

# **A Study of 3D CAD Model and Feature Analysis for Casting Object**

Rashiqah Rashli<sup>1\*</sup>, Zuliani Zulkoffli<sup>1</sup>, Elmi Abu Bakar<sup>2</sup> and Mohd Shukri Soaid<sup>2</sup>

<sup>1</sup> School of Mechanical Engineering, University Science Malaysia, Malaysia.

<sup>2</sup> School of Aerospace Engineering, University Science Malaysia, Malaysia.

Received 29 December 2011; received in revised form 30 January 2012; accepted 29 February 2012

## **Abstract**

When dealing with computer vision inspection testing parts in production line, the appearance of noise such as dust and inconsistent light distribution should be consider for further analysis on the parts image. In this paper, shape representation model using feature vector and Fourier descriptor were presented on the 3D CAD model image with the aim to gain the shape feature analysis for casting object. By adding light and salt & pepper noise on the CAD model image, the predicted database was compared to its original CAD image. In feature vector method, calculation on its Similarity, Correlation, Matching black and white points was carried out. Results observation show similarity of feature vector method performs 68% accuracy for light noise appearance, while correlation method performs 98% accuracy on disturbance of salt & pepper noise. Fourier Descriptor used to present the pose estimation of images on CCW and CW direction. Result shows matching sets similarity is value high since the dissimilarity value keeps below 0.3 and achieve few similar points in certain position. Thus, it is sufficient for casting object by implementing feature vector method which were very useful in analyze the noise on the image while pose estimation position described by Fourier Descriptor function.

**Keywords:** inspection, noise, shape representation, 3D CAD model image

## **References**

- [1] D. S. Zhang and G. Lu, "Review of shape representation and description techniques," *Pattern Recognition*, vol. 37, pp. 1-19, Jan. 2004.
- [2] Nghan D. Salih, David Chek Ling Ngo, "A Novel Method for Shape Representation," *GVIP 05 Conference, CICC, Cairo, Egypt*, Dec 2005, pp. 457-460.
- [3] Luciano da Fontoura Costa and Roberto Marconde Cesar Jr, *Shape classification and analysis*, 2nd ed. U.S.A: CRC Press, 2009.
- [4] Olga Miljkovic, "Image preprocessing tool," *Kragujevac J. Math.*, vol. 32, pp. 97-107, 2009.
- [5] Hong Shan Neoh and Asher Hazanchuk, "Adaptive Edge Detection for Real-Time Video Processing using FPGAs," *Global Signal Processing Expo and Conference*, Sep. 2004.
- [6] Canny J., "A computational approach to Edge detection," *IEEE Trans. Pattern Analysis and Machine Intelligence*, vol. PAMI-8, pp. 679-698, Nov. 1986.
- [7] Rafael C. Gonzalez, Richard E. Woods and Steven L. Eddins, *Digital Image Processing using MATLAB*, U.S.A: Prentice Hall Press, 2007.
- [8] Elmi Abu Bakar, Tetsuo Miyake, Zhong Zhang and Takashi Imamura, "3D CAD models and its feature similarity," *International Journal of Signal Processing*, vol. 5, pp. 259-263, Sep. 2009.

\* Corresponding author. E-mail address: sheeqa\_89@yahoo.com

Tel.: +6045996391; Fax: +604-5941025

- [9] Nobuyuki Otsu, "A threshold selection method from gray-level histogram," *Signal Processing & Analysis*, vol. SMC-9, pp. 62-66, Jan. 1979.
- [10] Stephen M. Smith and J. Michael Brady, "SUSAN - A new approach to low level image processing" *International Journal of Computer Vision*, vol. 23, pp. 45-78, May 1997.
- [11] Feng Zhao, Qingming Huang and Wen Gao, "Image matching by normalized cross-correlation" *International Conference on Acoustics, Speech, and Signal Processing*, vol. 5, pp. 729-732, May 2006.
- [12] Nikos K. Logothetis, Jon Pauls and Tomaso Poggio "Shape representation in the inferior temporal cortex of monkeys," *Current Biology*, vol. 5, pp. 552-563, May 1995.
- [13] W. Fortsner "A Feature Based Correspondence Algorithm for Image Matching," *International Archives of Photogrammetry*, press paper Internet Service Provider Communication III, 1986.
- [14] Lledó Museros, M. Teresa Escrig, "A qualitative theory for shape representation and matching," unpublished.

