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# Correct Matching of Key Points for Recognition of Myanmar Traffic Signs Using SURF Algorithm

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***Abstract*—** Traffic sign detection and recognition (TSDR) system is a vital component of intelligent transport system. It plays an important role by enhancing the safety of drivers, pedestrians and vehicles as traffic signs provide important information of the traffic environment of the road and assist the drivers to drive more safely and easily. During night time driving, visibility is affected by low light or even drivers might get dazzled by on-coming headlights. Hence, it is very important to have an automatic system that can recognize warning and prohoibitory traffic signs and give early warning to the drivers which in turns can avert potential hazard. The main idea of this system is to detect and recognize the traffic sign in night conditions by using feature matching method. Firstly, color input image is converted from RGB to grayscale image. Secondly, edge detection is done by using Sobel edge detection and segmentation is done by adaptive threshold. Then, potential signs are compared with the template signs as given in the database by using feature matching methods SURF features (Speed Up Robust Feature). In this paper, the images have been tested for off-line situations. From the experimental results, it is seen that this method can match the traffic sign effectively for night conditions.

***Keywords*—***Traffic sign detection, Sobel edge detection, Speed Up Robust Feature, Advanced Driver Assistance System*

## I. INTRODUCTION

Myanmar traffic sign detection and recognition (MTSDR) categorized as Warning Sign, Prohibitory Sign, Ordered Sign and Directional Guided Sign. Warning sign is a diamond with black border and yellow background, prohibitory sign is a circle with red border and white background, ordered sign is a circle with white foreground and directional guided signs give the places with directional arrow and text to the drivers on. Detection and recognition is one of the most challenging tasks in the field of computer vision and digital image processing to detect a specific object in a real-time environment [1].

The Harris corner detector method which is the combination of edge and corner detector is used for traffic sign detection. This system uses template-based approach [2]. The color differencing and YCBCR methods are used to specify the features of traffic sign. Those features are extracted and classified by using artificial neural network with overall processing time of 0.13490s. This approach cannot detect successfully in highly distorted image [3][4].

A traffic sign detection method by employing a scoring SVM model and the cascade CNN classifier and NiN architecture to solve a much harder problem [3]. The model is used to determine the existence of a traffic sign, which is more robust than single scale value. The detection module extracts traffic sign proposals by using color probability model and MSER region detector [5] [6] [7].

This paper present automatic detection and recognition of warning and prohibitory traffic signs in night conditions are as show in Fig. 1.


Fig. 1. Warning traffic signs and prohibitory traffic signs

## II. TRAFFIC SIGN DETECTION AND RECOGNITION

Traffic sign detection has been done by many researchers for Advanced Driver Assistance System (ADAS). But, there still have rooms for robust detection in night time.The major problem or challenges in night time traffic sign recognition is the insufficient of illumination. Less in illumination can reduce the recognition percentage of an image processing system.

Fig. 2 shows the block diagram of traffic sign detection system.

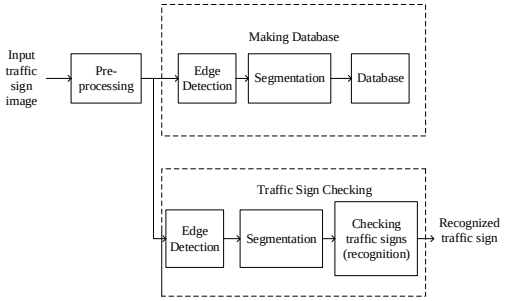


Fig. 2. The system block diagram of traffic sign detection

### A. *Preprocessing*

The input traffic sign images of this system are acquired using a digital camera. Pre-processing stage involves resizing of each image to pre-determined size. It converts RGB image to gray-scale image in order to speed up process calculation speed. Fig. 3 shows preprocessing image.


Fig. 3. Preprocessing of warning signs

### B. *Median Filtering*

Median filtering for coloured images is used to remove noise, salt and pepper noise, typically found in road sign images from natural scene. It is nonlinear filter and gives better results than averaging filters. It is also applied to smooth the

image and to fill up the unexpected area. Fig. 4 shows median filtering image.

Fig. 4. Median filtering of warning signs

*C. Sobel Edge Detection*

Edge detection is a fundamental tool in image processing, particularly in the areas of feature detection and feature extraction. An edge is the boundary between an object and the background and indicates the boundary between overlapping objects. This means that if the edges in an image can be identified accurately, all of the objects can be located and measured. The Sobel operator performs a 2-D spatial gradient measurement on an image and so emphasizes regions of high spatial frequency that correspond to edges. Fig. 5 shows Sobel edge detection.

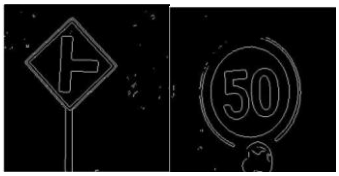

Fig. 5. Sobel edge detection of warning signs

***D. Segmentation***

Traffic sign segmentation is very vital in the area of traffic sign detection, by which the noise may be attenuated further in order to reduce the computational complexity, and thus improve the detection efficiency and accuracy. Fig. 6 shows segmentation image.

Fig. 6. Segmentation of warning signs

***E. Database***

To use the recognition it is crucial to create a database on all possible environments to avoid misclassification. The segmented images are used as database images.

***F. Recognition***

In SURF detection, interest point is found based on the determinant of Hessian matrix. Based on local maxima of determinant of the Hessian matrix at each location in the image over different scales the interest point is selected. For each key point an orientation is associated to allow rotation invariance. The orientation is calculated by computing the Haar wavelet responses in a circular neighborhood of each key point. Fig. 7 shows SURF key point descriptors.

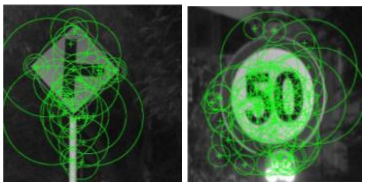

Fig. 7. SURF feature descriptor

## III. TESTS AND RESULTS

In this paper, the common road signs were tested using SURF algorithm. All the corresponding key points between database road sign and input road sign from the whole image are shown by lines. The resultant images are shown in the following figures. Fig. 8 to 10 show right narrow street, left turn and 50 speed limit speed signs from the results of SURF match results with images in the database. Fig. 10 shows no matching lines because the two signs are not same. In Fig. 11 the system cannot output the matching lines for same type of sign. Table I shows correct matching and error matching percentage of same signs. Table II shows correct matching and error matching percentage of different signs.

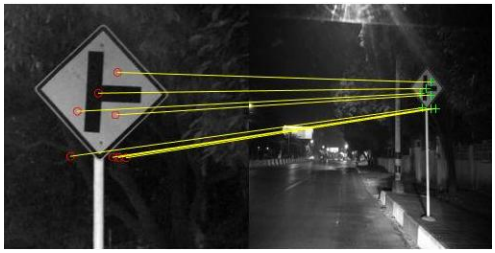

Fig. 8. Matching key points for right narrow street

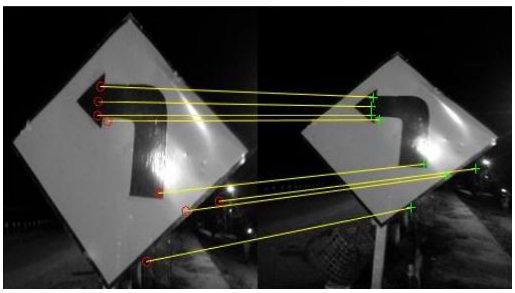

Fig. 9. Matching key points for left turn

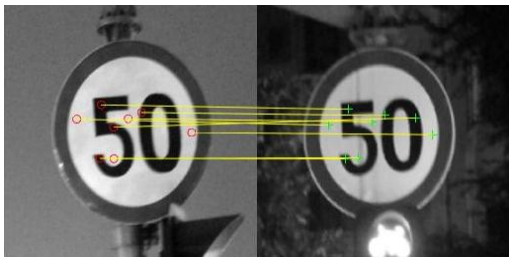

Fig. 10. Matching key points of 50 speed limit sign

Fig. 11. No matching key points for different signs (right narrow street and right turn)

Fig. 12. No corresponding key points for two same sign (left turn)

Table 1: Correct matching and Error Matching Percentage of Same Signs

| No. of traffic sign | | Percentage of fully matched (Same Signs) | Percentage of fully not matched (Same Signs) |
|---|---|---|---|
| Train | Test | | |
| 24 | 24 | 4.16% | 8.33% |

Table 2: Correct matching and Error Matching Percentage of Different Signs

| No. of traffic sign | | Percentage of fully not matched (Different Sign) | Percentage of fully matched (Different Signs) |
|---|---|---|---|
| Train | Test | | |
| 24 | 24 | 95% | 5% |

## CONCLUSION

In this system, we proposed correct matching of key points for recognition of Myanmar traffic signs. SURF descriptor gives scaling and rotation invariant recognition of traffic sign in night condition. In this system, our proposed algorithm improves the matching results. The system gives about 90% correct matching of warning sign and 95% of circular sign for night time traffic sign recognition. In future, the experiment will be done with large database of verification and validation of our system.

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