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# Age Detection system Using Fuzzy Logic in Image Processing

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**ABSTRACT:** Automatically human age recognizing using facial Image analysis has lots of potential real-world application, such as human computer interaction and multimedia communication. Several face detection algorithms are developed to track human face in a motion scene Edges can be recognizing using fuzzy logic algorithm with different levels of processing. In the proposed algorithm, a digital image is calculated using three (3) 3x 3linear spatial filters i.e. low-pass, high-pass and edge enhancement Filters through spatial convolution process. Fuzzy system inputs can be read through Edge strength values derived from the three masks form three set of edges, based on the Gaussian functions and fuzzy rules the fuzzy system checks whether a pixel in focus belong to an edge or non-edge. Defuzzier methods are used to produce final pixel classification of a image for generating output pixel value. In this paper, we are trying to detect the edges of images for recognizing age of human by using fuzzy logic in MATLAB environment without determining threshold value of image.

**KEYWORDS:** Age, Fuzzy Logic, Fuzzy Inference System, Edges, Fuzzy Edge Detection, fuzzy rule, digital image processing, fuzzy classification, image segmentation

## I.INTRODUCTION

An edge in an image is defined a boundary or contour where a abrupt change occurs in some physical aspect such as gray level value of an image. Edge detection is one of the most important tasks in image processing. Especially segmentation, registration, identification and recognition are based on edge detection algorithm. Many edge detection techniques are available in the literature. But most of them either have fixed result such as thickness of edges or some parameters must be selected certainly for good result such as threshold and σ. The fuzzy logic approach doesn't have this restricts. Facial landmark points like eye, nose, lip positions, chin, forehead along with steadiness of face, direction of gaze, amount of face movements presents many aspects of human behaviour.

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## II. FUZZY IMAGE PROCESSING

Fuzzy image processing has three main stages, image fuzzification, modification of membership values, and finally image defuzzification. The fuzzification and defuzzification steps are coding of image data (fuzzification) and decoding of the results (defuzzification). These steps make possible to process images with fuzzy technique. Fuzzy Sets and Fuzzy Membership Functions: The system implementation was carried out considering that the input image and the output image obtained after defuzzification are both 8- bit quantized; this way, their gray levels are always between 0 and 255. The fuzzy sets were created to represent each variable's intensities; these sets were associated to the linguistic variables Black, Edge and white. The adopted membership functions for the fuzzy sets associated to the input and to the output were triangles, as the functions adopted to implement the "AND" and "OR" operations were the minimum and maximum functions, respectively. The Mamdani method was chosen as the defuzzification procedure (12-19). Which means that the fuzzy sets obtained by applying each inference rule to the input data were joined through the add function; the output of the system was then computed as the membership function. The values of the three-membership function of the output are designed to separate the values of the blacks, whites and edges of the image. The method

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described does not implement any thresholding unlike few published methods which helps to detect each and every edge associated with the image but introduces fuzzy logic which derives its origin from approximate reasoning for highlighting all the edges associated with an image. The fuzzy relative pixel value algorithm has been developed with the knowledge of vision analysis with low or no illumination, thus making this method optimized for application requiring such methods. The method helps us to detect edges in an image in all cases due to subjection of pixel values to an algorithm involving host of fuzzy conditions for edges associated with an image. The purpose of this paper is to present a new methodology for image edge detection which is undoubtedly one of the most important operations related to low level computer vision, within area of feature extraction with plethora of techniques, each based on a new methodology, having been published. The method described here uses a fuzzy based logic model with the help of which high performance is achieved along with simplicity in resulting model. Fuzzy logic helps to deal with problems with imprecise and vague information and thus helps to create a model for image edge detection as presented here displaying the accuracy of fuzzy methods in digital image processing.

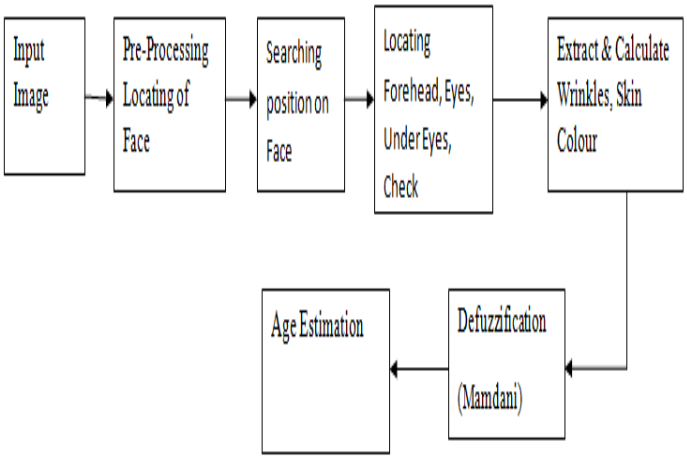
## III. DEFUZZIFICATION

Defuzzification is a process of producing a quantifiable result in fuzzy logic, for given fuzzy sets and corresponding membership degrees. These will have a number of variables into a fuzzy result. The result is described in terms of membership in fuzzy sets. There are seven methods for defuzzification

1. Centroid Method
2. Bisectors Method
3. Middle of Maximum Method.
4. Smallest of Maximum Method
5. Mamdani Method
6. Larsen's Method
7. Largest of Maximum Method.

In this paper for defuzzification we used Mamdani method. The input for the defuzzication is a fuzzy set (the aggregate output of fuzzy set) and the output is a single number.

## IV. PROPOSED SYSTEM




The main process to estimate the age from a human face is to find attributes of aging. These attributes play a vital roleas an important data to be classified age in groups and estimated age in points. A process of extracting attributes and estimating age has shown in following parts;

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### A. PRE-PROCESSING

In pre-processing method, we used standard color face pictures from FG-NET [11] and PAL [12] shown in Fig. 2(a).

### B. FEATURE EXTRACTION

To find the main positions on face, we should know where the spots on face appeared. The aging we have chosen affects the estimation of age on face . The main positions on face can tell us about aging of each rang, exhibited four important areas, as a forehead, under the left and right eyes, on the corner of left and right eyes, and besides the left and right cheek.

### C. WRINKLE FEATURE EXTRACTION

Aging on face is very important to estimate age from face. This utilized seven features of wrinkle, areas consisted of forehead, left eye corner, right eye corner, under left eye, under right eye, left cheek, and right cheek The process to determined wrinkle began in calculating horizontal aging using the mask using by Gabor filtering. ‘

### D SKIN COLOR FEATURE EXTRACTION

Besides wrinkle, skin color is also significant to distinguish the age [15]. This research took two positions into account for extracting skin color on face by converting the color system from RGB to HSV. In this regard, we were able to determine standard deviation of the picture .Finally, we will obtain two more features from skin color, namely, the eighth and ninth features on the left cheek and the right cheek, respectively.

### E. AGE GROUP CLASSIFICATION

SVMs is a popular machine learning technique in classification. It transformed original n dimensional data to higher dimension of features using kernel function. Even though SVMs was linearly binary classifier using maximal margin line as the classifier in nature, it can deal with multiclass using Decision Directed Acyclic Graph (DDAG) topology shown in Fig. 6. As earlier stated, kernel functions allowed SVMs to deal with non-linear classification. There were several kernel functions available in SVMs, such as linear, polynomial, quadratic, radial basis, Sigmoid, etc. Some kernel function were given in equation (7),(8),(9), and (10)

### F. FUZZY LOGIC

Following SVMs, the point age estimation was important. In this regard, Fuzzy Logic (FL) was popular in estimating the point age as shown in several algorithms in literature [2][5][15]. This paper presented a method to estimate the agepoint with FL. The results of SVMs in each age group will become an input to FL. Input variables were wrinkle and skin color features and the output variable was the point age. All variables applied triangular membership functions for their terms. In this research, there were nine significant fuzzy inference rules being constructed from Table 1. To calculate the input 1, wrinkle, on FL, an original input features on face from 1 to 7 was considered. Pixel values in the image of binary of the feature 1-7 were determined. It was summed, and then divided by the maximum value of the feature 1-7. Then, it was normalized by being multiplied by ten as shown in equations (11) and (12). In addition, input 2, skin color, was determined using the previous eighth and ninth features as earlier stated in SVMs.

## V. CONCLUSION

This paper presented the method to estimate the age group and point age using a hybrid of Support Vector Machines image processing and Fuzzy Logic (FL). The determining features consisted of facial wrinkles and skin color of face. For forecasting age groups, the proposed method using image processing to forecast the age. Then, FL took output from image processing as inputs to forecast the age in point in each group. For performance evaluation, 700 faces in FG-NET and 500 faces in PAL databases were implemented using 10-fold cross validation in comparison with the five advanced compared methods in literature. In this regard, the proposed method provided 90.88% and 3.12 in PAL database for accuracy and mean absolute error (MAE), respectively. It was superior to the compared methods. In addition, the proposed method gave 88.84% and 4.81 in FG-NET for accuracy and MAE, respectively methods. This

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suggested us to continue finding the most powerful features and the improved method to enhance the performance on age estimation in future work.

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