

Student Authentication Based on Barcode Scanner using OpenCV Python

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Abstract – *In this work, we are introducing an application that allows students to gain access to college amenities by scanning barcode. Technology is evolving at a breakneck pace in today's world, and transformation has become a requirement in every area to make productive use of it. The usual keyboard data entry is replaced with barcode technology. This program unifies all of the university's library and central computer center services, as well as allowing students to access the library and central computer center in the most advanced way possible. This program seeks to reduce manual labour and make the student's job easier in the most effective way possible. This application reduces paper work and relieves library employees of job pressure.*

Keywords: Barcode scanner, OpenCV python, ID Card.

I. Introduction

Students get access to the university's central computer center and library, among other things. Students currently use their student ID card to access the central computer center as well as the library. The Barcode Based Student Authentication System is a program that uses a barcode scanner to validate students' access to the library and central

computer center in regular batches. This application features a user-friendly design, and the student is only permitted to scan the card rather than utilize it. This barcode scanner is used to read, decode, and authenticate the barcode.

A barcode is a visually encoded machine-readable representation of data. A barcode is made up of a set of adjacent bars and spaces that run parallel to each other [1]. Numbers, letters, and symbols such as dot, colon, and others make up the bars and spaces, which come in a variety of widths. Information is represented using a variety of combinations of these alphanumeric characters. The success of barcode technology has been steadily improving in order to fit more information into the smallest amount of space possible [2]. Barcodes are now commonly used on books and in retail outlets to keep track of available products and facilitate checkout [3]. Scanners with web cams are commonly used to read barcodes. In general, barcodes are rectangle-shaped symbols made up of thin or thick parallel lines running parallel to each other. Barcodes make it possible to enter data into a computer quickly and automatically [4]. Barcodes have been employed in a variety of applications during the previous decade, including retail products and electronic equipment. The product's reference number is printed on the lines of

barcodes. In today's industrial world, there are various different sorts of barcodes. The technical characteristics of a particular type of barcode are defined by a barcode symbology, which includes bar width, character set, encoding method, and checksum parameters [5]. Numeric-only barcodes, alpha-numeric barcodes, 2D barcodes, and industry standard for barcodes and labels are the four types of barcodes available [6].

Only a student's ID card, which is a university ID card, allows them to use both facilities. She or he can scan the barcode on his or her card, which is unique. The Barcode Based Student Authentication and Verification System is a program that uses a barcode scanner to determine whether or not a student's ID card is valid. The barcode scanner is the primary piece of equipment to be used. In order to read a barcode, this barcode scanner is used. A barcode is merely a number that instructs a computer to access data. It was created to administer the college's library and central computer center, allowing students to access the college's facilities quickly and readily as needed, hence increasing operational efficiency and effectiveness. The computerization of government work will make it easier to complete a large amount of manual work rapidly. It will facilitate the storing and retrieval of all data in a short period of time. The amount of work required by library and computer center workers is reduced by this program. So, mainly a barcode can be seen on each student ID card. This barcode contains information on the student, such as his or her USN number, name, branch, and so on. Figure 1 shows the system's block diagram. Before accessing the library or computer center, the student must scan his or her ID card. This allows students to swiftly and

conveniently use university amenities, hence increasing the university's effectiveness.

II. Methods to authenticate Barcodes-

There are three main parts to authenticate the barcodes of ID card of running batch students of my institution-

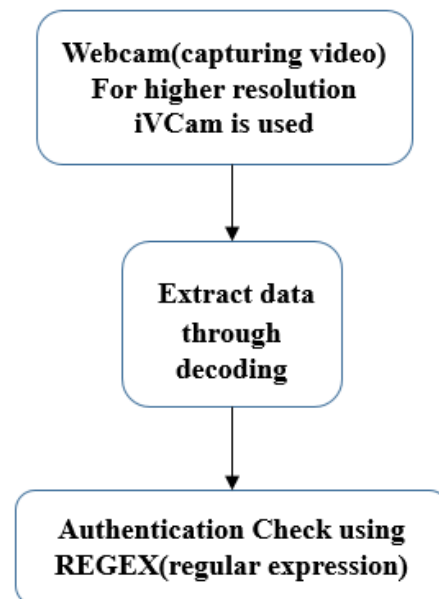


Figure 1: Flow Chart representing barcode authentication process for running batch of my institution.

A. Setting the WebCam –

```
cap = cv2.VideoCapture(0)
cap.set(3, 3000)
cap.set(4, 3000)
```

video's width id
video's height id

To accept the webcam so that it can find the barcode within the image. For higher resolution iVCam is used which can easily detect the barcode

B. Extracting data from barcode —

```
for barcode in decode(img):
    print(barcode.data)
    myData = barcode.data.decode('utf-8')
    print(myData)
```

[Decoded(data=b'001708010', type='CODE128',
 ↓
Message of the barcode **Type of the barcode**

rect = Rect(left=643, top=507, width=422, height=39),
 ↓
Location of the bounding box around the barcode

[polygon=[Point(x=643, y=507), Point(x=643, y=513),
 Point(x=644, y=537), Point(x=645, y=545),
 Point(x=1065, y=546), Point(x=1063, y=540),
 Point(x=1058, y=526), Point(x=1052, y=510), Point(x=1051, y=508)]]
 ↓
Polygon points of the bounding box
 (as it might not be perfect square or rectangle)

C. Adding bounding box around barcode-

pts = np.array([barcode.polygon], np.int32)
 ↓
To create bounding box (for polygon)
have to convert in array

cv2.polylines(img, [pts], True, myColor, 5)
 ↓
Defining image **defining polygon** **color**
 points **points** **of bounding**
 of polygon **of bounding** **box**
 box

pts2 = barcode.rect
 cv2.putText(img, myData, (pts2[0], pts2[1]),
 ↓
decoded data
from selected barcode **to stay text constant,**
 setting top and left
 point of the rectangular

cv2.FONT_HERSHEY_SIMPLEX,
 0.9, myColor, 2)
 ↓
Font size of the text **Font style of the text**
 Font thickness of text
 Font color of the text

D. Authentication Check-

```
if (re.search("^0{2}[0-2]{1}[0-9]{1}[0-1][0-9][0-1][0-9][0-9]$", myData)):
    print("it is in the same category")
if (re.search("^0{2}1{1}[6-9]{1}[0-1][1-9][0-1][0-9][0-9]$", myData)):
    myData = myData + ' [valid]'
    myColor = (0, 255, 0)
else:
    myData = myData + ' [invalid]'
    myColor = (0, 0, 255)
```

Importing regular expression(regex) function in python(re), the pattern of the id card can be verified.

III. Result & Discription: The OpenCV-Python barcode application detected the barcode in a matter of milliseconds. Authenticate this identified barcode under the following conditions: if the ID card of the usual batch of students (2016-2019) shows " valid ", else " invalid ".

My project's goal is to achieve this outcome. This is how it's displayed. —————

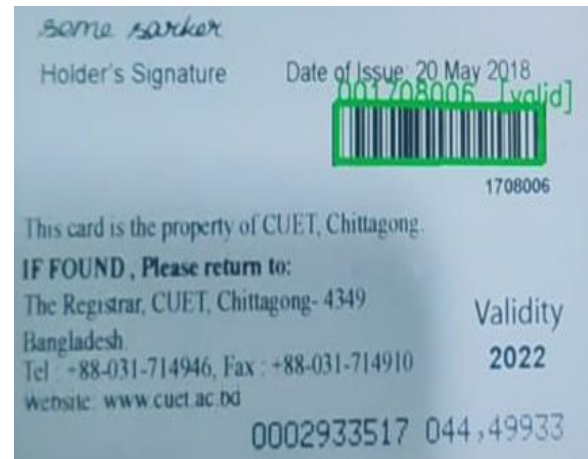


Figure 2: Valid ID(as this id card belongs to '17 batch)



Figure 3: Invalid ID(as this ID card belongs to '13 batch)

IV. Conclusion

The Student Authentication System with Barcode Scanner allows students to get easier access to college resources such as the library and central computer center, but only for those who have authorized ID cards. As a result, barcodes on each book allow the system to keep track of the books' availability. A librarian can acquire a detailed update on the circulated books by scanning barcodes in a library. With fewer staff members, automatic book check-in and check-out is possible. It was also intended to reduce physical labor. As a result, this application was created to make access to the library and computer center more convenient. This lowers manual labor and eliminates the time-consuming chore of entering data into the registry book.

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