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Automatic delivery-scam prevention using Raspberry-Pi

Bindu Bhaskaran, Barath Krishna Gunasekaran, Srinivasan Velumani
Department of Robotics and Automation Engineering, PSG College of Technology, Anna University, Coimbatore, India

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ABSTRACT

The word 'automatic' is unavoidable in this modern technical era. Automation facilitates not only technical advancement and time reduction to several processes, but also provides protection in various aspects. Delivery scam is a commonly occurring crime and it has to be reduced. Product delivery is a long process which involves various people to ensure correct delivery to the customer, providing chances for scam to occur. This paper discusses on an automatic delivery-scam prevention system with the help of Raspberry-Pi controller. This system provides safety to the ordered goods by limiting the authorisation of opening the packages to company and the customer only. It assures the safe and correct delivery of the ordered product.

Corresponding Author:

Barath Krishna Gunasekaran
Department of Robotics and Automation Engineering, PSG College of Technology, Anna University
Uthampalayam, Mullipuram, Tiruppur, Coimbatore, India
Email: barathgvbd@gmail.com

1. INTRODUCTION

In this fast-moving world, product delivery has become an essential part in our day-to-day life. With this proposed model, the safety of the ordered product is ensured. Product delivery companies and customers might not face losses and disappointments. Automation is the process of utilizing control systems and computers to reduce human contribution and provide technical assistance. The proposed model prevents product replacement by providing automatic safe lock mechanism to the delivery package and giving access only to the customers.

2. PROBLEM DEFNITION

When the customer orders a product, the delivering company sends the packed product to the regional deliverer, who is supposed to deliver the product safely to the customers, but these regional deliverers who mediate the delivery, open the packages and change the ordered products or steal them and sell them for their own necessities. Then at sometimes, the delivering agencies in each locality have, hired persons for delivering products to the given address. In some cases, these people also steal or replace the ordered products and goods. Even though, the delivering companies provide refund or re-deliver the products, both the companies and the customers face losses and issues.

3. PROPOSED SYSTEM

In this paper, we propose an effective model to prevent delivery-scam which uses a quick release (QR)-code scanner, solenoid locker and a liquid crystal display (LCD) integrated by a Raspberry-Pi 3 microcontroller [1]. The ordered product is placed in the model Figure 1 and locked. Before locking, the QR-

code printed on the product package is scanned in the QR-code scanner placed on the front side of the model. This scanning allows the controller to access the necessary customer details. As soon as the box closes, the controller generates a QR-code one-time password (OTP) and sends it to the customer mail id. The box can then be opened only with the help of the OTP received by the respective customer. Then, when the product is delivered to the desired customer, the customer has to scan the OTP received during order placement [2]. Only limited attempts are provided to scan and open the box, if exceeded, then the box cannot be opened without the confirmation from the delivering company. Then after the product is taken out, again the box is closed and the controller automatically erases all the information of the previous delivery and prepares itself for the next delivery. The block diagram is indicated in Figure 2.

Figure 1. Hardware trial model

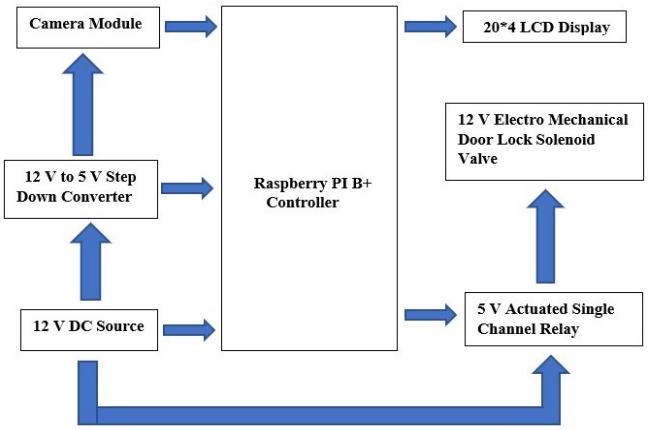

Figure 2. Block diagram of the proposed system

3.1. External design

The designed model consists of two racks, the top rack is for placing the ordered product package and the bottom one comprises the electronic components and wiring. The LCD display is featured on the side for requesting to scan and other miscellaneous purposes. The power button is placed along-side the LCD display, and it is accompanied by the QR code scanner.

3.2. Internal hardware

The main component of this delivery-scam prevention model is its controller Raspberry-Pi 3 [3]. It functions as the brain of the system and performs and integrates all the steps in the operation. The latest version of the Raspberry-Pi: Raspberry-Pi 5 MP camera module has been used here [4]. It weighs just three grams making it almost negligible while carrying the product. A camera with a still picture resolution of 2592×1944 has been used in coordination with the QR code scanner [5]. This 15-pin MIPI camera plugs directly into the Raspberry-Pi board.

The system is sourced with a 12 V direct current (DC) voltage source, which is then stepped down to 5 V and powers the controller and camera module. The microcontroller then integrates a 24x4 LCD display, a 5 V relay and the electromechanical solenoid valve which has been utilised for the locking purpose and carries out the operation as instructed by the program [6], [7]. The controller life is very long and the technologically advanced components used here makes this model futuristic [8], [9]. The circuit connection has been clearly portrayed in Figure 3.

Figure 3. Internal circuit connection

3.3. Flow chart of the proposed system

The flowchart Figure 4 illustrates the process in an elegant and clear manner. The left column on the chart indicates the events occurring in the packing company and the right column portrays the events occurring at the delivering point. It also shows the correct path of the process and states the situation of alternate events if the steps are not executed in correct manner.

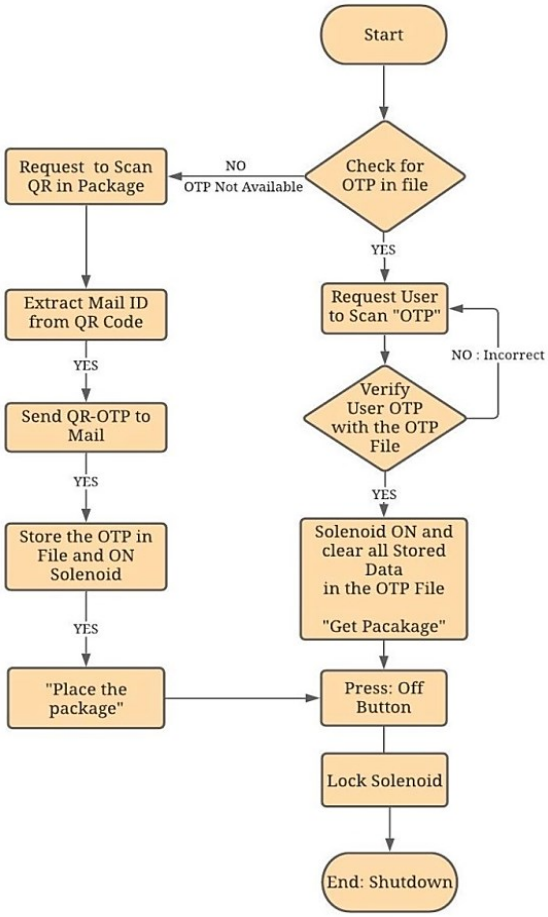

Figure 4. Process flowchart

4. OVERVIEW OF THE CODE SNIPPETS

The snippets as shown in Figures 5 and 6, performs extraction of customer details such as mail id from the package and generates and sends the QR-code OTP to the respective customer [10]. Figures 5 and 6 the code defines the information of the barcode. It also defines the functions of the camera module and the process of scanning the barcode.

```python
def barcode_scanner_pack():

    def read_barcodes(frame):
        barcodes = pyzbar.decode(frame)
        for barcode in barcodes:
            x, y , w, h = barcode.rect
            #1
            barcode_info = barcode.data.decode('utf-8')
            cv2.rectangle(frame, (x, y),(x+w, y+h), (0, 255, 0), 2)

            #2
            font = cv2.FONT_HERSHEY_DUPLEX
            cv2.putText(frame, barcode_info, (x + 6, y - 6), font, 2.0, (255, 255, 255), 1)
            #3
            with open("/home/pi/Desktop/project/pack_scanner_result.txt", mode ='w') as file:
                file.write(barcode_info)
                file.close()

        return frame

    camera = cv2.VideoCapture(0)
    ret, frame = camera.read()

    while ret:
        ret, frame = camera.read()
        frame = read_barcodes(frame)

        #cv2.imshow('pack_scan', frame)
        if cv2.waitKey(1) & 0xFF == ord('q'):
            break
        file =open("/home/pi/Desktop/project/pack_scanner_result.txt", "r")
        if file.mode == 'r':
            contents =file.read()
            file.close()
        if contents!='':
            break
    camera.release()
    cv2.destroyAllWindows()
```

Figure 5. Code snippet 1

```python
def send_otp(mail_id):

    otp = random.randint(1111, 9999)
    img = qrcode.make(otp)
    img.save('OTP_QRcode.png')

    Sender_Email = "dsp.services.amaze@gmail.com"
    Password = "dsp16361636"
    Reciever_Email = mail_id

    newMessage = EmailMessage()

    newMessage['Subject'] = "DSP-SERVICES"
    newMessage['From'] = Sender_Email
    newMessage['To'] = Reciever_Email
    newMessage.set_content('This is Your Sercret  OTP Barcode From DSP -'
                           + 'SERVICES. Scan at the Time of Your Delivery.\n\n'
                           +'Thank you for purchasing :)')

    with open('OTP_QRcode.png', 'rb') as f:
        image_data = f.read()
        image_type = imghdr.what(f.name)
        image_name = f.name

    newMessage.add_attachment(image_data, maintype='image', subtype=image_type, filename=image_name)
    with smtplib.SMTP_SSL('smtp.gmail.com', 465) as smtp:
        smtp.login(Sender_Email, Password)
        smtp.send_message(newMessage)

    return otp
```

Figure 6. Code snippet 2

Python programming is an unavoidable-criteria in this technical phase of the modern era [11]-[13]. As it supports a lot of libraries, it makes every complicated process much simpler to integrate and perform [14], [15]. Controller code has the full control over the entire process. It performs all the processes mentioned in a perfect procedural way [16]. Any adjustments needed in the system operation could be altered by changing the respective part in the controller code [17]-[20].

5. BENEFITS OF THE MODEL

This technically advanced, cost-effective model facilitates reusability for an infinite number of times. Very minimal amount of maintenance is sufficient. This model will definitely assure safe delivery especially for high budget products like electronic equipment and it can be designed in various sizes suiting

the majorly ordered expensive products [21]-[23]. A survey has been conducted among hundreds of people including customers who faced scam issues, delivering agencies and workers of the delivering companies [24]-[26]. The result Figure 7 showed that most people think that this system could prevent scam in product delivery and prove beneficial to customers as well as to the companies.

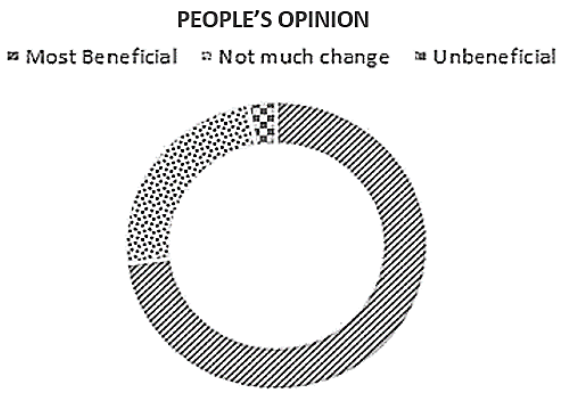

Figure 7. Pie chart showing the result of customer review on the proposed models

6. RESULTS AND DISCUSSION

The results of this process came out as per the procedure. After the perfect placing of the product in the package and verifying the customer details the mail along with the QR code OTP was received immediately Figure 8. This OTP can then be used to scan and open the package only by the respective customers [27]-[30]. Then the locker was opened without any malfunctions with the corresponding OTP and the product was delivered safely [31]-[33]. It really proved to be an effective method on implying barcode scanning-OTP generation technique [34]-[38].

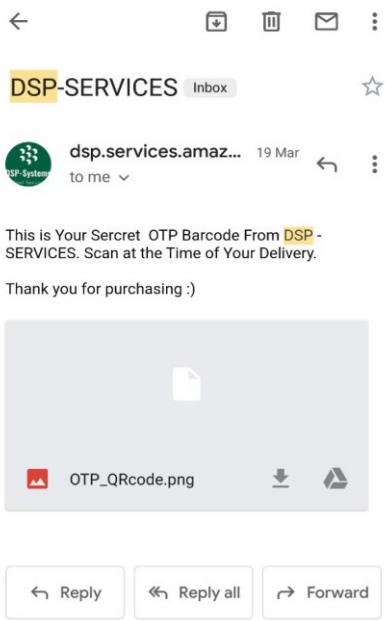

Figure 8. The OTP received through mails

7. CONCLUSION

This paper provides an over view of the system proposed to the automatic safe delivery process. If companies employ this system, it not only benefits the safety of the product but also prevents the companies

from issues such as mislaying, refunding. A hundred percent protection of the ordered product to the customers can be assured. Further advancements such as utilization of Raspberry-Pi 3 version could allow easy integration with server for fetching OTPs and neglects the use of cameras and scanners, which also makes the system more cost-effective. The beneficiary of this system is not limited with the delivering companies alone. It can also be extended to more public commercial services such as money orders, courier services and also for confidential posts.

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BIOGRAPHIES OF AUTHORS

Dr. Bindu Bhaskaran is currently working as Senior Grade Assistant Professor in the Department of Robotics and Automation Engineering, PSG College of Technology, Coimbatore, India. Completed her Bachelor's degree in Electrical and Electronics Engineering from Calicut University and Master's Degree in Energy Engineering from Anna University. She was awarded First Rank Gold Medal, Best Student and Best all-rounder in Master's Degree. She then obtained PhD in Electrical Engineering from Anna University Chennai in the year 2019. She has 16+ years of teaching experience and 2 years of industrial experience. Her areas of interest are Electrical machines, Control Systems, Power Electronics, Renewable Energy Systems and Electrical drives. She has published 8 papers in International Journals and authored one book in Basic Concepts of Smart Grid. She is a Life member of ISTE, IEI, IAENG, IAENG Society of Electrical Engineering, ISSE, SESI. She can be contacted at email: bdu.rae@psgtech.ac.in.

Barath Krishna Gunasekaran BE., Final Year Student in Department of Robotics and Automation Engineering at PSG College of Technology, Coimbatore, India. Worked on several projects related to automation, mechatronics, vision systems, electrical and electronics. The recent project work was Recognition and Identification of more similar objects using OpenCV and Neural Network. Working on a Robot Arm Visual Environment Development project using ROS, CAD and URDF Generation. Innovation Coordinator at Institution's Innovation Council. Have conducted and organised around thirty webinars on Robotics, Product Development, Electronics through IEEE, IIC and MHRD councils. Made several bots such as Automatic Colour Sorter, Fire Fighter, Automatic Irrigation System and many more. Field of Interests are Power Electronics, ROS, Vision Systems. He can be contacted at email: barathgvbd@gmail.com

Srinivasan Velumani BE., Final Year Student in Department of Robotics and Automation Engineering at PSG College of Technology, Coimbatore, India. The recent project work is Visualization of Mobile Robot using ROS. Made several project-works like Five DOF pick and place robot, Digital IC tester, Smart Glove for physically challenged and many more. Had taken up an Internship at Dush Robotics Pvt, Ltd., Coimbatore, India. Field of Interests include Embedded Systems, Mobile Robots and Electronics. He can be contacted at email: srinisri1636@gmail.com.