



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 8, August 2024

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.524

9940 572 462

6381 907 438

[ijrset@gmail.com](mailto:ijrset@gmail.com)

[www.ijrset.com](http://www.ijrset.com)

# **Design and Implementation of Fabric Sewing Defect Detection and Automatic Stitch Control System using Image Processing**

**R. Venkatesan<sup>1</sup>, L. Prakasam<sup>2</sup>, A.Jothi<sup>3</sup>, V.Senthil<sup>4</sup>**

PG Scholar, Department of Embedded System Technologies, PSV College of Engineering and Technology,  
Krishnagiri, Tamil Nadu, India<sup>1</sup>

Assistant Professor, Department of ECE, PSV College of Engineering and Technology, Krishnagiri,  
Tamil Nadu, India<sup>2,3,4</sup>

**ABSTRACT:** The system recommends computer vision to detect defects in images, which sometimes include fabric. Examining sewing defects is an important step in the quality assurance of garment production. Although automated drug detection has been shown to be effective, these systems are often configured with manual features created by the operator. Recently, deep learning methods including artificial neural networks (ANN) have shown success in many computer vision applications. To use the representation of ANNs, we directly investigated the use of maps of layers based on global annotation. In this project, we propose an error detection method to use ANN feature maps extracted from the first set of a pre-training model to detect bursts from captured images of sewing work. Experiments were conducted on a set of stitching images, including original images, synthetic images, and rotated images, to evaluate the effectiveness of the proposed method. As a result, the plan found defects with 97.3% accuracy. Additionally, additional cases were explored for computing tools and deep learning libraries to reduce the call time required for on-the-fly calculations. The results confirm the feasibility of the scheme as a suitable production method for clothing production. This work specifically investigates the hardware integration with the communication interface of the Nano controller. This setting sends a signal to the relay, allowing the system to stop the sewing machine when a defect is detected. The system has the feature that if any defect is detected, the image is captured and sent to authorized personnel using the IMAP protocol, thus improving (not good) the entire management process.

## **I.INTRODUCTION**

Models based on computer vision and image classification are used in many applications, including business problems. Clothing is considered one of the needs of human life, and the history of the textile industry is as old as human civilization. Fabric is considered the main source of people's clothing and is also used in many commercial products. Materials such as wool, cotton, polyester composites or nylon can be used to create textile fabric aprons<sup>9</sup>. The textile industry uses advanced technology to produce these fabrics and inspection procedures to detect defects. The price of the fabric sent to the store varies depending on the number of defects present at the same time, and the price increases according to the number of defects.

## **II.OBJECTIVE**

- We propose an effective method to detect defects by using ANN maps to identify broken topics.
- To find the best binarization threshold, we use a transformation method suitable for the binarized image.
- The territory should be divided into zones.

## **III.LITERATURE SURVEY**

This article combines image prioritization, decision-making models, negative candidate map generation, and convolutional neural network (CNN) technology to improve deep learning methods that are not good enough to find the system. A new pair of advanced layering capabilities have been introduced in CNN to help deal with the downsides of data with complex features and disparate data. The average accuracy and recovery of error detection in current images

reach 90% and 80% based on the pixel level, and the accuracy of calculating the number of errors from population data is over 98%. [1] Fabric defect detection is now a field of research to identify and solve textile industry problems, improve material quality and maintain fabric quality. Traditional visual inspection methods are time-consuming, expensive, and unreliable because they are prone to errors. Defect detection is a major challenge in defect detection. Therefore, in order to overcome these complaints, the detection of these defects must be faster and more cost-effective. Considering these requirements, this article introduces wavelet filtering. It also describes various techniques such as pre-processing, decomposition, thresholding and noise removal [2] to obtain the final output. DT is pursuing smart factory to use artificial intelligence (AI), Internet of Things, big data and robotics to increase efficiency in the business sector, add information, improve work procedures, improve quality management. and digital Twin design technology [3]. This article presents a new method for rapid detection and removal of defects in textile fabric images. The textile industry is in great need of visual inspection, especially today, when quality control of textile products has become an important issue. While the percentage of problems detected in manual crime detection machines with trained inspectors is very low, instant automated systems will increase this rate. Therefore, automatic visual inspection systems play an important role in evaluating the quality of textile fabrics. To identify defects, we first decompose the image into bit planes. Look for low-flying planes carrying important information about the wrong location and pictures. We then find the correct position through mathematical morphology [4]. Although effective, this process requires a lot of misinformation. However, it is very difficult to find a lot of misinformation in business life. To overcome this problem, we propose a method for error detection using autoencoders. Our proposed autoencoder is trained using a combination of error data alone and data generated using error features based on expert knowledge. One of the main advantages of our method is that it does not need actual false data, and we confirmed that its performance is comparable to machines trained with truly false data [5].

#### **IV. EXISTING & PROPOSED SYSTEM**

##### **1.EXISTING SYSTEM**

- Fabric defect detection is a hot topic in the field of automation and quality control is an important part of the textile industry. Additionally, the search method is evaluated on the fly using a standard automated specification system.
- This current system allows researchers and experts in the field of image processing and computer science to understand the difference between different detection methods.
- Recognition takes a digital image from a photographic image and converts it into a binary image using advanced techniques and techniques. Technology. Therefore, in this research, a flaw detector with optical quality is used for image processing.

##### **1.1 DISADVANTAGES**

- The accuracy achieved with this method is low, around 70%.
- Education and success take a lot of time. Because more information is needed for every job.

##### **2. PROPOSED SYSTEM**

- In this project, we proposed a sewing defect detection method that uses a ANNs feature map to detect broken stitches based on machine learning and image-processing method.
- With image-based defect detection, it is essential to obtain an accurate target image. Hence, a camera can be used to capture the high-quality images needed for analysis.
- Specific information was obtained from the first group of previous studies in the field of computing. We used this technique to identify broken thread by capturing the image of the sewing process using mapping and other methods (e.g., binarizing feature maps, segmenting outline regions of sewing stitches, and detecting thread breakage defects).
- To assess the effectiveness of the proposed method, experiments were conducted on a set of sewing images, including normal images with synthetic defects.
- If defect detection systems, the proposed system goes beyond image analysis by incorporating a hardware component. The integration of a serial communication setup connected to a Nano controller allows the system to send signals to a relay. This relay, in turn, has the capability to stop the sewing motor upon the detection of a defect, providing a real-time response to ensure immediate corrective action in the manufacturing process.
- Upon identification of a sewing defect, the system captures an image of the defect and sends it to an authorized person using the IMAP protocol, enhancing the defect management and alert process.

- The high accuracy of the proposed method, achieving a 97.3% accuracy in detecting true defects. This level of precision is crucial for maintaining quality assurance in garment production, reducing the likelihood of faulty products reaching consumers.

2.1 ADVANTAGES

- The system can detect sewing defects with greater accuracy and efficiency.
- In the textile industry, we can detect the damage in the real picture and we can repair the damage with the help of advanced management systems.
- The method which is used in this research work categorizes 90% of faults in the cloth. Improvements and improvements in visual performance can often be achieved using techniques designed to detect flaws in traditional techniques.

V. BLOCK DIAGRAM

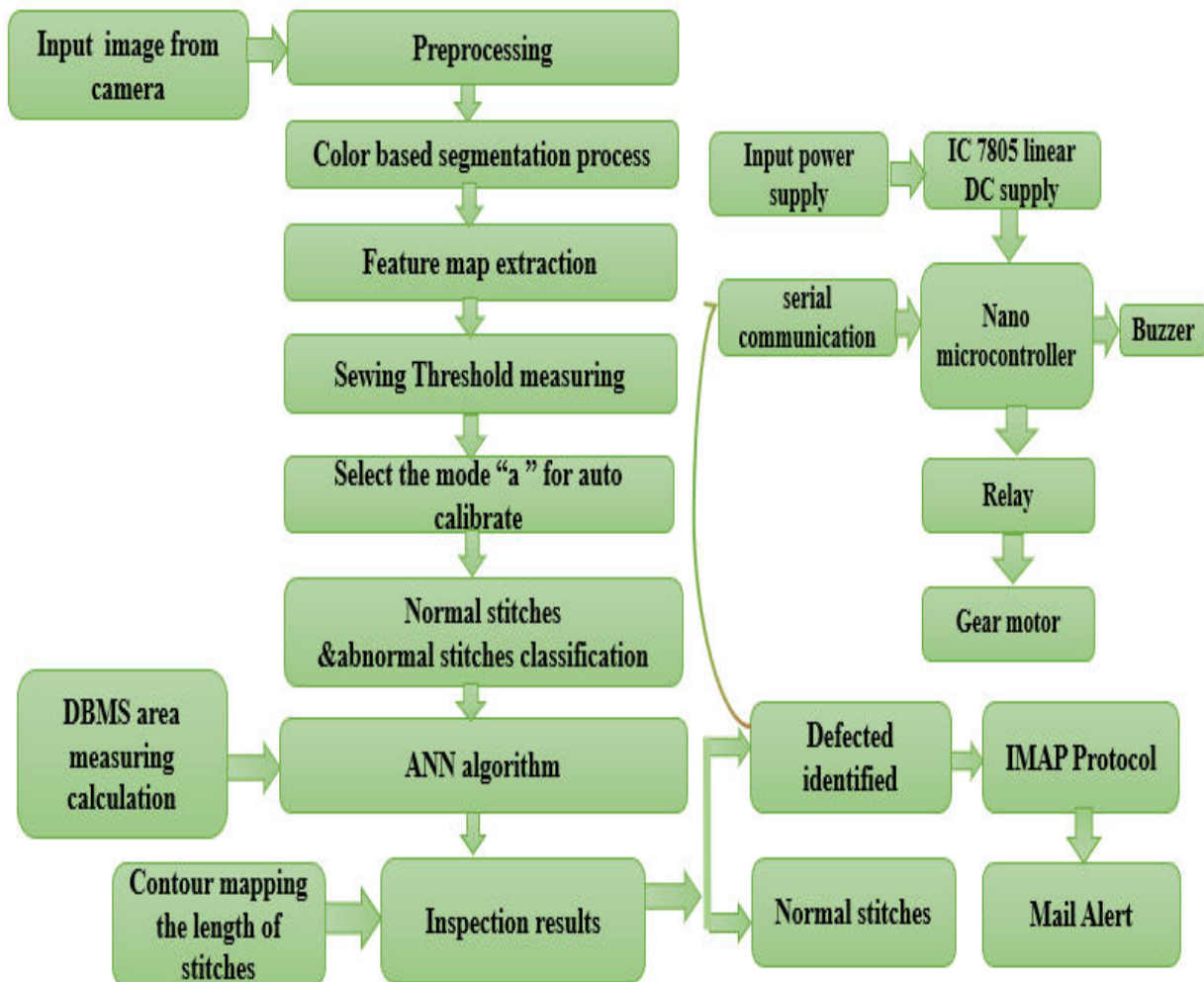


Fig no: 1 Block diagram

## VI. CIRCUIT DIAGRAM

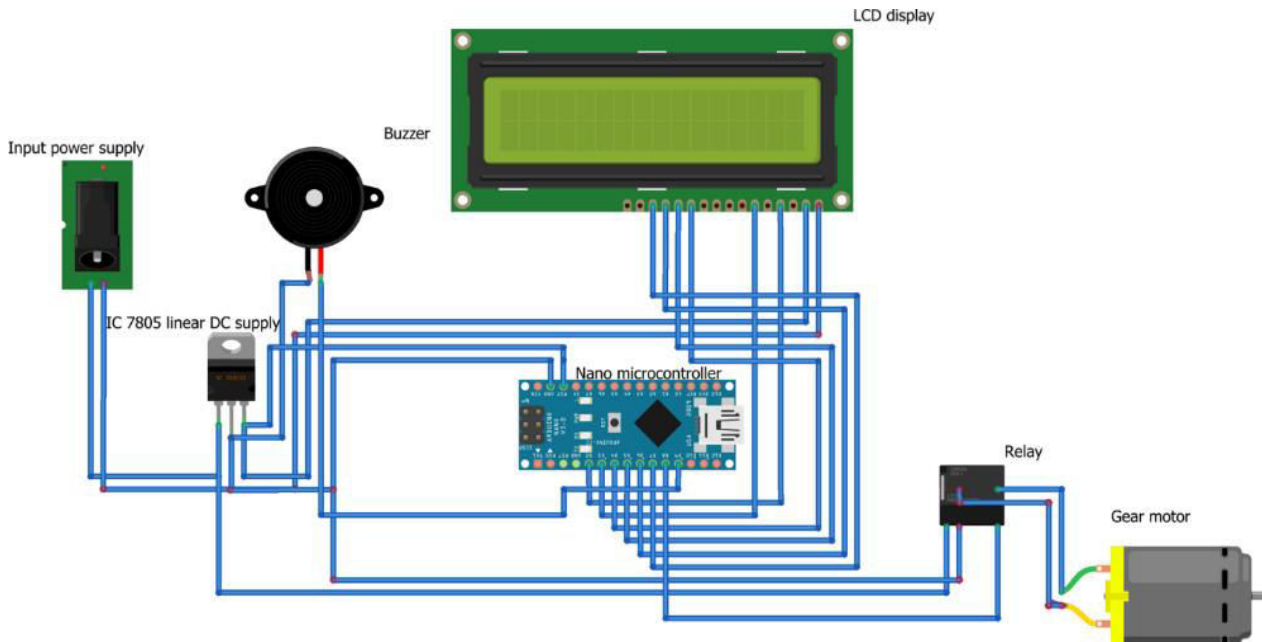


Fig no: 2 Circuit diagram

## VII. HARDWARE REQUIRMENTS

### 1. IC VOLTAGE REGULATORS

As mentioned in the previous section, DC power can be generated from AC lines. Most electrical and electronic devices require a constant DC voltage regardless of switching frequency. Although it is possible to use a DC battery as input, this option is expensive and needs to be replaced from time to time. Therefore, to achieve this goal, it is necessary to first convert the AC input to a DC voltage source and control it.

### 2. LCD display:

A liquid crystal display (LCD) is a flat panel, electronic display device, or film that uses light to illuminate the liquid crystal display. Liquid crystal does not emit light directly. An LCD can display an arbitrary image (like a general-purpose computer) or a fixed image that can be shown or hidden, such as prefixes, numbers, and the 7 display on a digital clock. They use the same technology, except that one image consists of many small pixels, while other images contain many large elements. LCDs are used in many applications, including computer monitors, televisions, instrument panels, and aircraft cockpit displays and signage. They are found in consumer products such as video players, gaming devices, watches, calculators, and phones, and have replaced cathode ray tubes (CRTs) in many applications.

### 3. Relay

A relay is an electrical switch that opens and closes under the control of another device. In their original form, switches were made of electromagnets to open or close one or more contacts. It was created by Joseph Henry in 1835. Simple electromagnetic relays, like the car picture in the first picture, are modified versions of electromagnets. It consists of a metal coil around a soft metal core, a metal yoke that provides a neutral path for the magnetic field, a moving wire, and one or more relays.

### 4. Nano Microcontroller

Arduino Nano is a microcontroller board developed for Arduino. It can be created using microcontrollers like Atmega328. T. It is a small board that can be adapted to many applications. Other popular Arduino boards include Arduino Mega, Arduino Pro Mini, Arduino UNO, Arduino YUN, Arduino Lily pad, Arduino Leonardo, and Arduino

Due. This board has many similar functions and features to the Arduino Demilune board. But the nanoplates are packaged differently. It can be used from a small USB port because it doesn't have a DC connector, but it can also be connected directly to a pin like VCC. The board can supply voltage from 6 to 20 volts from the mini USB port on the board.

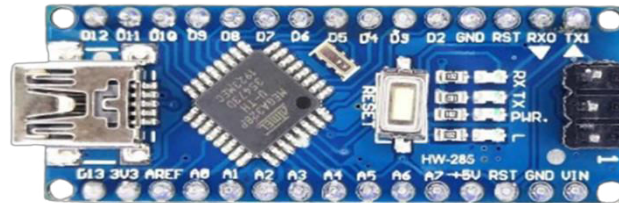


Fig no: 3 Nano controllers

### VIII. SOFTWARE REQUIRMENTS

#### 1. ARTIFICIAL NEURAL NETWORK (ANN)

An artificial neural network (ANN) is a part of a computer system designed to simulate the way the human brain analyzes and processes information. It is the basis of artificial intelligence (AI) and can solve problems that prove difficult or intractable with human or statistical models. Artificial neural networks are capable of self-learning, allowing them to produce better results as more and more data is collected. A single neuron can be thought of as logistic regression. Artificial neural networks (ANNs) are groups of many neurons in each layer. Since the input is processed in the forward direction, ANN is also called a feedforward neural network. As we can see here, Artificial Neural Network has 3 layers: input layer, hidden layer and output layer. The login process accepts the input, the hidden process processes the input, and the logout process is completed. Essentially each layer tries to learn some weight.

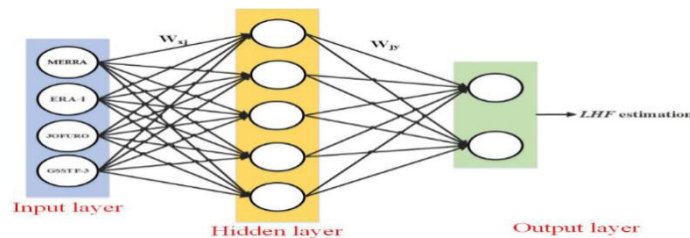


Fig no: 4 ANN algorithm

#### 2. PRE-PROCESSING

Preprocessing routinely prepares data for analysis. Before starting the actual processing, the data must first be processed to eliminate the effects of the detector. Preprocessing is the most important part of data processing. Once data is obtained as the output of the experiment, the next step is to model the data to extract important information. In general, data output may be too large, too small, or fragmented. Data preprocessing involves classifying and processing data into one of three types. Therefore, data filtering, data sorting, data processing and noise models play an important role in data preprocessing.

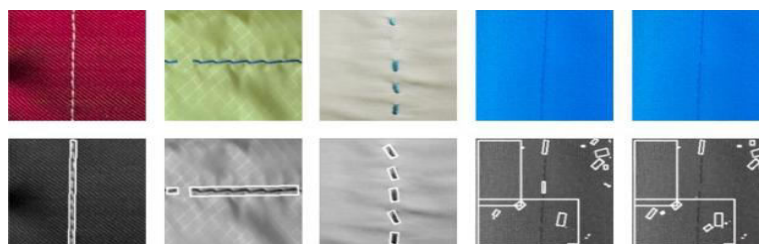


Fig no: 5 Pre-processing

### 3. SEGMENTATION PROCESS

Segmentation divides the image into several regions containing each pixel with similar characteristics. For image analysis and interpretation to be effective and useful, these areas must be closely related to the material or properties of interest. Segmentation is the first step from low-level image processing, which transforms gray or color images into one or more other images, to high-level image descriptions of features, objects, and scenes. The success of image analysis depends on the reliability of segmentation, but segmenting images accurately is often a very difficult problem.

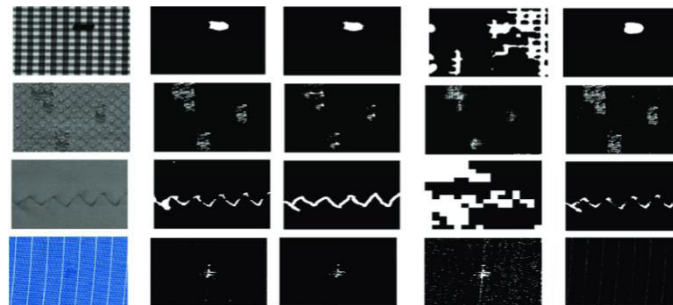


Fig no: 6 Segmentation process

### 4. CONTOURS MAPPING

A contour is defined as a graphic border line connecting all points with the same reference. Contours are very useful in analyzing images, finding the size of objects of interest, and locating objects. OpenCV has a Contour() function that helps extract contours from images. It works best on binary images, so primarily thresholding, Sobel edges, etc. We should use it. It represents the slope of a particular area.

### 5. IMAP Protocol

Internet Message Access Protocol (IMAP) is a protocol for retrieving emails from email servers. It is a mail access protocol developed by Mark Crispin in 1986. The current version of IMAP is IMAP4. It is used as the most common protocol for receiving email messages. This term is also known as Internet Mail Access Protocol, Interactive Mail Access Protocol, and Temporary Mail Access Protocol.

## IX. RESULT

The faulty sewing machine uses deep learning and ANN feature maps from pre-trained examples to detect broken threads in images with 97.3% accuracy. The technique has been tested and its robustness confirmed on many stitching images, including normal images, irregular images, and rotated images. The system is integrated with the hardware and uses Nano controllers to stop the sewing machine when a defect is detected. It also ensures that defects in the production process are reported and controlled in a timely manner by taking photographs of defects and sending them to authorized personnel via the IMAP protocol. This system demonstrates the ability to perform well as a certified production technology.

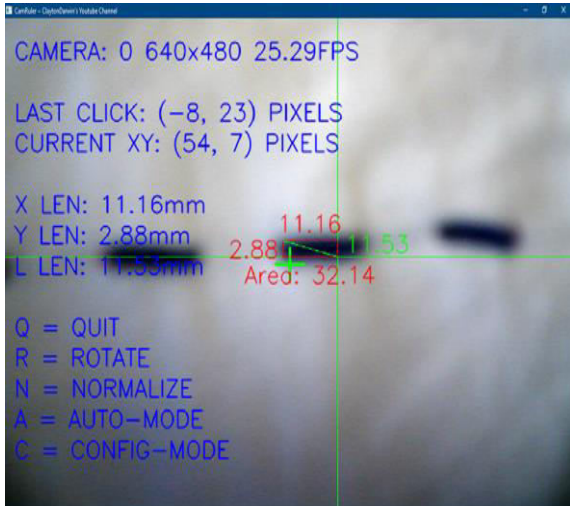


Fig no: 7 Fix the stitch area as threshold

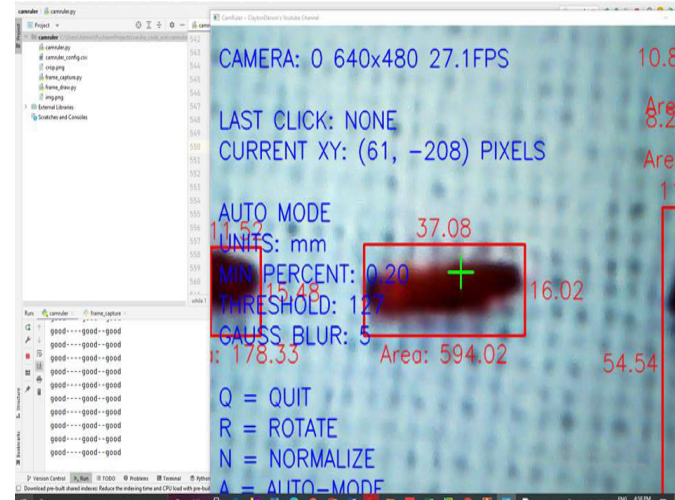


Fig no: 8 Good sewing

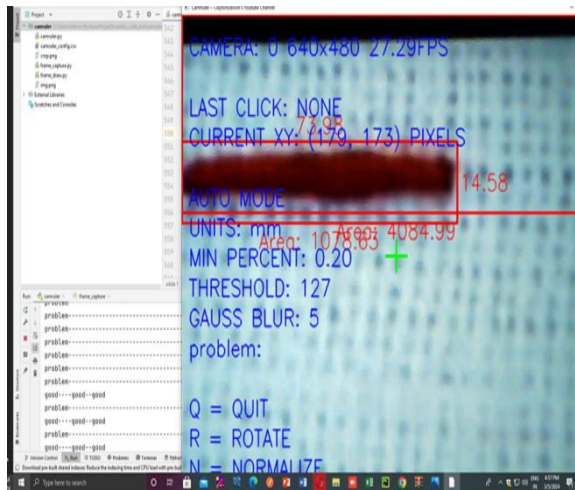


Fig no: 9 Sewing problem

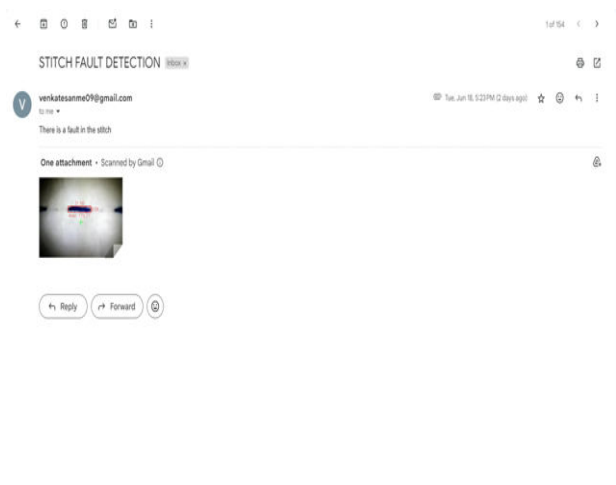


Fig no: 10 Mail alert stitch fault detect

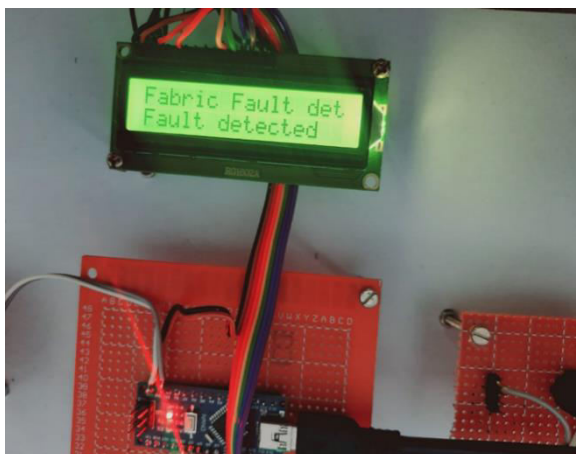


Fig no: 11 Fabric fault detected

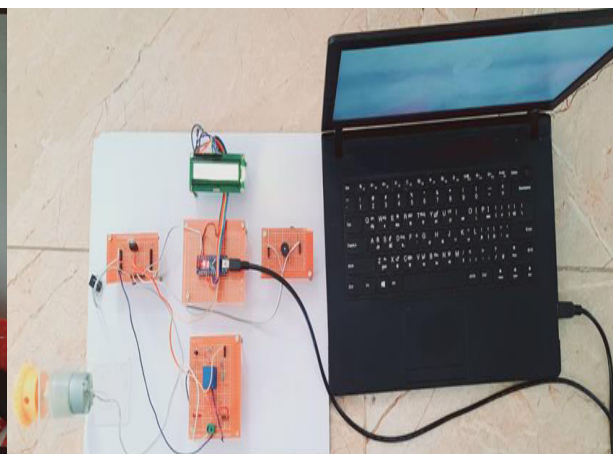


Fig no: 12 Kit over all setup



## X. CONCLUSION

In this project, we propose a defect detection method that uses ANN feature maps to detect corrupted threads while addressing the limitations of the imaging process. We propose a new fabric defect detection system that can process different types of fabric. Our direct method uses raw images as input. Only. The average accuracy of the results of our algorithm is 97.3%, which can ensure accurate detection of defects. Compared with traditional learning methods, experimental results show that our proposed method can learn effectively by adjusting the parameters. Additionally, our method can improve efficiency and reduce the time required to acquire false images.

## REFERENCES

- [1] Yiu-ming Cheung, Senior Member, IEEE, and Qinmu Peng, Member, IEEE” Eye Gaze Tracking with a Web Camera in a Desktop Environment” *IEEE transactions on human-machine systems*, vol. 45, no. 4, august 2020
- [2] Muhammad Usman Ghani, Sarah Chaudhry, Maryam Sohail, M.Nafees Geelani” Gaze Pointer: A Real Time Mouse Pointer Control Implementation Based on Eye Gaze Tracking” *Journal of Multimedia Processing and Technologies* Volume 5 Number 2 June 2021
- [3] Chaudhari.Sonali. A, Madur.Neha” Virtual Mouse Using Eye Tracking Technique” *International Journal of Emerging Research in Management & Technology* ISSN: 2278-9359 (Volume-4, Issue-2) February 2020
- [4] Prajakta Tangade<sup>1</sup>, Shital Musale<sup>1</sup>, Gauri Pasalkar<sup>1</sup> Miss. UmaleM.D., Miss.Awate S.S. “A Review Paper on Mouse Pointer Movement Using Eye Tracking System and Voice Recognition “*International Journal of Emerging Engineering Research and Technology* Volume 2, Issue 8, November 2021,
- [5] N. Ramanauskas Department of Electronics, Šiauliai University “Calibration of Video-Oculographic Eye-Tracking System “*electronics and electrical engineering medicine technology* 2020.
- [6] A. Vaitkevičius, M. Taroza, T. Blažauskas, R. Damaševičius, R. Maskeliūnas, and M. Woźniak, “Recognition of American sign language gestures in a virtual reality using leap motion,” *Appl. Sci.*, vol. 9, no. 3, p. 445, Jan. 2019.
- [7] A. O. Kılıç, E. Sari, H. Yucel, M. M. Oğuz, E. Polat, E. A. Acoglu, and S. Senel, “Exposure to and use of mobile devices in children aged 1–60 months,” *Eur. J. Pediatrics*, vol. 178, no. 2, pp. 221–227, Feb. 2019.
- [8] J. Ker, L. Wang, J. Rao, and T. Lim, “Deep learning applications in medical image analysis,” *IEEE Access*, vol. 6, pp. 9375–9389, 2018.
- [9] H. Li, “Deep learning for natural language processing: Advantages and challenges,” *Nat. Sci. Rev.*, vol. 5, no. 1, pp. 24–26, Jan. 2018.
- [10] W. Zhang, X. Zhao, L. Zhao, D. Yin, G. H. Yang, and A. Beutel, “Deep reinforcement learning for information retrieval: Fundamentals and advances,” in *Proc. 43rd Int. ACM SIGIR Conf. Res. Develop. Inf. Retr.*, Jul. 2020, pp. 2468–2471.
- [11] G. Apruzzese, M. Colajanni, L. Ferretti, A. Guido, and M. Marchetti, “On the effectiveness of machine and deep learning for cyber security,” in *Proc. 10th Int. Conf. Cyber Conflict (CyCon)*, May 2018, pp. 371–390.
- [12] A. Voulodimos, N. Doulamis, A. Doulamis, and E. Protopapadakis, “Deep learning for computer vision: A brief review,” *Comput. Intell. Neurosci.*, vol. 2018, pp. 1–13, Feb. 2018.
- [13] F. Zantalis, G. Koulouras, S. Karabetsos, and D. Kandris, “A review of machine learning and IoT in smart transportation,” *Future Internet*, vol. 11, no. 4, p. 94, Apr. 2019.
- [14] G. Devineau, F. Moutarde, W. Xi, and J. Yang, “Deep learning for hand gesture recognition on skeletal data,” in *Proc. 13th IEEE Int. Conf. Autom. Face Gesture Recognit. (FG)*, May 2018, pp. 106–113.
- [15] J.-H. Kim, G.-S. Hong, B.-G. Kim, and D. P. Dogra, “Deep Gesture: Deep learning-based gesture recognition scheme using motion sensors,” *Displays*, vol. 55, pp. 38–45, Dec. 2018.



INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  [ijirset@gmail.com](mailto:ijirset@gmail.com)



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details