ISSN:2231-0711
www.ijcset.net

A Method of Detection and Classifying the Vehicle

B. Uppalaiah[#1], K. Ankalarao[*2], T. Charan Singh[#3]

[#1, #3] *Department of CSE, Holy Mary Institute of Technology & Science (HITS COE)*
[*2]*Department of CSE, Anurag Engineering College (AEC)*
[1]bnp.uppalaiah@gmail.com
[3]tejavath.charan@gmail.com
[2]konakalla.ankalarao@gmail.com

***Abstract*—Vehicle Class is an important parameter in road traffic management. With the help of vehicle classification the computation of percentage of state-aid streets, highways become simpler and it is also used in automated toll bridges. In this paper we classify the vehicles into three main broad categories: A) Light vehicle B) Medium Vehicle C) Heavy Vehicle. Firstly, the image pre-processing is done with the gray-scale conversion and filtering of the image. Then with the help of fuzzy logic based novel edge detection technique we detect the edges to get the shape and size of the vehicle and classify the vehicle.**

***Keywords*— Edge Detection, Median Filter, Fuzzy Logic.**

I. INTRODUCTION

In this paper we classify the vehicle using fuzzy logic based novel edge detection technique. As it is known that Vehicle classification plays a key role in solving Traffic congestion problem.

Current automatic vehicle classification systems have several deficiencies: low accuracy, special requirements, fixed orientation of the camera, or additional hardware and devices. In comparison with the existing systems, the major advantages of the proposed system are (a) no special orientation of the camera is required, (b) no additional devices are needed, and (c) high classification accuracy is provided.

Vehicle length and the distance between axles are used for vehicle classification. The different classes of vehicles are identified as 1) Light Vehicle 2) Medium Vehicle 3) Heavy Vehicle.

Light vehicle includes scooter, motorcycle, while Medium vehicle includes car, mini bus, jeep etc. and the Heavy vehicle includes bus and truck.

There are various edge detection techniques, the most common of them are sobel, perwitt, kenny and Krisch.

The Sobel operator is a discrete differentiation operator which computes an approximation of the gradient of the image intensity. In other words it can be said that, it uses intensity values only in a 3×3 region of each image point to approximate the corresponding image gradient, and it uses only integer values for the coefficients which weight the image intensities to produce the gradient approximation. A major drawback of sobel edge detection technique is that it is easily susceptible to noise and to some extent it gives an inaccurate approximation of the image gradient.

Canny edge detection operator is a multi-stage algorithm to detect a wide range of edges in images. It uses a first order gaussian function, because it is susceptible to noise present on raw images, so the image is convolved with the Gaussian filter. The resulting image is slightly blurred. So, the edge detecion operator is not able to detect edges in a fine manner.

Now the Novel fuzzy logic based edge detection technique which will be used in classification of vehicles in this paper. Here, each pixel of the input image 'edginess' measure is calculated using three 3×3 linear filters after which three fuzzy sets are characterized by (3) Gaussian membership function associated to linguistic variable “Low” , “Medium” and ”High” representing the edge strength. Experimental results show the ability and high performance of proposed algorithm compared with other edge detection techniques as shown below:

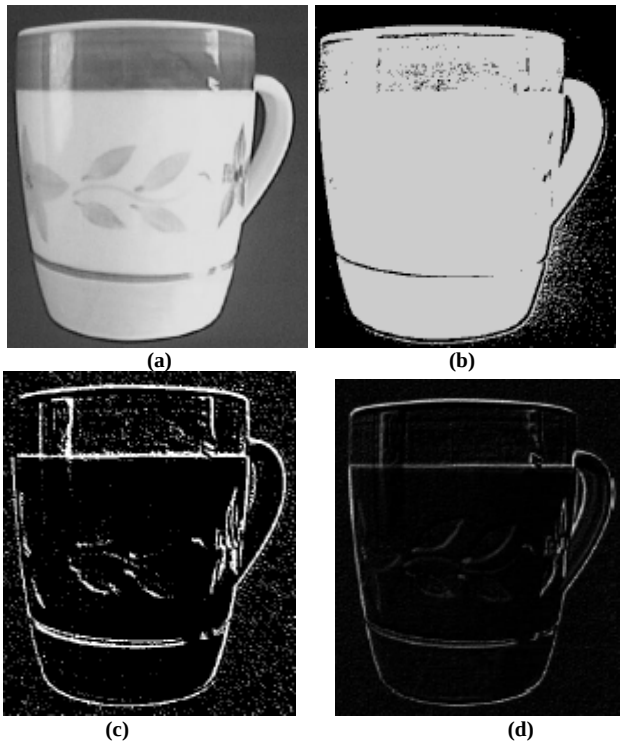

Figure 1. (a) Original Images, (b) Sobel Operator Results, (c) Kirsch Operator Results, (d) Proposed Fuzzy Edge Detection Algorithm Results [1].

In the second phase, with the help of fuzzy inference rule to the three fuzzy sets modifies the membership values in such away that the output (“edge”) is high for those pixels belonging to edges in the input image.

II. FUZZY LOGIC BASED APPLICATION

Fuzzy logic gives a powerful approach to decision making concept. As the fuzzy logic concept was given in 1965 by Lotfi Zadeh, since then many applications have been made in this. The below figure shows that how the fuzzy based application works: Microsoft notes four main components being important in *Surface's* interface: direct interaction, multi-touch contact, a multi-user experience, and object recognition.

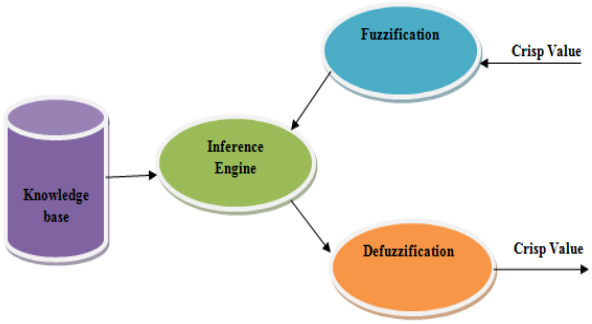

Figure2: Structure of a Fuzzy Expert System

The fuzzification is the process of transforming crisp values into grades of membership for linguistic terms of fuzzy sets. The membership function is used to associate a grade to each linguistic term. In this fuzzy statements in the antecedent are resolved to a degree of membership between 0 and 1.

Inference Engine: In the process of inference, the truth value for the premise of each rule is computed and applied to the conclusion part of each rule.

Aggregation of all outputs: It is the process by which the fuzzy sets representing the outputs of each rule are combined into a single fuzzy set. The output of the aggregation process is one fuzzy set for each output variable.

Defuzzification: This is the final process, in which fuzzy output set is converted to a crisp number.

III. LITERATURE REVIEW

Vehicle Detection Using Image Processing and Fuzzy Logic An algorithmic approach to vehicle detection and classification using fuzzy logic is developed. This helps in not only reducing the complexity of the system but enhances its use in areas which are too difficult to be detected by normal means. Pre-processing of the image is done by converting the image into gray scale and filtering the image. Sobel edge detection technique is used to detect the edges as the inner edges are irrelevant. For vehicle classification, fuzzification of area and circumference is and each vehicle type (e.g. Small, medium and big) is assigned a measurement range of values.

Novel Fuzzy logic Based Edge Detection Technique

A new edge detection technique is developed with the help of fuzzy logic. In this the edge strength is derived using three(3) mask to avoid detection of spurious edges corresponding to noise. The three edge strengths used as fuzzy system inputs and fuzzified with the help of Gaussian membership functions. Finally, Mamdani defuzzifier method is used to produce the final output pixel classification of a given image.

Through the simulation results, it is shown that the proposed technique is far less computationally expensive; its application on digital image improves the quality of edges as much as possible compared to the Sobel and Kirsch methods[1].

IV. PROPOSED WORK

The various steps for the vehicle classification are discussed given below:

Input Image

Image is taken into any format as matlab supports all the image formats including jpeg, tiff, bmp etc.

Conversion to Gray scale Image

An image is converted into gray scale before applying any operation on it. As every pixel of color image has three numerical RGB components to represent the color by three 8-bit numbers so, every pixel need 24-bit (three 8 bit bytes) to represent. On the other hand every pixel of gray scale needs only one 8-byte.

Filtering

A filter is defined by a kernel, which is a small array applied to each and every pixel of an image. Here, Median filters are used for removing noise from images as it removes the noise without blurring the edges. A median filter is like an averaging filter in some ways. The averaging filter examines the pixel in question and its neighbour's pixel values and returns the mean of these pixel values. The median filter looks at this same neighbourhood of pixels, but returns the median value.

VEHICLE DETECTION

Edge Detection

Edge is a sign of lack of continuity, and ending. Novel fuzzy logic based edge detection technique is used to detect the edges of vehicles, as it gives better results compared to other edge detection techniques. With the helpof this we get the minimum number of edges and especially the boundary edges of the vehicle which helps in getting the shape of the vehicle. In this edge detection Gaussian membership functions are used.

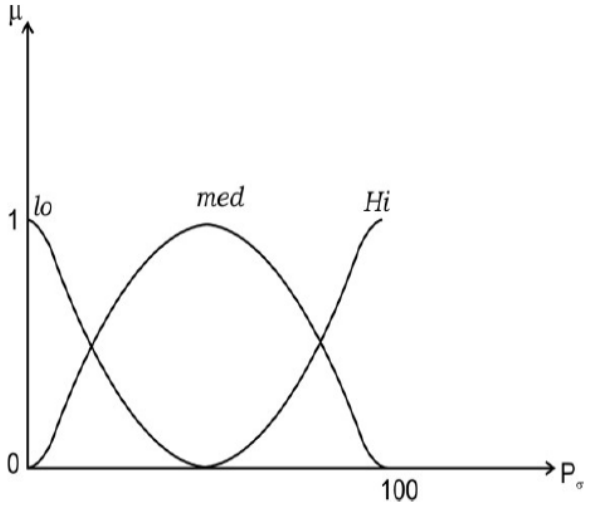

Figure 3: Gaussian Membership Functions[1]

Defuzzifier method is employed to produce the final output pixel classification of a given image[1].

Classification

Vehicles are classified into three main broad categories: Light Vehicle Medium Vehicle Heavy Vehicle. With the help of important parameters given as below: 1) Axle distance 2) Body length 3) Chassis height In the fuzzy logic block the, the vehicle length, height and the axle distance are interpreted to linguistic variables (Light, Medium and Heavy vehicle) all with the help of S-shaped membership function by taking linguistic variable on the vertcal axis and size on the horizontal axis.

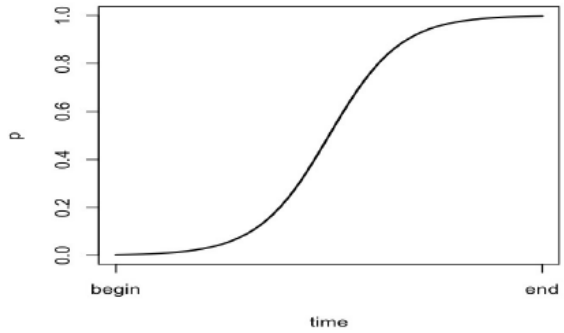

Figure 4: S-shaped Membership Function

After this, fuzzy inference rules are used to get the final output. The fuzzy rules are if-then linguistic rules using the fuzzy inputs and output sets. Finally, defuzzification is done to get the output. Here defuzzification technique is used as it is highly interpretable.

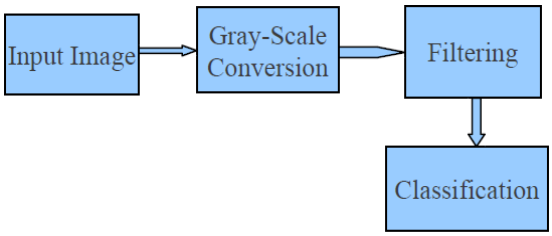

Figure 5: Designing steps of Vehicle Classification

V. CONCLUSION AND FUTURE WORK

In this paper, I proposed a method of detection and classifying the vehicle into three main broad categories (light, medium and heavy) with the help of Novel fuzzy logic based edge detection technique which gives better results over Sobel and Krisch operators. In future work, we can also detect the vehicle number plate with the help of Novel fuzzy logic based edge detection technique which will give better results over other techniques.

REFERENCES

[1] Aborisade, D.O, "Novel Fuzzy logic Based Edge Detection Technique" International Journal of Advanced Science and Technology, Vol. 29, April, 2011.

[2]] Prashant Sharma and Dr. Preeti Bajaj, "Accuracy Comparison of Vehicle Classification System using Interval Type-2 Fuzzy Inference System ", Third International Conference on Emerging Trends in Engineering and Technology.

[3] Dr. P.K.Suri, Dr. Ekta Walia and Er. Amit Verma, "Vehicle Number Plate Detection using Sobel Edge Detection Technique", IJCST Vol. 1, Issue 2, December 2010.

[4] Isha Jain and Babita Rani, "Vehicle Detection Using Image Processing and Fuzzy Logic ", International Journal of Computer Science & Communication Vol. 1, No. 2, July-December 2010, pp. 255-257.

[5] Sung-Wook Kim, Kwangsoo Kim, Joo-hyung Lee and Dong-il (Dan) Cho, "Application of Fuzzy Logic to vehicle classification algorithm in Loop/Piezo-Sensor Fusion Systems ", Asian Journal of Control, Vol. 3, No. 1, pp. 64-68, March 2001 .

[6] Abdallah A. Alshennawy, and Ayman A. Aly, "Edge Detection in Digital Images Using Fuzzy Logic Technique", World Academy of Science, Engineering and Technology 51 2009.

AUTHOR PROFILE

Bonepalli Uppalaiah received his B.Tech degree in Information Technology from Kakatiya University, Warangal, India, in 2006, the M.Tech degree in Software Engineering from Jawaharlal Nehru Technological University, Hyderabad, India, in 2010. Presently, working as an Assistant Professor in the dept. of Computer Science Engineering at Holy Mary Institute of Technology & Science (HITS COE). His research interests include Data Mining, Network Security, Information Security, Web Services and Mobile Computing.

Konakalla Ankalarao received his B.Tech degree in Computer Science Engineering from JNT University, Hyderabad, India, the M.Tech degree in Computer Science Engineering from Jawaharlal Nehru Technological University, Hyderabad, India. Presently, working as an Assistant Professor in the dept. of Computer Science Engineering at Anurag Engineering College (AEC), Anantagiri, Kodad. His research interests include Data Mining, Network Security, Information Security, Web Services and Mobile Computing.

Tejavath Charan Singh received his B.Tech degree in Computer Science Engineering from JNT University, Hyderabad, India, in 2006, the M.Tech degree in Software Engineering from Jawaharlal Nehru Technological University, Hyderabad, India, in 2010. Presently, working as an Assistant Professor in the dept. of Computer Science Engineering at Holy Mary Institute of Technology & Science (HITS COE). His research interests include Data Mining, Network Security, Information Security, Web Services and Mobile Computing.