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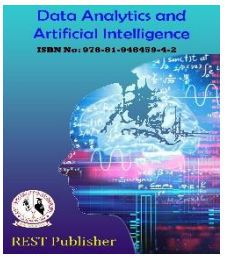

Artificial Neural Networks Based Fabric Sewing Defect Detection Automatic Stitch Control System

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Abstract: *This system proposes a computer vision-based strategy for discovering imperfections in images with occasional substances. Inspection of sewing defects is a fundamental step in ensuring the quality of garment production. Although traditional applications of automated defect detection have demonstrated good performance, these methods are typically configured with hand-crafted features designed by a human operator. Recently, deep learning methods that include artificial neural networks (ANNs) have demonstrated excellent performance in a wide variety of computer vision applications. In order to make use of ANN feature representation, the direct use of feature maps from convolutional layers as universal feature descriptors has been studied. In this project, we propose a sewing defect detection method using an ANN feature map extracted from the initial layers of a pre-trained model to detect a broken stitch from a captured sewing operation image. To assess the effectiveness of the proposed method, experiments were conducted on a set of stitching images, including normal images, their synthetic defects, and rotated images. As a result, the proposed method detected real defects with an accuracy of 97.3%. In addition, other conditions for computing devices and deep learning libraries were investigated to reduce the computational time required for real-time calculations. The results confirm the feasibility of the performance of the proposed method as a suitable production technology for clothing production.*

Keywords: *Artificial Neural Networks, sewing fault detection, broken stitch detection.*

1. INTRODUCTION

Computer vision and models based on image classification are used in various applied fields including industrial problems. Clothing is considered one of the basic requirements of human life, and the history of the textile industry is as old as human civilization. Fabric is considered the main element of human clothing and is also used in many industrial products. Natural elements such as wool, cotton, polyester, or nylon composite can be used to create bib fabric9. In the textile. industry, sophisticated machinery is used to produce this fabric, and defects are located through an inspection process. The inspection process is traditionally completed by Manual human effort traditionally completes the inspection process to ensure fabric quality. The price of the substance that is sent to the market depends on the number of simultaneous occurrences of defects and the price increases with the increase in the number of defects.

2. OBJECTIVE

We propose an effective sewing defect detection method that uses an ANN feature map to detect broken stitches. In the sewing defect detection algorithm, we applied simple image processing methods to identify thesewing-stitch region. To automatically find an optimal threshold value for banalization, we use the adaptive thresholding method which is suitable for binarizing images. To check the continuity of stitch regions, the extracted region from the feature map must be segmented into individual regions.

3. LITERATURE SURVEY

In this project, a deep learning algorithm is developed for a fabric defect inspection system on a loom by combining image preprocessing, fabric motif detection, candidate defect map generation, and artificial neural networks (ANNs) techniques. A new pair-potential activation layer was introduced into the ANNs, resulting inhigh defect segmentation accuracy on fabrics with complex features and an unbalanced data set. The average accuracy and recall of defect detection on existing images reached more than 90 and 80% at the pixel level, respectively, and the accuracy of counting the number of vehicles on the road will be stored in database accuracy at 98%. [1] Fabric defect detection is now an active area of examination to identify and solve problems in the textile industry, increase performance, and also to maintain fabric quality. The traditional system of visual inspection by human beings is extremely time-consuming,

expensive, and unreliable because it is highly error-prone. Defect detection classification is a major challenge in defect inspection. Therefore, faster and cost-effective automatic fault detection is very necessary to overcome these shortcomings. It also explains in detail various techniques to obtain the final output such as pre-processing, decomposition, thresholding, and decommissioning. [2] In the manufacturing sector, DT has been implemented in the form of smart factories, process operations, and improved quality control by leveraging artificial intelligence (AI), the Internet of Things, big data, robotics, and digital twin design techniques. [3] This paper presents a new approach for the rapid detection and extraction of fabric defects from fabric images. Automated visual inspection systems are highly needed in the textile industry, especially when product quality control is a significant issue in the textile industry. In manual defect detection systems with trained inspectors, a very smaller percentage of defects are detected, while an automatic real-time system can increasethis number to a maximum number. Automated visual inspection systems thus play a major role in assessing the quality of textiles. To detect fabric, we first decompose theimage into its bit planes. The lower-order bit planes were found to carry important information about the locationand shape of the defects. We then find the exact position using mathematical morphology.[4]

4. EXISTING SYSTEM

Fabric defect detection is a very popular automation topic and quality control is one of the importantfunctions in the textile industry. The performance of the designed idea is evaluated using different techniques of patterned fabric images with different types of common fabric defects. In addition, the detection methods were also evaluated in real-time using a model automation specification system. This existing system of researchers and experts in image processing and computer vision to understand the uniqueness of different defect detection methods. Recognition receives a digital fabric image from an image acquisition device and transforms it into a binary image using restoration and thresholding methods. This research presents a technique that reduces physical exertion.

5. DISADVANTAGES

The accuracy obtained by this method is quitelow, around 70 percent. Training and execution take a lot of time. The whole process is tedious because it requiresmultiple datasets of individual features.

6. PROPOSED SYSTEM

In this project, we proposed a sewing defect detection method that uses an ANN feature map to detect broken stitches based on machine learning and image processing method. In image-based defect detection, it is essential to obtain an accurate target image. Thus, a camera can be used to capture the high-quality images needed foranalysis. The feature map was extracted from the initial layers of the pre-prepared area calculation. We implemented a strategy for determining a broken suture from a captured image of a sewing operation using feature map extraction and other processes (e.g., feature map binarization, suture contour region segmentation, and broken suture defect detection). To assess the effectiveness of the proposed method, experiments were performed on a set of stitching images, including normal images with synthetic defects.

7. ADVANTAGES

The system can detect sewing defects with greater accuracy and efficiency. In the textile industry, we can detect damage in real time and use advanced control systems to repair the damage. The method used in this research paper categorizes 90% of substance errors. Improving and improving the performance of the visual system can generally be done using the proposed algorithm to detect common defects in normal textures.

8. ARCHITECTURE DESIGN

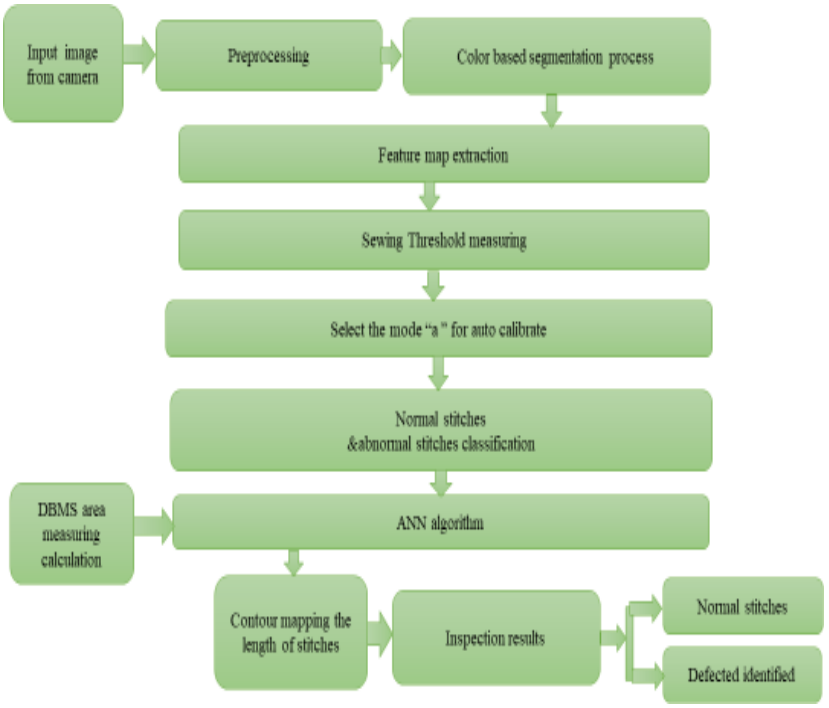

FIGURE 1. Architecture Design

9. MODULE

- Image processing module
- Segmentation module
- Database module
- Sewing recognition module
- Output module

10. MODULE DESCRIPTION

Image processing module: Digital analysis of 2D images of substances is created based on receiving images from the system. The system takes a defective fabric image and then converts it to a grayscale image.

Segmentation module: Appropriate denoising of the image is applied and transformed to an equivalent binary image. Generally, a setnumber of yarns are used to create fabrics, and different techniques like knitting, weaving, and felting are used to make fabrics. The type of fabric varies depending on the fibers used, the technique used to create the fabric, the machinery used to produce it, and the finishing techniques. This project tries to cover most of these features.

Sewing recognition module: AI fabric inspection machines are programmed to identify specific product defects, reducing the risk of producing defective products by up to 90 percent. Machines take real-time images of the fabric and compare them to pre-programmed data to quickly identify defects.

Database module: database management system (DBMS) is a softwaretool that allows users to easily manage a database. The database module gathers the fabric image information of each scheme and integrates the input images to be compared.

Output module: AI is finding textile manufacturer's management, helping with visual inspection work like coloR matching and pattern making.

FIGURE 2. Output Prediction

11. SYSTEM FUNCTION

Segmentation Process: Segmentation divides the image into different regions containing each pixel with similar attributes. To be meaningful and useful for image analysis and interpretation, regions should be strongly related to the depicted objects or features of interest. Meaningful segmentation is the first step from low-level image processing, which transforms a grayscale or color image into one or more other images, to a high-level image description in terms of features, objects, and scenes. The success of image analysis depends on the reliability of segmentation, but accurate image segmentation is generally a very challenging problem. Segmentation techniques are either contextual or non-contextual. The latter does not take into account the spatial relationships between elements in the image and group pixels together based on some global attribute, e.g. gray level or color. In addition, contextual techniques exploit these relationships, e.g., group pixels with similar gray levels and close spatial locations.

FIGURE 3. Segmentation Process

12. THRESHOLDING SEGMENTATION

The simplest method for segmentation in image processingis the threshold method... Splits pixels in an image by comparing the pixel intensity to a specified value (threshold value). It is useful when the desired object has ahigher intensity than the background (unnecessary parts). You can treat the threshold (T) as a constant, but this would only work if the image has very little noise (junk information and data). You can keep the threshold constantor dynamic according to your requirements. The thresholding method converts a grayscale image into a binary image by dividing it into two segments (mandatory and optional parts).

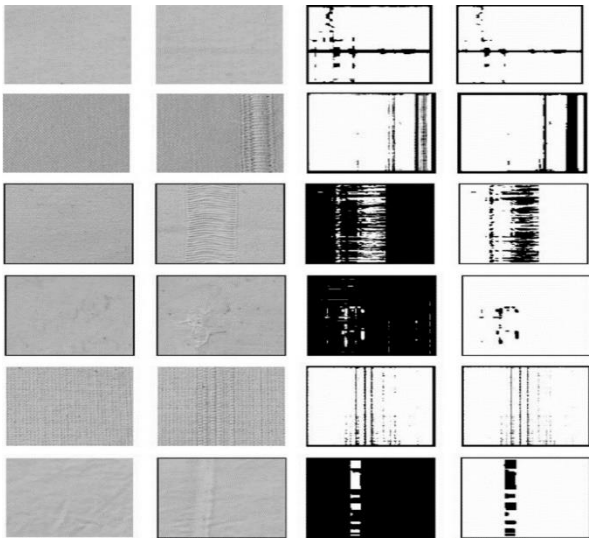

FIGURE 4. Threshold Measuring

13. CONTOURS MAPPING

Contours are defined as a line connecting all points along the image boundary that have the same intensity. OpenCV has a find Contour () function that helpsextract contours from an image. It works best on binary images, so we should first use thresholding techniques, Sobel edges, etc. A contour map is a type of map wherethe shape of the earth's surface is represented by contour lines, the relative spacing between these lines shows the relative slope of a particular surface. The meaning of the contour map is quite clear to us, if we derive this definitionfurther, it means - it is the delineation of any feature in the map, which is formed by the construction of lines. Lines are cut based on equal values of this property available as data points. In terms of a contour map, it can be said that contour mapping is a kind of topographic mapping, but fora distinct study of this concept, we find that there is an acute difference between the two, so we cannot use each other as synonyms A topographic map is a precise map that shows natural terrain as well as man-made objects such as buildings, roads or bridges. While contour maps represent elevation changes using contour lines.

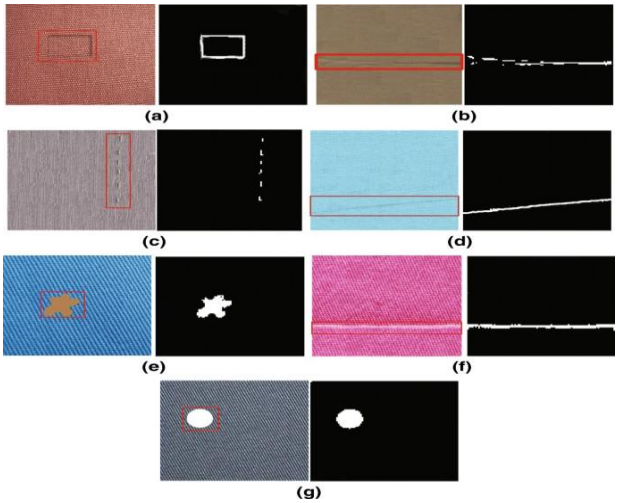

FIGURE 5. Stitches Contour Mapping

14. DATABASE MANAGEMENT

A Database Management System (DBMS) is a software system that is designed to manage and organize data in a structured way. It allows users to create, edit, and query a database, as well as manage the security and access control of that database. Collected information that is in anorganized form for easier access, management, and various updates

is called a database. Before we go into further discussion about databases, we need to have prior knowledge of what exactly DATA is. Data can be defined as a set of facts and records to which we can apply reasoning, discussion, or some calculation. Data is always readily available and plentiful. It can be used to process some useful information from it. It can also be redundant,it can be irrelevant. Data can exist in the form of graphics, reports, tables, text, etc., representing all kinds of information that allow easy retrieval, updating, analysis, and data output through a systematically organized or structured repository of indexed information. Containers with large amounts of data are known as databases, for example, a public library stores books. Databases are computer structures that store the train image in videos. The data set is very useful because the collection of images stored in data management it controls data structure protects and delivers data. Any system that manages databases used in many projects it is called a database management systemor DBM. A typical diagram representation for a databaseis a cylinder.

FIGURE 6. Database Management

15. ARTIFICIAL NEURAL NETWORK (ANN)

Artificial Intelligence Platforms that are built on top of ANNs disrupt traditional ways of doing things. OFtranslation of websites into other languages by order of a virtual assistant online grocery store to chat with a Chatbot to solve problems are AI platforms simplifying transactions and making services available to everyone atnegligible costs. Artificial neural networks have beenapplied in all areas of operation. By email service providers use ANNs to detect and remove spam from the user's inbox; asset managers use them to predict the directionof a company's stock; rating firms use them to improve credit scoring methods; e-commerce platforms usethem to personalize recommendations for your audience; Chatbots are developed with ANN for natural language processing; Deep learning algorithms use ANNs to make predictions the probability of an event; and the list of ANN inclusions goes on across many industry, sector.

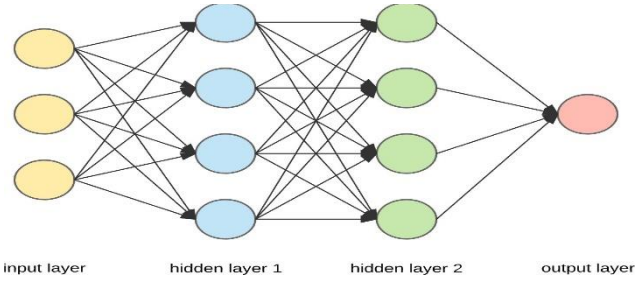

FIGURE 7. ANN Algorithm

16. RESULTS

This project developed to AI-image process-based monitor to create fabrics and garments; consulting firms use it to predict trends for their manufacturing faults. The project works on data collection-based prediction levels. Repairing the fit issue, trends forecasting, and even authenticating upscale items and also machine automatically turns off.

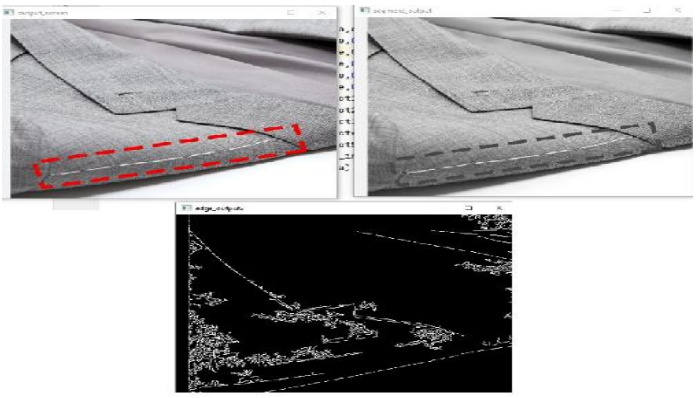

FIGURE 8. defect detection in fabric

17. CONCLUSION

In this project, we proposed a sewing defect detection method that uses an ANN feature map to detect broken stitches while solving related image-processing method limitations. We proposed a new fabric defect detection system that can deal with various types of fabrics. Our method does directly utilize the original image asinput. Instead. Our algorithm achieved an average accuracy of 97.3% for results, which can achieve accurate detection of defects. Compared with traditional shallow learning approaches, the experimental results demonstrate that our proposed method can effectively learn defect features by adaptively adjusting the parameters. In addition, our method can improve efficiency, shortening the time of obtaining an accurate defect image.

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