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Steel Quality Prediction using Machine Learning

Bhavesh Chaudhari[1], Bhushan Patil[2], Mayur Ingale[3], Ratnesh Sarode[4], Dr Prakash Kadam[5]
[1, 2, 3, 4, 5]*Mechanical Engineering, JSCOE, Pune*

Abstract: ***These days, just like other industries mechanical industries are also shifting towards the automation by using various techniques like machine learning, nano technology, 3D printing, etc. From 19th century steel has been widely used for construction purposes especially TMT rod(thermo mechanically treated rod).In steel industries conventional methods have been widely used for predicting the quality of steel.These conventional methods are not so accurate as well as some times they are unable to identify the errors along with this they consume a large amount of time. we have proposed a machine learning technique by which microstructures of steel are compared from any dataset of images, in order to find the differences and from the obtained differences ,the component which have less amount of defects can be obtained.***

I. INTRODUCTION

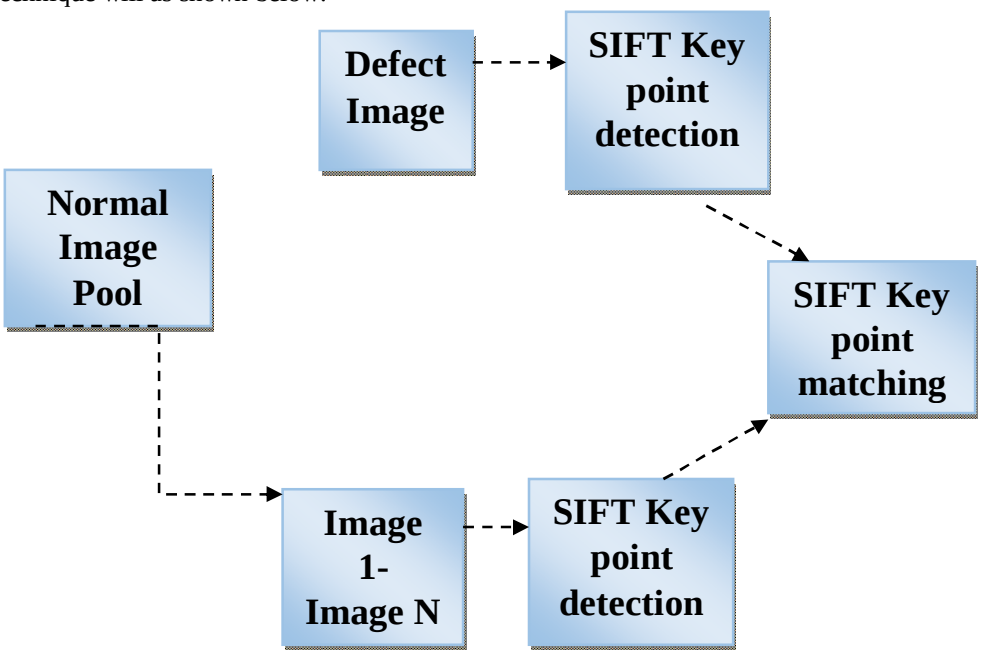
The aim of the project is to help Quality Testing Department for testing the quality of steel by just using the Machine Learning technique and image dataset of steel microstructures to pretend which of the component is most suitable for construction purpose. We have selected component as TMT rod which is backbone for all type of constructions.TMT rod is an alloy of carbon(C),sulphur(S),phosphorus(Ph)and main constituent is iron (Fe).We have selected grade of iron as Fe500.We have used SIFT (scale invariant feature transform) Technique. It a 2D coordinate Machine Learning technique which analyse the differences between two images by comparing them with each other. Out of these two images one image is the image of perfect component and another image is of component having defects, these two images are compared with each other to find differences. More differences indicated more defects so the image which will show less number of differences can be selected as optimum and the component can be selected for the desired use.

II. PROPOSED SYSTEM

To implement the SIFT algorithm following are the requirements:

1] Data set of images
2] In data set there must be one image of perfect component(as we have to compare other images with respect to it.)
3] Computer system with IDE tool. (Integrated development environment)

We have used Visual Studio Code as IDE to compare images.
The algorithm of the proposed technique will as shown below:

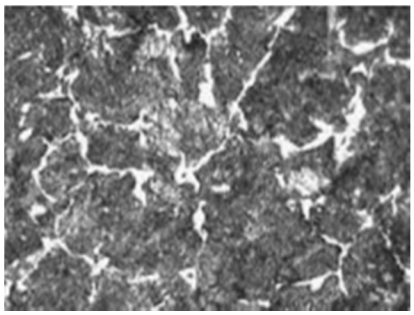


III. IMPLEMENTATION OF TECHNIQUE

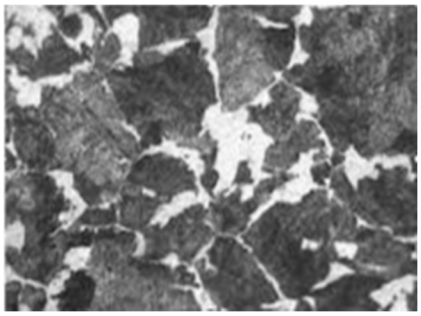
We have selected a data set of 4 images out of which Img no. 1 is the microstructure image of perfect steel component(TMT rod) while we have to compare remaining images with respect to Img no. 1 in order to find the results. Other 3 images have minor defects so it will be analysed.

The data set selected by us is

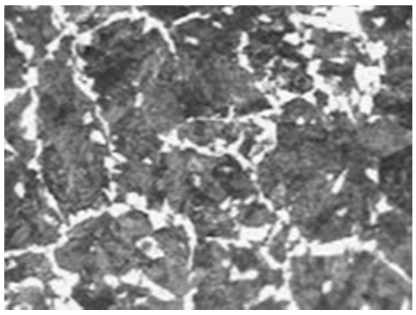
Img 1 :



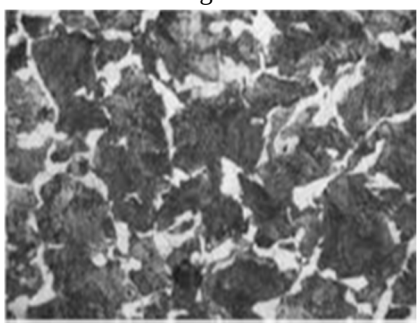
Img 2 :



Img 3 :



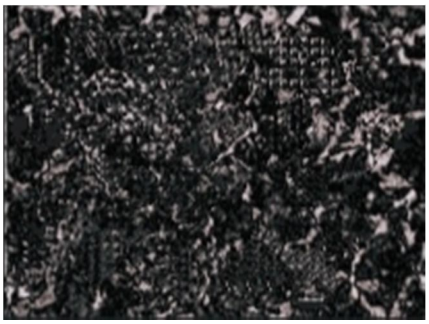
Img 4 :



IV. RESULT AND DISCUSSIONS

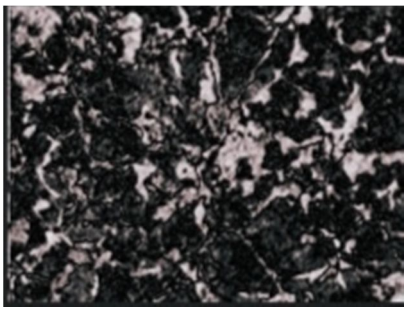
After comparing this images with respect to Img no. 1 we got the differences as below:

Diff between Img 1 & Img 2 :



Diff between Img 1 & Img 3 :

Diff between Img 1 & Img 4 :



Our Proposed System Works as: It eliminates all the similarities during comparing and it only shows the differences between microstructures. The white spots indicates the differences while the blackness indicates the similarities which are omitted. "**So we can see that the difference between Img 1 & Img 3 are less.So Img 3 can be used as an alternative to Img 1 as it is the only perfect image of microstructure amongst the dataset."**

V. CONCLUSIONS

In the proposed system, we have implemented the SIFT technique that would help Steel Quality Testing department in order to select the right component for desired use.This method will save a lot of time as well as it will reduce workload of human.

VI. ACKNOWLEDGEMENTS

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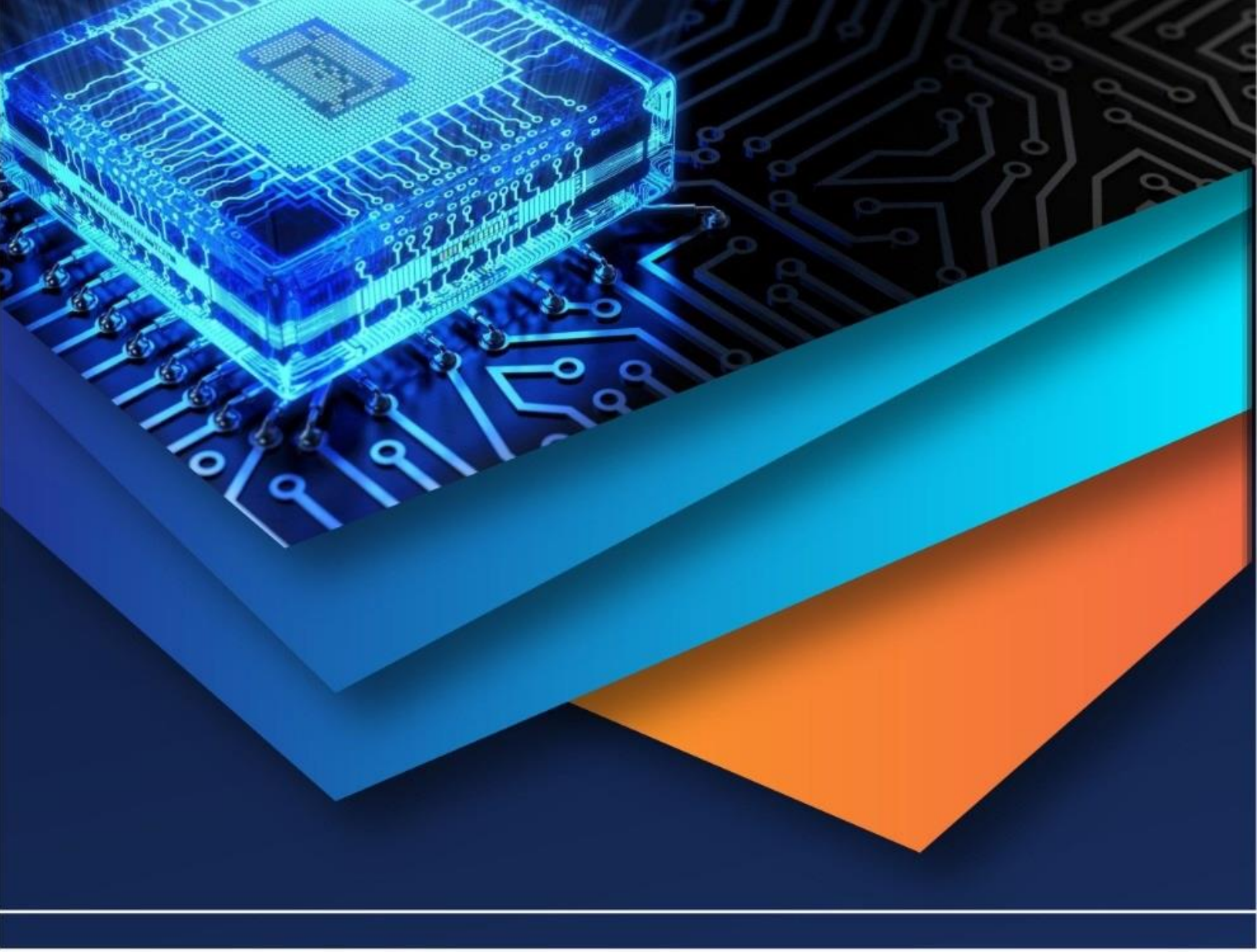

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