

UNIVERSITI TEKNOLOGI MARA

**SHAPE-BASED RECOGNITION
USING COMBINED JACCARD AND
MAHALANOBIS MEASUREMENT**

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ABSTRACT

Numerous well-established shape recognition approaches for handling variance of image transformations and strokes variations in free-hand digital sketching environment but none has satisfactorily deal with object features yet. Complexity in the computation measure, expensive in computation time, requires large training data set and extensive training is not practical, especially in sketching recognition. In contrast, methods for similarity measurement such as Jaccard distance, Mahalanobis distance and others are commonly used in recognition tasks offer a simple computation, not require a large training data set and can handle variances of image transformations and strokes variations. Therefore, we proposed a shape recognition algorithm using similarity measurement combining Jaccard and Mahalanobis distance is used to measure the similarity between geometry shape sketches. Two major pre-processing procedures involved feature extraction and edges perfection were performed for shape normalization and beautification. The new combined algorithm also implements edges separation and masking technique to improve similarity measurement and reduce the amount of testing data set used. Results show that the combination of Jaccard and Mahalanobis distance increase similarity percentages from 18% to 66%, thus accrued an improvement of 48% differences. Having this difference, the two major contributions made in this study are first a combined algorithm and a new technique of separating edges in Jaccard and the use of extreme vertices in Mahalanobis distance. This proposed combined algorithms and techniques can achieve high performance in shape similarity measurement recognition and also the masking technique in Mahalanobis distance measurement can reduce the amount of data analysis.

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

This chapter provides an overview of the study starting with reviews on research background, fields of underlying object and shape recognition techniques; it also covers on several applications and the constraints in the area. The chapter proceeds by highlighting the problems, outlining the objectives and specifying the scope and limitations of the study. The present chapter also discusses on the significance contribution of this research and concludes this chapter by presenting the organization of thesis.

1.2 BACKGROUND OF THE STUDY

Rapid increase of digital images and growing power of technologies has contributed to wide varieties of recognition application and research areas. One of these important recognition research areas was shape recognition. Shape recognition had been introduced extensively over the past fifty years and became one of the largest research areas in the field of pattern recognition and computer vision. Shape recognition application was generally based on matching and recognizing of planar shape descriptions including handwriting, geometric shape, traffic signs, real image, free-hand drawing, trademark and others. Over the years, shape recognition had been developed in a wide range of domain applications such as appearance-based recognition (Bicego et al., 2005), service robot in smart environment (Park et al., 2007), trademark retrieval (Zou & Umugwaneza, 2008), medical diagnosis (Laatu et al., 2004) and content-based image retrieval (CBIR) (Wang et al., 2005).

Basically, shape recognition recognizes and identifies the best matched shape from the class of a shape based on the query shape (Attalla & Siy, 2005). There are four dominant visual features that are representing the features of an object used in recognition tasks which are shape, texture, colour, and brightness. Among the visual