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QR Code Detection

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Abstract: *Due to the incorrect image collecting approach, QR code identification frequently confronts obstacles such as uneven backdrop fluctuations, inadequate illuminations, and distortions. As a result, identifying QR codes is difficult, and artificial intelligence-based methods were developed to address this challenge. This article uses an improved adaptive median filter technique and a QR code distortion correction method based on backpropagation (BP) neural networks to increase the identification rate of QR image codes. The distorted QR image can be fitted into the geometric deformation pattern using this combination of artificial intelligence methods, and QR code identification is possible. This paper addresses two-dimensional code distortion, which has been a critical research topic in present software systems. The research findings, which focused on the picture preprocessing step, demonstrated a significant improvement of 14 percent in the reading rate of QR image codes following processing using the system algorithm described in this article. The artificial intelligence technique used improves the recognition rate of the two-dimensional code image to some extent.*

Keywords: QR codes

I. INTRODUCTION

As the digital information era progresses, Internet technology encourages the widespread usage of QR codes in the real world, dramatically enhancing people's daily lives. The issue of picture identification of two-dimensional codes has also drawn a lot of interest due to the fast growth of two-dimensional codes [1]. The two-dimensional code swiftly took over the Chinese consumer market because it was inexpensive, could hold a lot of data, and could be scanned independently of a database. People have preferred two-dimensional barcodes since the turn of the 20th century because of their inexpensive cost, high mistake correction rate, and quick recognition speed. The growth of the Internet over the past century has accelerated the adoption of QRcodes. It is become a part of peoples' daily life. In the area of digital image processing, QR code identification technology is a popular subject. Due to its great information storage capacity, comfortable and rapid reading benefits, and secure and reliable coding technology, QR codes have been steadily adopted in a variety of sectors with the ongoing development of the Internet of Things [9,10]. The two-dimensional code reading technology is also progressing in the direction of intelligence, miniaturisation, and networking at the same time. Therefore, the study of the artificial intelligence-based QR image code identification system has enormous and far-reaching significance.

This paper offers an improved adaptive median filter technique and a QR code distortion correction approach based on backpropagation (BP) neural networks to address the different issues with QR code identification. An effective method for fitting the deformed QR picture into the geometric deformation pattern is provided by an ensemble of artificial intelligence algorithms with image processing. The two-dimensional code distortion that was a significant research concern in the current software systems is addressed in this work. This piece focuses mostly on the preprocessing phase

II. LITERATURE SURVEY

In the 1980s, foreign research on two-dimensional coding technology started. It has attracted interest and research from several nations throughout the world since it gets around many of the drawbacks of one-dimensional bar codes. Two-dimensional barcodes have been used in the document, bill, embedded integrated circuit, warehousing and logistics, pharmaceutical, and other sectors in the United States, Japan, South Korea, and other nations. A range of multipurpose portable QR code reading devices with cutting-edge technology have been developed and produced by bar code equipment manufacturers including SYMBOL and Zebra in the United States and Option in Japan.

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The majority of 2D codes were created by foreign nations since 2D barcode research in China and many other industrialised nations lagged behind. Therefore, in order to enable the encoding of domestic QR codes, we need to keep advancing the core technologies for the recognition of diverse QR codes.

III. ARCHITECTURE DIAGRAM

The QR code is a matrix two-dimensional barcode since the information is stored in a matrix, and a matrix two-dimensional barcode is often made up of standard analytical graphics modules like circles, squares, and hexagons. The easiest and most efficient way to read information via the camera is through graphics. However, using camera-based reading techniques to extract data from a QR code picture will also result in uneven lighting and image distortion, which directly prevents the QR code image from being correctly decoded or results in the loss of crucial information. To enable the efficient execution of the subsequent decoding and increase the accuracy of QR code reading, numerous preparation tasks must be completed before QR code decoding. Image capture is the first step in the QR picture recognition process. Next, a number of tasks are carried out, including image preprocessing, barcode identification, information sampling, information error correction, information decoding, and ultimately output results. Figure displays the typical operating flowchart for recognising QR codes. Image preprocessing is a crucial step in the overall process of recognising QR codes. Information sampling, information error correction, and information decoding all follow set principles. The decoding can be done in accordance with the criteria after the picture preparation is finished [32]. As a result, the implementation of the picture preprocessing method is the main topic of this work.

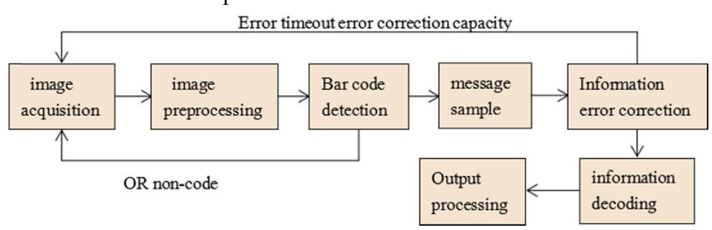
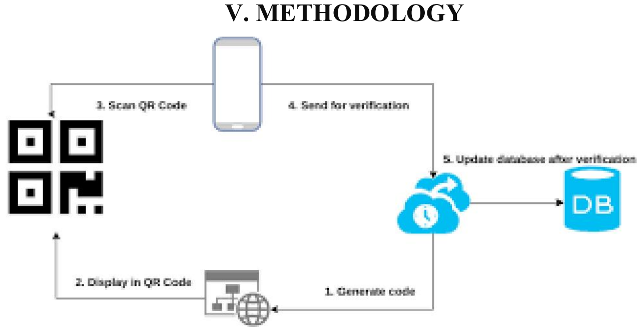


Figure 1

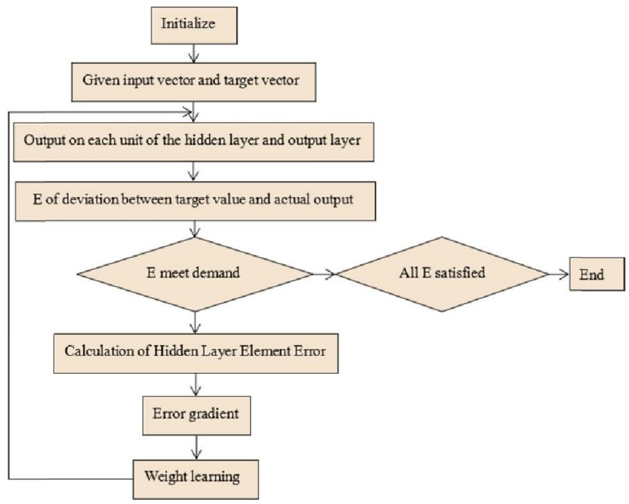
IV. PROPOSED SYSTEM

The traditional adaptive median filter method is improved in this article based on an investigation of the present algorithm's flaws. The more accurately the enhanced algorithm alters the criteria for assessing noise points, the more accurate the noise point judgement will be. The image's fine features can be completely protected at the same time [33]. the following basic actions: In order to determine the noise spots later, scan the whole image with a 3 3 window, note the minimum and maximum values for each window, and use the upper and lower limits of all the minimums and maximums as a starting point. The algorithm replaces the module's maximum and minimum values with the global minimum value's upper limit and lower limit, respectively.

V. METHODOLOGY



In order to gather the data for this article, the regular QR code picture is first captured using the camera function on a mobile device, and then the set of sample QR images is created by simulating distortion in the normal QR code image. depicts the experiment's workflow. Provides a step-by-step breakdown of the pretreatment procedure. The gathered colour image is depicted in. To create the gray-scale image, processing in grayscale is first done. It is evident from a comparison of thethat the colour has been removed from the image through the grayscale conversion procedure. However, the image has salt-and-pepper noise that degrades the image's quality. The picture in Figure is filtered using the enhanced adaptive median filter technique, and displays the processed image.



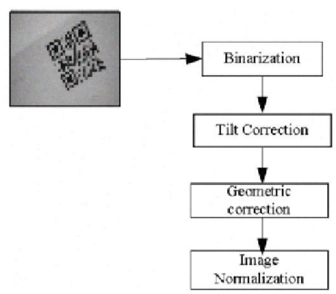
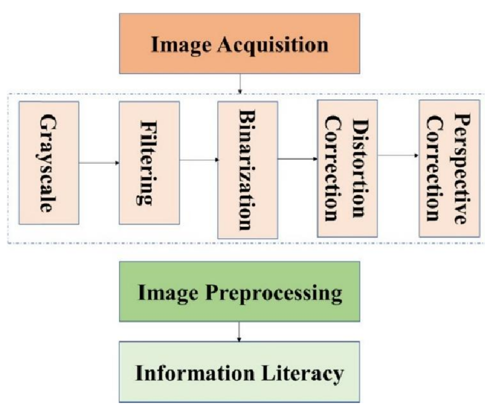


Fig. 1. Recognition Process



Only the points in the image with the pixel values "1" and "0" are left after the binarization procedure. The picture in the figure is severely distorted; it is corrected using a distortion-correction technique, and the corrected image is then processed using an ecological closure procedure. Figure displays the final outcome. As seen in Figure, the technique suggested in this article has significantly improved the image processing's ability to fix surface distortion, but there has also been a substantial perspective problem. When reading information, the QR picture of this will provide significant challenges or perhaps be unreadable. As a result, the perspective inverse transformation should be applied to the image before reading the information. The perspective projection inverse transformation procedure is used to process the perspective transformation. The outcome of this technique is depicted in the Figure. From an intuitive standpoint, the picture in Figure that has undergone the inverse perspective transformation is noticeably better than the original image in Figure. The success of the method suggested in this paper, however, cannot be explained by the aforementioned improvement.

VI. CONCLUSION

The major focus of this article is on identifying QR codes that are more badly deformed, especially those that are printed on materials that are prone to creases. The rate of QR code recognition in this instance is either extremely low or nonexistent. The use of QR codes in trade-marks is certain to be a significant development trend since they make great two-dimensional codes. As a result, it is crucial to increase the QR code's rate of recognition in particular situations, and doing so can help spread the use of QR codes significantly. This article suggests a better adaptive median filtering method based on conventional median filtering and traditional adaptive median filtering. According to the testing findings, the algorithm effectively filters and denoises images even when there is a lot of noise present in them. This method also somewhat enhances the image in terms of safeguarding features after filtering and denoising it. Before performing the QR code decoding process, a thorough study of the image pretreatment work of the QR code symbols is conducted, followed by a thorough investigation of the existing QRcode image preprocessing techniques. The use of every method is compared in order to rectify picture distortion, particularly when identifying QR codes written on the surface of products that are prone to creases. In this article, a processing technique for distorted QR code images is suggested, and its efficacy is afterwards confirmed.

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