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DESIGN AND DEVELOPMENT OF AUTOMATIC SURFACE DEFECT DETECTION IN HOT ROLLED STEEL STRIP

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ABSTRACT

Defects on steel strip surface can majorly cause unhealthy effects, since they make physical and chemical properties mismatched from steel specification. Nowdays , automatic surface detection is used, to find defect on steel strip. These defects appear in major variety of forms and various classes, machine learning methods are basically involved to visual surface inspection for coping with these appearances. In this paper, we present defect detection model to perform defect visualization using convolutional neural network. In the project , the NEU database, which having six kinds of typical surface defects of hot-rolled steel strip, used for improve efficiency of model. The results show that the proposed model can perform defect segmentation in all kinds of defects in database. this process not needed skilled learning with no labeling and small training procedure so it is easy to give required application .also, this defect detection shall improve the productivity and reliability of steel strip's production process.

Keywords- Steel surface defect, Python deep learning, Convolutional Neural Network, Classification.

I. INTRODUCTION

The main aim of this project is detection of surface defects of different types of classes of hot rolled Steel strip. Using CCD camera images are captured and after achieving images that images are used for the detection processes .for grabbing 20 frames per second line scan camera is used ,after getting the images detection process is carried on that images and then defects are classified in different types. Performance of steel is depend on the surface defect on that Steel .In traditional method detection is done by the human eye so it is not proper detection so result is get imperfect and which is cause the major economic loss. So now a days there is a need of the automatic defect detection and which is coming up with the improved online defect detection system. By using automatic detection defect is easily found out since image processing detection has advantages of the non -contact efficiency ,visual inspection and intelligence. The main idea is the acquiring the images from the steel production industries and Do the prophet detection on that images and hand of the all the effects on that Steel which is help for Minimize that defect.

II. PROBLEM STATEMENT

Hot-rolled steel strip, is products of iron and steel industry, is mostly used in automotive, electrical, chemical, shipbuilding and other industries, and has a great development space in the next few years. In hot-rolled steel strip apparent quality is an important factor affecting its performance. Because of influence of equipment, raw materials and manufacturing technology, different types of irregularities on the surface of hot-rolled steel strip are formed in the production process, such as patches, crazing and inclusion. These defects do not affect the apparent quality of steel products, and are easy to cause rust, stress concentration, cracking and other quality problems, which greatly reduces the performance and service life of steel products. At present, manual inspection is the main method to detect the surface defects on hot-rolled steel strip in industry. This process is not only lengthy and laborious, but also high error rate. With the continuous development of image processing technology, machine learning method has gradually replaced the traditional method of manual detection, and has been applied in large-scale production practice.

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III. PROPOSED WORK

The industrial world is in a constant state of change. Machine learning will change mechanical engineering and thus many user industries. Nowdays Implementation has already started and having focus on concrete application scenarios and their implementation .From available data we can improve The efficiency ,flexibility and quality of the systems. Only for customers need there are also new business models are developed. In innovation in mechanical engineering machine learning is the key for this through the software and information technology. A defect classification method based on deep learning is proposed to detect defects on the surface of hot-rolled steel strip. As per traditional, this method improves the accuracy and efficiency of hot strip surface defect detection. Also, this method has a strong ability of defect recognition

IV. METHODOLOGY

The overall framework as in diagram consists of five stages; the first stage is learning of hot rolled steel strips, second is evaluation of flow chart, third is study of points such as to detect on the surface of hot rolled steel strips, defects and parameters, fourth is analysis of software, fifth is compare the results.

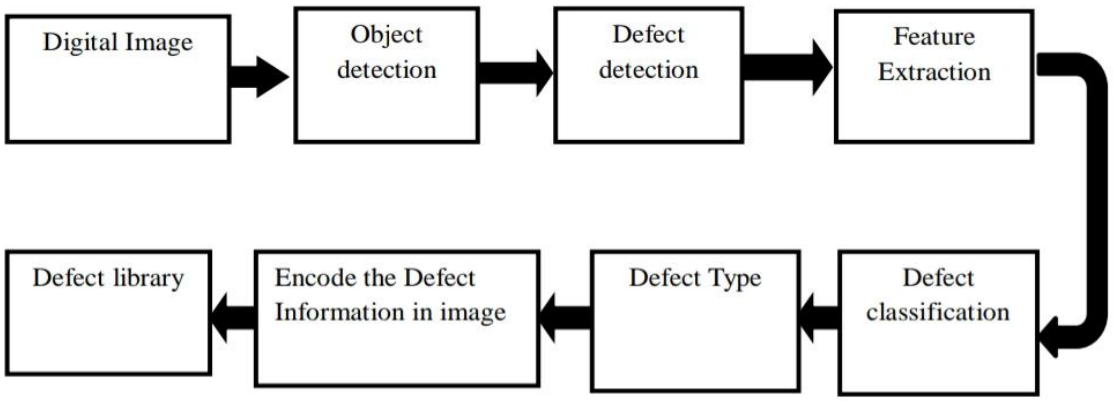

Figure1.Block Diagram Defect Detection on steel strip surface.

V. EXPERIMENTAL SETUP

In normal programming algorithm tell the computer what to do in simple way for example sorting algorithm turn data to criteria But in machine learning we need to follow some criteria such as formulation, cleaning, visualization of data, training, evaluation and the result based on the requirements The major thing in project choose the best algorithm and dataset for required output. That's why we choose the CNN model . In CNN there is automatic thought of extraction from image in the case I go with the pixel vector algorithm if I lost any pixel then CNN can effectively adjust the pixel.

VI. RESULT DISCUSSION

In this paper CNN perform the task for surface defect detection in hot rolled steel strip with there simple models. The main aim of project is not only defect detection but also designing the classifier. The accuracy of classification is going on next level with this technique. In the result we are able to find moderate accuracy with small dataset and small model in hot rolled steel strip. And accuracy can be up to 98.9%.

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8998 - val_loss: 0.3355 - val_accuracy: 0.9306
Epoch 13/20
166/166 [==============================] - 17s 102ms/step - loss: 0.2926 - accuracy: 0.
9191 - val_loss: 0.1013 - val_accuracy: 0.9583
Epoch 14/20
166/166 [==============================] - 19s 113ms/step - loss: 0.3139 - accuracy: 0.
9155 - val_loss: 0.0457 - val_accuracy: 1.0000
Epoch 15/20
166/166 [==============================] - 17s 104ms/step - loss: 0.2628 - accuracy: 0.
9197 - val_loss: 0.0244 - val_accuracy: 1.0000
Epoch 16/20
166/166 [==============================] - 18s 107ms/step - loss: 0.2708 - accuracy: 0.
9245 - val_loss: 0.6448 - val_accuracy: 0.9306
Epoch 17/20
166/166 [==============================] - 17s 105ms/step - loss: 0.2454 - accuracy: 0.
9269 - val_loss: 0.0711 - val_accuracy: 0.9722
Epoch 18/20
166/166 [==============================] - 18s 110ms/step - loss: 0.2465 - accuracy: 0.
9360 - val_loss: 0.0268 - val_accuracy: 1.0000
Epoch 19/20
166/166 [==============================] - 17s 104ms/step - loss: 0.2469 - accuracy: 0.
9342 - val_loss: 0.0213 - val_accuracy: 1.0000
Epoch 20/20
166/166 [==============================] - 17s 103ms/step - loss: 0.2531 - accuracy: 0.
9269 - val_loss: 0.0351 - val_accuracy: 0.9861
```

Figure-2: Sample of model accuracy result.

VII. CONCLUSION

The proposed work gives the higher defect detection rate as compared to manual inspection and also shows defect with categorization. This inspection were generate to meet the customer demands and decrease the financially looses and also saves manpower and time. In the near future, we will explore more correct and quick results. Also it detects not only detect which appear in actual rolling process but also detect pre-detects. The experimental results shows that the analyze their performance and improve classification accuracy. In the near future, we will explore more correct and quick results.

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