

Corrosion Detection by Image Processing

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Abstract:

Corrosion is an electro chemical reaction that occurs if the coating gets damaged even in a small area or if it develops cracks or if the thickness of the coating is not adequate. In India the losses have been estimated approximately of 25,000 Crores Rupees per Year due to the impact of Corrosion according to News letter NACE, India. India with a GDP of around \$2 Trillion loses as much as \$100 Billion (more than Rs 6 Lakh Crore) every year on account of Corrosion, which can be checked by using Zinc to Galvanise Steel Structures. "India loses around 4-5 percent of GDP annually on account of Corrosion losses," Hindustan Zinc Ltd (HZL) CEO Sunil Duggal told to PTI. Various SCADA standards are used in the Data Transmission for its fast Calculating Speed and the Cryptography to confirm the Data Package that is from the right ID which can avoid the measured values and the control instructions to be maliciously modified by attacker. SCADA can work on a numerous Sensors. In proposed work we can identify the Corrosion by Image Processing. This will help to prevent the metal or machineries from Corrosion by using SCADA. It increases their lives.

Keywords — RGB, HSV, SCADA, GDP.

I. INTRODUCTION

A few ventures, for example, semiconductor and steel producers utilize the term manufacture. The

assembling segment is firmly associated with building and mechanical plan. Instances of significant producers in North America incorporate General Motors Corporation, General Electric, Procter and Gamble, General Dynamics, Boeing, Pfizer, and Precision Castparts. Models in Europe incorporate Volkswagen Group, Siemens, FCA and Michelin. Models in Asia incorporate Toyota, Yamaha, Panasonic, LG, Samsung and Tata Motors [5].

A. Corrosion Behaviour of Steel

Corrosion products formed on a steel surface mainly contains various iron oxides, iron hydroxides, and iron oxy-hydroxides. Akaganeite is made between the corrosion products layer and iron substrate with action of chloride ions during a humid environment within the presence of oxygen and water. The chloride ions, present within the akaganeite lattice, can accelerate the iron by releasing in ionic form and dissolving within the acid solution. They concluded that the iron oxides are more stable and protective than the iron oxy-hydroxides thanks to the compact and regular structure and lower free energy of formation of the lattice [8].

II. LITERATURE REVIEW

To comprehend the sources of SCADA, we should always comprehend the problems mechanical associations are trying to fathom [2]. Before the thought of SCADA was presented within the mid-twentieth century, many assembling floors, modern plants, and remote destinations trusted staff to physically control and screen hardware by means of push catches and straightforward dials. As modern floors and remotes site began to scale call at size, arrangements were expected to regulate gear over long separations. Mechanical associations began to use transfers and clocks to offer a

point of supervisory control without sending individuals to remote areas to interface with every gadget [16].

JanuszSmulko et al [4, 2006], the electrochemical current noise was observed and analyzed when pitting corrosion processes occurred on the chrome steel surface. Transients characteristic for the Meta stable pitting processes were observed. These processes created visible pits on the electrode surfaces. a replacement method of the registered noise analysis is proposed by estimating a diagonal slice of the bi spectrum function. The results of the bi spectrum behavior were compared with the facility spectrum. It appeared that the bi spectrum function reveals new information that's not available when only the facility spectrum is taken into account.

Kristen M. Donnell and Reza Zoughi et al [5, 2012], Detection and assessment of consumption in strengthening steel bars (Rebars) regularly utilized in bond based structures may be a significant progressing concern. Installed sensor innovations hold guarantee for this reason. As lately, Modulated Scatterer Technique (MST) has indicated incredible potential as an inserted sensor innovation.

The initial introduce assessing the potential of implanted MST for rebar erosion location is to assess its potential for distinguishing the nearness of unpretentious consumption during a rebar [4]. This short paper researches the estimation potential for a double stacked differential MST approach for identifying generally unobtrusive consumption during a steel rebar.

The deterioration or destruction of materials (metals) under the chemical or electrochemical action of the encompassing environments is named Corrosion [8]. The deterioration by physical causes isn't corrosion but it's described as erosion, galling or wears [6]. Corrosion may be a big menace to the economy of the country. India with a GDP of around \$2 Trillion loses the maximum amount as \$100 Billion (more than Rs 6 Lakh Crore) per annum on account of Corrosion, which may be checked by using Zinc to Galvanise Steel Structures. "India loses around 4-5 percent of GDP annually on account of Corrosion losses," Hindustan Zinc Ltd (HZL) CEO Sunil Duggal told PTI [11].

III. PROPOSED SOLUTION

Modern SCADA systems allow real-time data from the plant floor to be accessed from anywhere within the world. This access to real-time information allows governments, businesses, and individuals to form data-driven decisions about the way to improve their processes. Without SCADA software, it might be extremely difficult if not impossible to collect sufficient data for consistently well-informed decisions. Also, latest SCADA designer applications have Rapid Application Development (RAD) capabilities that allow users to style applications relatively easily, albeit they do not have extensive knowledge of software development. The introduction of recent IT standards and practices like SQL and web-based applications into SCADA software has greatly improved the efficiency, security, productivity, and reliability of SCADA systems [7, 8]. SCADA software that utilizes the facility of SQL databases provides huge advantages over antiquated SCADA software. One big advantage of using SQL databases with a SCADA system is that it makes it easier to integrate into existing MES and ERP systems, allowing data to flow seamlessly through a whole organization. Historical data from a SCADA system also can be logged during a SQL database, which allows for easier data analysis through data trending.

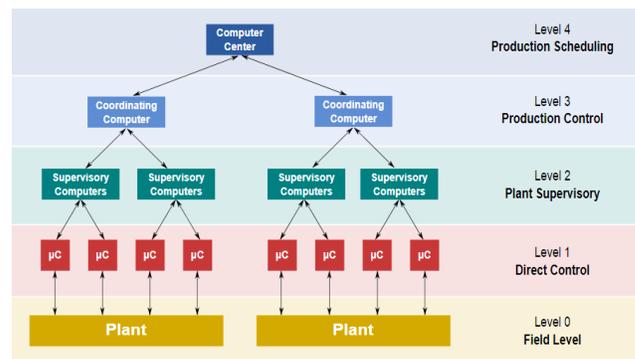


Fig.1 Functional degrees of an assembling control activity

The key characteristic of a SCADA framework is its capacity to play out a supervisory activity over an assortment of other restrictive gadgets. The going with outline may be a general model which shows useful assembling levels utilizing automated control [3].

- i. Level 0 contains the sector gadgets, for instance, stream and temperature sensors, and last control components, for instance, control valves.

- ii. Level 1 contains the industrialized info/yield (I/O) modules, and their related dispersed electronic processors.
- iii. Level 2 contains the supervisory PCs, which gather data from processor hubs on the framework, and provides the administrator control screens.
- iv. Level 3 is that the creation control level, which does not straightforwardly control the procedure, yet is worried about checking generation and targets.
- v. Level 4 is that the creation booking level.

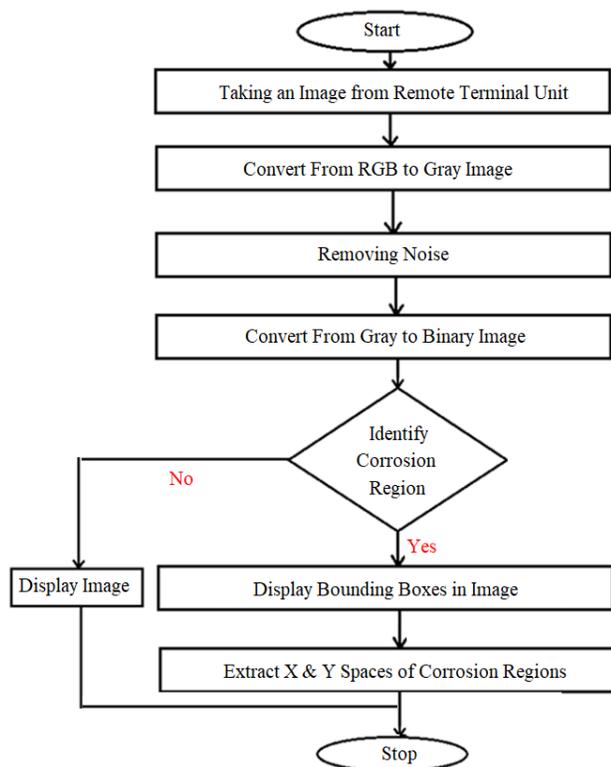


Fig.2 Proposed Methodology

MATLAB may be an intelligent framework whose fundamental information component is a cluster that doesn't require dimensioning. Two standard Colormaps were evaluated to be used with this program: Red Green Blue (RGB) and Hue Saturation Value (HSV). RGB begins from dark and develops various hues by including essential hues: Red, Green, and Blue. The Median Filter may be a non-direct computerized sifting procedure, frequently wont to expel commotion from an image or sign. Such commotion decrease may be a run of the mill pre-preparing venture to enhance the aftereffects of later handling (for instance, edge

discovery on a picture).

$$J = \text{medfilt2}(I)$$

It performs median filtering of the image I in two dimensions. Each output pixel contains the median value in a 3-by-3 neighborhood around the corresponding pixel in the input image.

$$J = \text{medfilt2}(I, [m \ n])$$

It performs median filtering, where each output pixel contains the median value in the m-by-n neighborhood around the corresponding pixel in the input image.

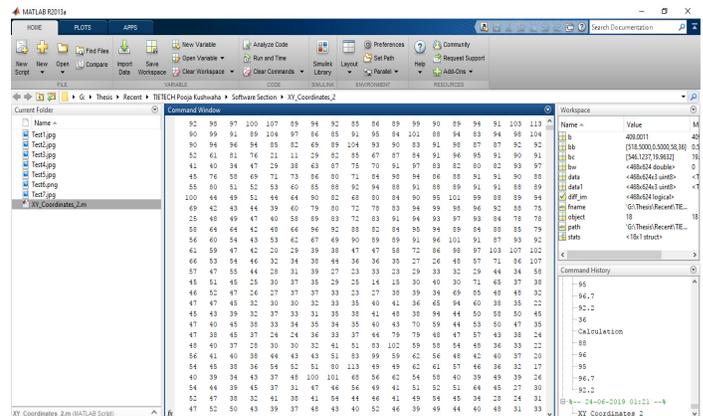


Fig. 3 Calculation of all the X & Y Coordinates using MATLAB

I. CONCLUSION

Pradeep Jain, Umesh C. Bhakta and Salil K. Sanyal et al [2], presents a contextual investigation directed to discover the reasons of crack/disappointment at curves of water cooled stator bar in a 210 MW generator. The bars containing empty and strong sub-conductors were cleaned to expel the protection.

The bombed parts were inspected under filtering electron magnifying lens, optical magnifying instrument and the consumption items by X-Ray investigation. This disadvantage of the method is this; it requires a number of equipment even it consumes more time. Firstly we have applied the proposed method on the Steel Bars and observe the result. Then we use different images to verify our proposed work. There are some important results of the algorithm.

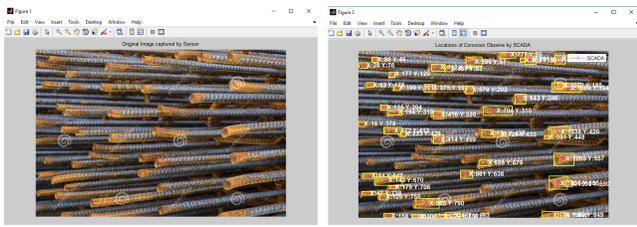


Fig. 4 Captured image-1 and its calculated X-Y Co-ordinates using MATLAB

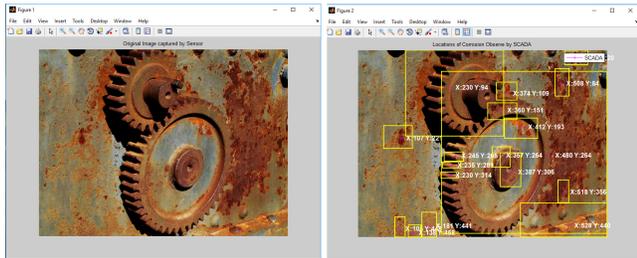


Fig. 5 Captured image-1 and its calculated X-Y Co-ordinates using MATLAB

This may help to stop the metal or machineries from Corrosion. It increases their lives. Methods to scale back the sulfur, chloride, or oxygen content within the surrounding environment can limit the speed of metal corrosion. For instance, feed water for water boilers are often treated with softeners or other chemical media to regulate the hardness, alkalinity or oxygen content so as to scale back corrosion on the inside of the unit. It means the proposed method might be very helpful for the Corrosion detection in industries which already used SCADA.

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