MECHANICAL SPARE PART INSPECTION USING ARTIFICIAL NEURAL NETWORK

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ABSTRACT

Artificial Neural Network (ANN) is a fast-growing method which has been used in different industries during recent years. The main idea for creating ANN which is a subset of artificial intelligence is to provide a simple model of human brain in order to solve complex scientific and industrial problems. ANNs are high-value and low-cost tools in modelling, simulation, control, condition monitoring, sensor validation and fault diagnosis of different systems. They have high flexibility and robustness in modeling, simulating and diagnosing the behavior of rotating machines even in the presence of inaccurate input data. They can provide high computational speed for complicated tasks that require rapid response such as real-time processing of several simultaneous signals. ANNs can also be used to improve efficiency and productivity of energy in rotating equipment.

In the present study develop an efficient system for sorting out various machine components in order to attain very high efficiency. Feature extraction tools are used for feature extraction of the input object. Artificial neural network the popular artificial intelligence technique is used for recognising the wavelet component object. There is also a special error function for increasing the efficiency of the system. Matlab 7.10 is used for the simulation of the object.

Keywords: Digital Signature, MATLAB 7.10, Recognition, Wavelet Transform, Artificial Neural Network.

1. INTRODUCTION

There are things at which humans are still way ahead of the machines in terms of efficiency one of such thing is the recognition especially pattern recognition. There are several methods which are tested for giving the machines the intelligence in a efficient way for pattern recognition purpose.
The artificial neural network is one of the most optimization techniques used for training the networks for efficient recognition.

The machine is made by integration of many parts to extract information from an image in order to solve some task. As a scientific discipline, computer vision is concerned with the theory behind artificial systems that extract information from images. Recognition is the classical problem in computer vision, image processing, and machine vision. It is related to the determination of whether or not the image data contains some specific object, feature, or activity. This task can normally be solved robustly and without effort by a human, but is still not satisfactorily solved in computer vision for the general case, involving arbitrary objects in arbitrary situations. The existing methods for dealing with this problem can at best solve it only for specific objects, such as simple geometric objects, human faces, printed or handwritten characters, or vehicles, and in specific situations, typically described in terms of well-defined illumination, background, and pose of the object relative to the camera. Protective relaying is applied to components of a mechanical sorting for the following reasons:

a) Separate the faulted equipment from the remainder of the system so that they can continue to function.
b) Limit damage to the faulted equipment.
c) Minimize the possibility of fire.
d) Minimize hazards to personnel.
e) Minimize the risk of damage to adjacent high-voltage apparatus.

Sort recognitions are the most important components in a system. Avoiding damage to component is vital; otherwise continuity in power delivery may be seriously disrupted. However, since the cost of repairing faulty machine may be great and since high-speed, highly sensitive protective devices can reduce damage and thereby repair cost, relays should be considered for protecting machines also, particularly in the larger sizes. Faults internal to machines quite often involve a magnitude of fault current that is low relative to the transformer base rating. This indicates a need for high sensitivity and high speed to ensure good protection. The plan selected should balance the best combination of these factors against the overall economics of the situation while holding to a minimum.

a) Cost of repairing damage
b) Cost of lost production
c) Adverse effects on the balance of the system
d) The spread of damage to adjacent equipment
e) The period of unavailability of the damaged equipment

Differential protective relay has been used as the primary protection of most machines for many years. Inrush can be generated when a transformer is switched on the transmission line or an external line fault is cleared. Similarly Over-excitation and CT saturation conditions may produce differential currents. This may result in mal-operation of differential protection if blocking scheme is unavailable. Therefore, to distinguish between fault current and other operating conditions is the key to improve the security of the differential protection.

2. LITERATURE REVIEW

The present study based on implementation of artificial neural network for sorting out automobile parts using MATLAB 7.10 software. Internal fraud detection is concerned with
determining fraudulent financial reporting by management [17, 18, 19, 20, 14, 9]. The optimization algorithm has less iteration than implementation with Artificial Neural Network process for the same task and other improved algorithms while the convergence rate is faster and the precision is higher [7]. Curve figures in terms of perimeter radius are used as feature extraction [6, 10, 12] for recognizing objects. This method is more suitable for real time recognition systems compared with previous research [5], because we can get better iteration time, speed of belt conveyor and accuracy, the idea of combining different modules has been studied in the ANN field and statistics [2, 3], few attempts have been made in evolutionary learning to use population information in forming the final system. Recognition is the classical problem in computer vision, image processing, and machine vision. It is related to the B. Green, J. Choi, Assessing the Risk of Management Fraud through Neural Network Technology. Auditing: A Journal of Practice and Theory 1997, vol. 16(1) pp14- 28.

Determination of whether or not the image data contains some specific object, feature, or activity. This task can normally be solved robustly and without effort by a human, but is still not satisfactorily solved in computer vision for the general case, involving arbitrary objects in arbitrary situations. The existing methods for dealing with this problem can at best solve it only for specific objects, such as simple geometric objects, human faces, printed or handwritten characters, or vehicles, and in specific situations, typically described in terms of well-defined illumination, background, and pose of the object relative to the camera [1–6, 8, 11].

In this paper, we use the MATLAB and implement the wavelet transform analysis and artificial neural network for image processing and detection [13]. The optimization algorithm has less iteration than implementation with Artificial Neural Network process for the same task and other improved algorithms while the convergence rate is faster and the precision is higher [7]. Curve figures in terms of perimeter radius are used as feature extraction [6, 10, 12] for recognizing objects. This method is efficient and more suitable for real time recognition systems compared with previous research [5, 7] because we can get better iteration time, speed of belt conveyor and accuracy.

3. METHODOLOGY

A software framework is designed using the MATLAB which is more suited for the image processing application due to its basic matrices. The process start with image acquisition where image will be capture using the high resolution camera, follow by pre-processing of the images captured to reduce the image for its unified size [15]. Images are then converted to gray scale and double precision image for the analyzing process. After the images have been pre-processed, the WAVELET TRANSFORM is determined. Lastly according to the parameter of WT, the status of a TRAINING process can be determined by using neural network and action can be taken to follow up this result.

3.1 Configuration database

This configuration is used for configuring the information such as image size and image resolution. In this case, image size is fixed i.e. 100 x 100 pixels, and the image input format is in gray scale.

3.2. Image processing feature extraction

Image processing feature extraction consists of wavelet transform methodology for getting the unique feature vector.

3.3. Artificial neural network

Artificial neural network is the soft computing optimisation technique which is used to give the train result in a efficient way depending on the training set of data. So, it is essential to give
artificial neural network proper training input vectors which is nothing but the principal component analysis highest eigen values. These values are different and unique for the input datasets.

The flowchart for discussed algorithm is shown in fig 1.
The algorithm for implementation of the work is as follows:

1. Image acquisition from digital camera or web camera of high resolution.
2. Pre-processing of the acquired image by image enhancement algorithms.
3. Image resize into 100x100 common resolutions for uniformity.
5. Wavelet energy detection and get parameters like approximate coefficient, horizontal coefficient, vertical coefficient and diagonal coefficients.

4. SIMULATION RESULT

Finally, we compare the wavelet-based image compression with the DCT-based image compression while the compression ratio is similar. In the figures followed, the left column is DCT-based images, and the right column is Wavelet-based images. Both of them use larger and larger quantization step-size to generate higher and higher compression ratio, and we observe the difference of the two compression method.

$$I_1: \text{Original image with width } W \text{ and height } H$$
$$C: \text{Encoded jpeg stream from } I_1$$
$$I_2: \text{Decoded image from } C$$
$$\text{CR (Compression Ratio) } = \frac{\text{sizeof}(I_1)}{\text{sizeof}(C)}$$

$$\text{RMS (Root mean square error) } = \sqrt{\sum_{y=1}^{H} \sum_{x=1}^{W} [I_1(x, y) - I_2(x, y)]^2 / (H \times W)}$$

In this study we have touched the topic of performance evaluation of three feature extraction techniques which is given to the artificial neural network for recognition of nut and bolt. We noticed that it becomes more and more urgent to correctly and appropriately evaluate computer vision algorithm performance. Therefore a generic evaluation system must be constructed for benchmarking.
Fig. 2: Simulation result on MATLAB 7.10. A. Running window of MATLAB 7.10, B. Selected spare part input, C. Graphical simulation output of selected input, D. Name of selected input

5. CONCLUSIONS

The wavelet transform decomposition analysis is the simple yet powerful descriptors of object detection. We tested on the basis of theoretical concepts that this descriptor can be used to approximate the spatial location of a sparse foreground hidden in a spectrally sparse background, which is also continuous in nature. Provided experimental data to show that the approximate foreground location highlighted by wavelet energy was perfectly notable, predicting them better than other algorithm at a very high speed and accuracy. The result is then when given to the artificial neural network the result accuracy is very high compared to some traditional methods.

REFERENCES


