Name of the Scholar: **B. Mohammed Imran**

Name of the Supervisor : **Prof M. M. Sufyan Beg**

Department : **Department of Computer Engineering**

Title of thesis : **Image Retrieval Using Extended Fuzzy Logic**

ABSTRACT

A rapid increase in crimes and terrorism throughout the world has made people worried about their country's safety and also their own self. But, those miscreants who are the main cause for such tragedies are not generally captured in the surveillance camera either. In such situations, the on-lookers are looked up to provide the features of miscreants involved. Thereafter, the sketches can be made by the experts based on the narrations. In some criminal cases, the imprecise information as evidence found by an investigation team, called crime scene investigation. In both these situations, decisions made as such with the available information may go erroneous, due to imprecision in the information. So, here comes a need of computation of imprecise information and the sketches. We compute the fuzziness in imprecise information through estimation, by making a standard model as reference. However, the difference between the imprecise information and the reference discloses the degree of fuzziness in membership function.

In this regard, we begin estimating fuzziness in imprecise geometric shapes that are drawn without making use of rulers and compass. This type of geometry is referred to as fuzzy geometry. The fuzzy geometry is believed as the counterpart of Euclidean geometry. The fuzzy geometric objects can be envisaged as the fuzzy transformed form of Euclidean geometric objects. However, there is no proper definition for fuzzy transformation. In this perspective, fuzzy transformation of Euclidean geometric objects like point, line, parallel, circle, triangle, rectangle and square result in fuzzy version referred as f-point, f-line, f-parallel, f-circle, f-triangle, f-rectangle and f-square. The fuzziness in fuzzy geometric objects is estimated in terms of membership functions. The estimation is carried out as per the fuzzy algorithm designed by us. The mathematical function generates exponential membership function. Further, we have performed simulation that shows the fuzzy transformation on fuzzy objects like line, circle and parallel. In addition, we have designed a fuzzy inference system to compute the fuzzy similarity in fuzzy triangles by giving the membership values. The dataset used as inputs are

derived from the well known postulates of similar triangles. Since, there are fuzzy geometric shapes like fuzzy triangle, fuzzy rectangle and fuzzy square, which contribute multiple parameters for its estimation. The need of better aggregation for multiple parameters has motivated us to switch to ordered weighted averaging operators. Nonetheless, we have implemented ordered weighted averaging for both fuzzy validity and fuzzy similarity among a set of fuzzy triangles, fuzzy rectangles and fuzzy squares.

Our ultimate goal is to make a model that can retrieve fuzzy images based on the perceptions as input in natural language. This feature of retrieving fuzzy images is not even found in well known image retrieval systems. Certainly, the query in natural language inherits impreciseness. We designed fuzzy image retrieval especially for fuzzy geometric objects. Because, the geometric objects are the basics of any shape found in an image. For that, we have estimated the fuzzy validity, then, those fuzzy images are stored along with the possible descriptions in natural language. The descriptions in natural language are the keywords. Undoubtedly, we have incorporated the techniques of document retrieval, because, it is the basis for information retrieval. The outputs are justified with the input queries.

Our work can be further extended to retrieve the fuzzy facial features using a perception based query. For that, a very large database containing several types of eyes, nose, ears, forehead, cheeks, chin, and eyebrows is required. However, their corresponding descriptions need to be stored in many possible ways. Consequently, the search engine fetches the most relevant facial objects from the image database to the user. Further, by the features of the miscreants given as input from the on-lookers will fetch approximate image. Nonetheless, this retrieved fuzzy image can be subjected to compute fuzzy similarity, wherein a high relevancy image can be matched, which is called as the fuzzy valid solution. However, our work opens a wide range of applications in intelligent image retrieval.