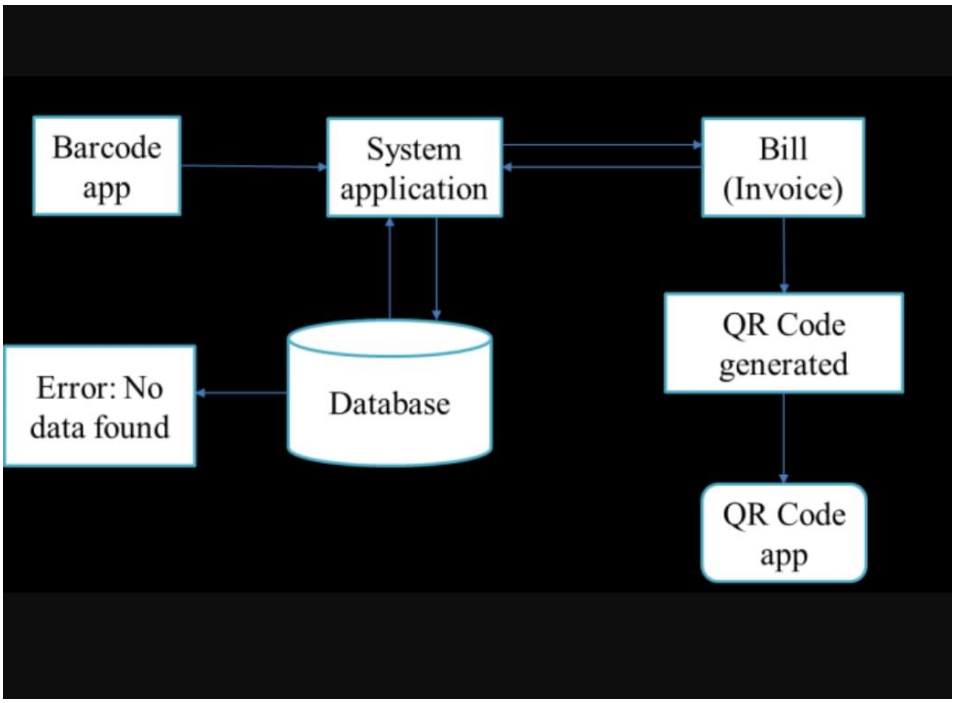
- **Firmware:** For controlling the scanner module and processing data.
- **Libraries:** For interfacing with the OLED display and scanner module.
- **User Interface:** Simple and intuitive for displaying scanned data.

5. Design Considerations:

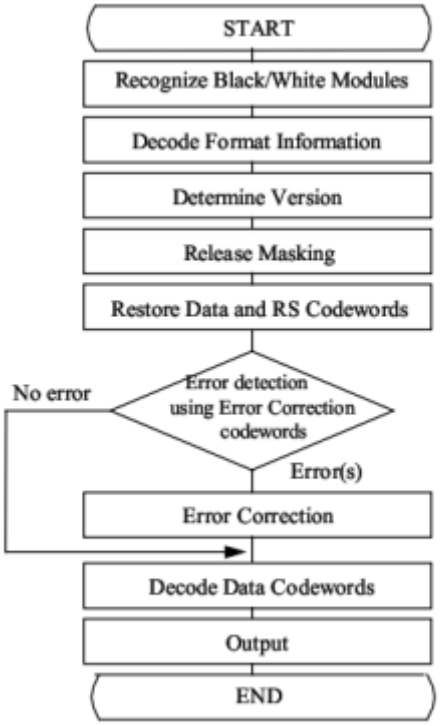
- **Compactness:** Ensure the overall design is small and portable.

- **Power Efficiency:** Optimize for low power consumption.
- **User-Friendly:** Easy to use with minimal setup.

PROJECT ARCHITECTURE:



FLOW EXPLANATION:



WIRING DIAGRAM:

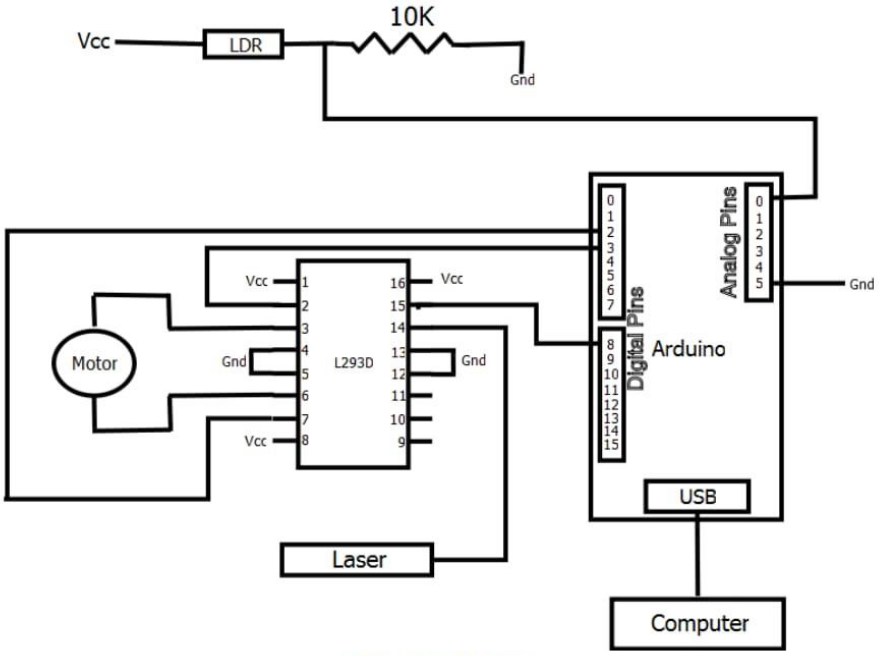


Figure 1: Circuit Diagram

NOTE:

Barcode/QR Code Reader Microcontroller

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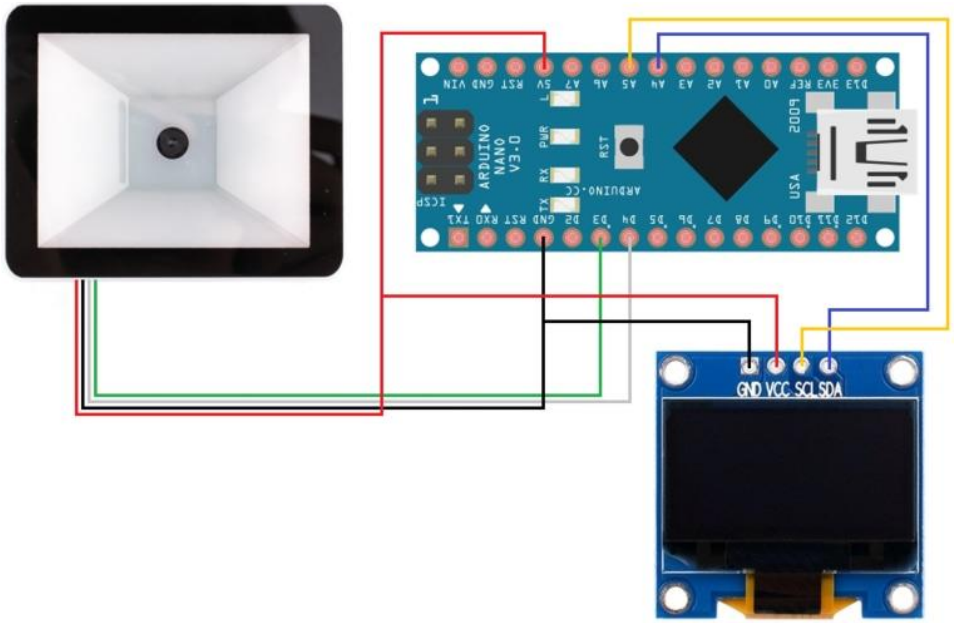
VCC ----------> 5V (or 3.3V)

GND ----------> GND

TX ----------> RX (Digital Pin)

RX ----------> TX (Digital Pin)

KiCad PCB Design:



COMPONENTS WORKING PRINCIPLE/ FUNCTIONALITY:

A compact barcode and QR code reader system typically consists of several key components, each contributing to the overall functionality of the system. Here's a breakdown of these components and their roles:

1.Camera or Scanner Module:

- **Function:** Captures the image of the barcode or QR code.

Details: High-resolution cameras are used to ensure clear image capture, especially for densely packed or small codes. Some systems use laser scanners for traditional barcodes.

2.Illumination System:

- **Function:** Provides sufficient lighting to ensure the code is visible and can be read accurately.
- **Details:** LED lights are commonly used to illuminate the code, which is particularly important in low-light conditions.

3.Image Processor:

- **Function:** Processes the captured image to enhance clarity and extract the code.
- **Details:** This may involve noise reduction, contrast enhancement, and binarization to convert the image to a format suitable for decoding.

4.Decoder Software:

- **Function:** Interprets the processed image to extract the information encoded in the barcode or QR code.
- **Details:** Uses algorithms to decode various symbologies (formats) of barcodes and QR codes. This software can be embedded in the scanner hardware or run on a connected computer.

5.Communication Interface:

- **Function:** Transfers the decoded information to a host device, such as a computer, tablet, or smartphone.
- **Details:** Common interfaces include USB, Bluetooth, Wi-Fi, and serial ports. The choice of interface depends on the application and device compatibility.

6.Power Supply:

- **Function:** Provides the necessary power for the operation of the reader system.
- **Details:** Can be battery-powered for portability or use an external power source for stationary setups.

7.User Interface (Optional):

- **Function:** Provides feedback to the user about the status of the scan (e.g., successful read, error).
- **Details:** May include LEDs, buzzers, or small displays.

8.Housing/Enclosure:

- **Function:** Protects the internal components and ensures durability.
- **Details:** Designed to be ergonomic for handheld devices or robust for industrial applications.

Functionality Overview

1.Image Capture:

- The camera or scanner captures the image of the barcode or QR code under proper illumination.

2.Image Processing:

- The captured image is processed to enhance quality and prepare it for decoding.

3.Decoding:

- The processed image is analyzed by the decoder software to extract the encoded data.

4.Data Transmission:

- The decoded data is transmitted to the host device through the communication interface.

5.User Feedback:

- The system provides feedback to the user about the scan status.

PROJECT OUTCOME:

- Understanding the problem statement in the compact barcode and qr code reader system
- Small in size and lightweight
- Easy to use and integrate
- Accurate and reliable
- Compatible with various platforms and devices
- Affordable and cost-effective

CONCLUSION:

The compact barcode and QR code reader system successfully reads and decodes various barcodes and QR codes with high accuracy, and integrates seamlessly with multiple devices and operating systems. This system provides a efficient and reliable solution for inventory management, point-of-sale systems, asset tracking, and other applications, making it an essential tool for businesses and individuals alike.