QUALITY INSPECTION OF METAL SHEET THROUGH ADVANCED C-SCANNED TECHNIQUES

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Abstract : A computational method to damage detection problems in structures was conducted using neural networks. The problem that is considered in these works consists of estimating the existence, location and extent of stiffness reduction in structure which is indicated by the changes of the structural static parameters such as deflection and strain. The neural network was trained to recognize the behavior of static parameter of the undamaged structure as well as of the structure with various possible damage extent and location which were modeled as random states. The proposed techniques were applied to detect damage in a simply supported beam. The structure was analyzed using finite-element-method and the damage identification were conducted by a neural network using the change of the structural strain and displacement. The results showed that using proposed method the strain is more efficient for identification of damage than the displacement. Here we have analysis the metal sheet by use of ultrasonic technique with the help of SVM. This is predictive mechanically that will calculate approximate crack detection in metal sheet and the quality of the sheets.This thesis predicts the cracks and the length of the crack ina predictive manner. The result in this thesis gives the good predictive analysis of the metal sheets.

Keywords: Neural Network, Artificial Intelligence, Hyper spectral, Crank, Wave, Particle vibration.

I. INTRODUCTION

1.1 Introduction of Artificial Intelligence

Artificial intelligence (AI) is the human-like intelligence exhibited by machines or software. It is also an academic field of study. Major AI researchers and textbooks define the field as "the study and design of intelligent agents",where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success.John McCarthy, who coined the term in 1955, defines it as "the science and engineering of making intelligent machines".

AI research is highly technical and specialised, and is deeply divided into subfields that often fail to communicate with each other. Some of the division is due to social and cultural factors: subfields have grown up around particular institutions and the work of individual researchers. AI research is also divided by several technical issues. Some subfields focus on the solution of specific problems. Others focus on one of several possible approaches or on the use of a particular tool or towards the accomplishment of particular applications.

The central problems (or goals) of AI research include reasoning, knowledge, planning, learning, natural language processing (communication), perception and the ability to move and manipulate objects. General intelligence (or "strong AI") is still among the field's long term goals. Currently popular approaches include statistical methods, computational intelligence and traditional symbolic AI. There are a large number of tools used in AI, including versions of search and mathematical optimization, logic, methods based on probability and economics, and many others. The AI field is interdisciplinary, in which a number of sciences and professions converge, including computer science, psychology, linguistics, philosophy and neuroscience, as well as other specialized field such as artificial psychology

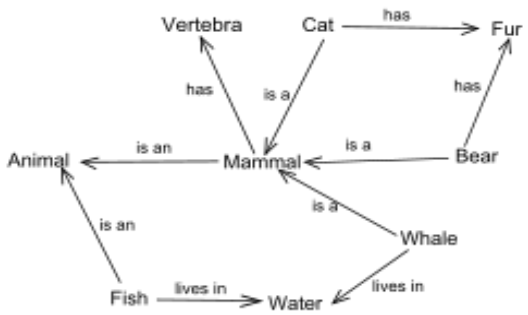

Fig1.1 : AIChartateristic

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1.2 Hyper-spectral Image Processing

Using a Hyperspectral Imaging System on plants, we aim at first on clarifying our perceptual knowledge regarding plants health status. We know that a plant is healthy through the color of their leaves. It is common to think that the greener the plant is, the healthier it is. On the same time, color acts as an indicator when something is wrong, and informs the gardener, farmer or agriculturalist. Then, they only realise the damage providing the color difference between health and damaged leaves, is notable enough. Experience and constant monitoring is crucial to be able to identify in time the danger through the visible symptoms and apply the necessary treatment. The color of the leaves if formed due to the absorption of certain wavelenghts of light, because of the plant's chromophores. Chlorophyll and carotenes are the most basic chromophores and their role in the process of photosynthesis is to be clearified later on. Since color of the leaves is linked to chlorophyll and carotenes and these chromophores are crucial to the process of photosynthesis, we could assume that there is a link between health status and chromophores concentration. Light is a form of electromagnetic wave. As such it can be also seen both as a particle and as wave as Einstein indicated. The key features of electromagnetic wave are the frequency and the wavelength.

1.3 Fuzzy Logic

FL is the fuzzy if–then rule. Although rule-based systems have a long history of use in artificial intelligence, what is missing in such systems is machinery for dealing with fuzzy consequents or fuzzy antecedents. In most applications, an FL solution is a translation of a human solution. Thirdly, FL can model nonlinear functions of arbitrary complexity to a desired degree of accuracy. FL is a convenient way to map an input space to an output space. FL is one of the tools used to model a multi input, multi output system. Fuzzy logic poses the ability to mimic the human mind to effectively employ modes of reasoning that are approximate rather computing, decisions or actions are based on precision, certainty,and vigor. Precision and certainty carry a cost.Than exact.

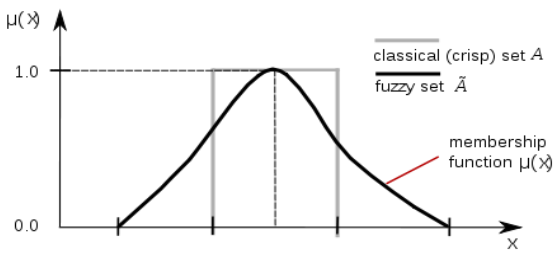

Fig1.2:Membership Function

1.6 Ultrasonic Testing

Ultrasonic Testing (UT) uses high frequency sound waves (typically in the range between 0.5 and 15 MHz) to conduct examinations and make measurements. Besides its wide use in engineering applications (such as flaw detection/evaluation, dimensional measurements, material characterization, etc.), ultrasonics are also used in the medical field (such as sonography, therapeutic ultrasound, etc.).

Fig1.3 : Ultrasonic Testing

In general, ultrasonic testing is based on the capture and quantification of either the reflected waves (pulse-echo) or the transmitted waves (through-transmission). Each of the two types is used in certain applications, but generally, pulse echo systems are more useful since they require one-sided access to the object being inspected.

II. LITERATURE SURVEY

G. M. AtiqurRahaman, Md. MobarakHossain May, 2009

Quality control is an important issue in the ceramic tile industry. On the other hand maintaining the rate of production with respect to time is also a major issue in ceramic tile manufacturing. Again, price of ceramic tiles also depends on purity of texture, accuracy of color, shape etc.

The proposed method fails to detect the glaze and scratch faults. So it may be future work to detect and classify the glaze and scratch faults. We propose no method to improve the computational time for the proposed classification technique.

Crack detection methods using radio frequency identification and electrically conductive materials. Koichi Morita and Kazuya Noguchi –October 2008

Radio Frequency Identification (RFID) tag is a promising device for the management of products at a very low cost. Huge number of such low-cost sensors can be installed to the structure beforehand, after a disaster we can access to these sensors wirelessly and very easily.

Health monitoring is important to attempt life-lengthen and life cycle cost reduction of building structures. For popularization of health monitoring, establishment of more economical sensor system is desired. In this study, crack detection sensor which consists of an RFID tag and electrically conductive materials are examined. Conclusions of this study are shown in the below:

Hyper spectral Imaging and Spectral Classification Algorithms in Plant PathologyAnthony

Sgouros – December 2008

Hyper-spectral imaging acquires a plurality of narrow-band images across the visible and the non-visible part of the spectrum. In the obtained dataset the intensity re-emitted from the object under analysis is recorded as a function of both wavelength and location.

The main drawback of classification techniques is their need for processing power. The dimensionality and thus the size of the spectral cubes and the complexity of the algorithms, make computation hard on time. In our case, data cubes loaded and ready for computation are of 120MB. Due to the plurality of cubes acquired during the three stages of our experiment, and the fact that no spectral reference existed, implied high experimentation onthe collected dataset. Execution time, should be as small as possible, andreducing it was a crucial key to get results.

III. DAMAGE DETECTION AND MATERIAL ASSESSMENT

3.1 Damage Detection

In the previous years, some proposed defect detection methods have been proposed to find out the image defects. But they have some limitations that can be described briefly as follows: In H. Elbehiery et al. presented some techniques to detect the defects in the ceramic tiles. They divided their method into two parts. In the first part, Existing method consisted with the captured images of tiles as input. As the output, they showed the intensity adjusted or histogram equalized image. After that, they used the output of first part as input for the second part. In the second part of their algorithm,

We have basically four methods by which detection can be identify.

- ✓ Perceptron Neural Networks Damage Assessment
- ✓ Probabilistic Neural Networks Damage Assessment
- ✓ Image Analysis for Damage Assessment.
- ✓ Fuzzy C-Means Clustering DamageAssessment.

3.3.1 Radio Frequency Identification (RFID)

By the radio communication between RFID tag and transmitter with antenna and controller, the object can be recognized. Distance of this communication depends on the type of transmitter and tag. At the present time, there are RFID products whose communication distance is 2[cm] to 9[m]. It is possible to communicate with a myriad tag by one transmitter because of the mobility of the transmitter. The price of tag itself is much more economical than conventional sensors.

FIG3.1 RFID

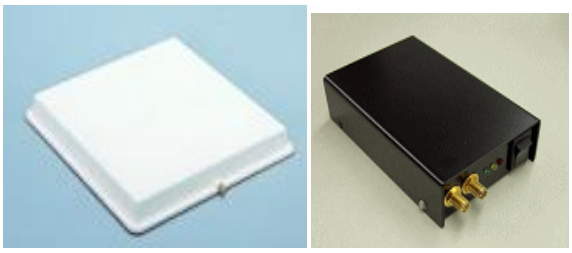

Fig 3.2 Antenna Sensor

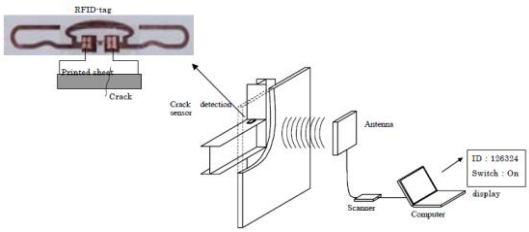

Fig: 3.3RFID for crack detection

3.2 SVM Support Vector Machine

In machine learning, support vector machines (SVMs, also support vector networks) are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression analysis. Given a set of training examples, each marked as belonging to one of two categories, an SVM training algorithm builds a model that assigns new examples into one category or the other, making it a non-probabilisticbinarylinear classifier. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of

the gap they fall on.Figure 3.4 shows the working of SVM classification algorithm.

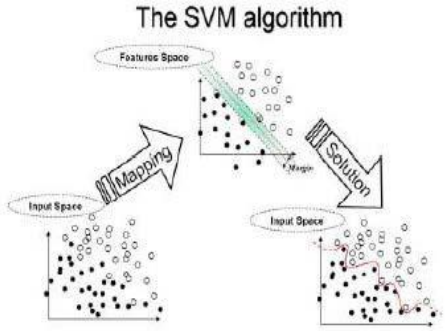

Fig3.4 :SVM Algorithm

3.3 C-Scan

The C-scan presentation is a type of presentation that is possible for automated two-dimensional scanning systems that provides a plan-type view of the location and size of test specimen features. The plane of the image is parallel to the scan pattern of the transducer. C-scan presentations are typically produced with an automated data acquisition system, such as a computer controlled immersion scanning system. Typically, a data collection gate is established on the A-scan and the amplitude or the time-of-flight of the signal is recorded at regular intervals as the transducer is scanned over the test piece. The relative signal amplitude or the time-of-flight is displayed as a shade of gray or a color for each of the positions where data was recorded. The C-scan presentation provides an image of the features that reflect and scatter the sound within and on the surfaces of the test piece.

High resolution scans can produce very detailed images. The figure shows two ultrasonic C-scan images of a US quarter. Both images were produced using a pulse-echo technique with the transducer scanned over the head side in an immersion scanning system. For the C-scan image on the top, the gate was set to capture the amplitude of the sound reflecting from the front surface of the quarter. Light areas in the image indicate areas that reflected a greater amount of energy back to the transducer. In the C-scan image on the bottom, the gate was moved to record the intensity of the sound reflecting from the back surface of the coin. The details on the back surface are clearly visible but front surface features are also still visible since the sound energy is affected by these features as it travels through the front surface of the coin For the C-scan image on the top, the gate was set to capture the amplitude of the sound reflecting from the front surface of the quarter.

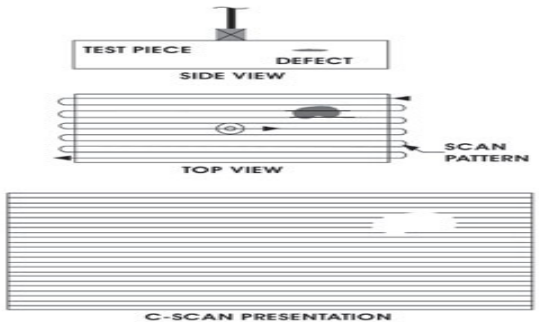

FIG3.5 –C-Scan Technique

3.4 Present Work

C-Scan using light energy. We are using C-Scan technology by mean of energy ratio. We transmit a bunch of energy on the sheet and recollect the energy. The ratio of energy transmitted to energy received by C-Scan process is evaluating during scanning of metal sheet detection process. The change in the ratio of energy reflects there is a change in surface of metal sheet. Somehow we can have the idea about the surface condition of sheet by mean of change in the light energy. This process also involve to find the cracks present in metal sheet. We can have idea about the range of cracks present in the metal sheet. This process predicts only the range of crack by mean of scanning.

IV. EXPECTED RESULT

We will present a scanning sheet that will show the quality of metal sheet through the C-Scan technique with energy ratio. In this we willhave to scanned the sheet of metal virtually and g simulative software will generate the final outcome in term of four catergories Poor, Average, Good & Excellent.

V. CONCLUSION AND FUTURE SCOPE

5.1 Conclusion

On this C-scan process, there is easily predict the surface condition and how and where crack is located on metal sheet. This process gives us better and efficient method for crack detection in metal with high level of accuracy. In the scanning implementation we have taking any metal sheet and through scanning we find the quality of that sheet whether it is good, average or poor. This scanning technique gives us better and efficient method for crack detection in metal with high level of accuracy. In this we have use tools and technology of MATLAB 2010B. This work can be used in:

- Support Vector Machine: C-Scan technique uses for fine scanning .
- Light energy used instead of sound to get better scanning results.

5.2 Limitations

Although this thesis has so many advantages in live environment, still it faces some problems. In this a large size sheet is taking more time as compare to small sheet scanning because the scanning is done pixel wise so it takes much time in scanning. Sometimes it results are predictive . In other words we can say it gives the predictive answer. Sometimes the results are not our expectation .

5.3 Future Scope

Our future endeavors will include further development of the system, such that it could be used in real time through the Internet, as an online Web-based structural health monitoring system. In we can helpful in repairing the damage in metal.This technique is helpful to get more accurate results through C-Scan process.

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