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A Hybrid Connecting Character Based Text Recognition and Extraction Algorithm

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***Abstract*—** Traffic sign recognition is a technology by which a vehicle is able to recognize the traffic signs put on the road e.g. "speed limit" or "children" or "turn ahead". In this paper a novel Connecting Character based text recognition and extraction algorithm is designed which uses Maximally Stable Extremely Regions (MSER) for test candidate recognition and extraction from traffic signs. Despite their auspicious properties, MSER has been conveyed to be delicate towards blurred Image. To allow for detecting small letters in images of limited resolution or blurred Image, the complimentary properties of Lucy-Richardson Algorithm and canny edge Algorithm is used.

.***Keywords***- *Traffic sign, Recognition, character*

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I. INTRODUCTION

Traffic sign recognition is a innovation by which a vehicle can perceive the activity signs put out and about e.g. "speed cutoff" or "kids" or "turn ahead". This is a piece of the highlights on the whole called ADAS. The innovation is being created by numerous car providers, including Mainland and Delphi. It utilizes Picture preparing strategies to identify the movement signs. The recognition techniques can be for the most part isolated into shading based, shape based and learning based strategies.

Vienna Tradition on Street Signs and Flags is a bargain marked in 1968 which has possessed the capacity to institutionalize movement signs crosswise over various nations. Around 52 nations have marked this bargain, which incorporates 31 nations from Europe. The tradition has comprehensively characterized the street signs into seven classes assigned with letters A to H. This institutionalization has been the principle drive for helping OEMs build up a movement sign acknowledgment framework that can be utilized all around.

The principal TSR frameworks which perceived speed limits were produced in collaboration by Mobileye and Mainland AG. They initially showed up toward the finish of 2008, on the upgraded BMW 7 Arrangement, and the next year on the Mercedes-Benz S-Class. Right now, these frameworks just recognize the round speed confine signs discovered the whole way across Europe (e.g.[1]).

Second-age frameworks can likewise identify overwhelming confinements. It was presented in 2008 in the Opel Insignia,[2] later took after by the Opel Astra and the Saab 9-5. This innovation is additionally accessible on the 2011 Volkswagen Phaeton[3] and, since 2012, in the Volvo S80, V70, XC70, XC60, S60, V60 and V40, as an innovation called Street Sign Information.[4] They are not ready to perceive city restrain signs, which in most European nations are related with speed limits, as they are excessively comparative, making it impossible to bearing signs.

Activity signs can be examined utilizing front oriented cameras in numerous advanced autos, vehicles and trucks. One of the essential utilize instances of a movement sign acknowledgment framework is for speed limits. The majority of the GPS information would get speed data, yet extra speed restrict movement signs can likewise be utilized to separate data and show it in the dashboard of the auto to alarm the driver about the street sign. This is a propelled driver-help highlight accessible in most top of the line autos, primarily in European vehicles.

Present day activity sign acknowledgment frameworks are being produced utilizing convolution neural systems, essentially determined by the necessities of self-ruling vehicles and self-driving autos. In these situations, the identification framework needs to distinguish an assortment of activity signs and not simply speed limits. This is the place the Vienna Tradition on Street Signs and Flags comes to help. A convolution neural system can be prepared to take in these predefined movement signs and 'master' utilizing Profound Learning methods.

The neural net thus utilizes Picture Handling and PC Vision to prepare the system with its potential results. The prepared neural net would then be able to be utilized as a part of constant to distinguish new movement signs continuously. Self driving auto organizations like Waymo and Uber are creating and outsourcing activity sign informational collections alongside Guide and Route organizations like Tom Tom.[5] Propelled PC vision and neural system methods make this objective exceedingly effective and achievable progressively.

There are differing calculations for movement sign acknowledgment. Normal ones are those in view of the state of the sign board. Ordinary sign board shapes like hexagons, circles, and rectangles characterize distinctive sorts of signs, which can be utilized for arrangement. Other significant calculations for character acknowledgment incorporates Haar-like highlights, Freeman Chain code, AdaBoost recognition and profound learning neural systems strategies. Haar-like highlights can be utilized to make fell classifiers which would then be able to help distinguish the sign board characters.Deep learning can be consolidated into movement sign location. Polygonal estimate of computerized bends utilizing Ramer–Douglas– Peucker calculation can be utilized to identify the state of the sign sheets and techniques like Help Vector

Machines and Byte-MCT with an AdaBoost classifier has been used in one of the methods to detect traffic signs.[6]

II. DETECTION AND RECOGNITION TECHNIQUES

The Much looks into have been focussed on the discovery and acknowledgment of content in common scenes. Ways to deal with this sort of issue can be comprehensively ordered into two gatherings: district based strategies and associated segment (CC)- based techniques. Nearby highlights, for example, surface are utilized to find content areas in locale based content identification. While in CC-based strategies, content characters are divided separately by utilizing data like power variety, edges and shading contrast. They fundamentally comprise of three stages: the primary stage recognize CCs inside the picture, the second stage in view of their highlights, wipe out far-fetched CCs and the last stage aggregate the rest of the CCs into words or lines.[10]

A. Maximally Steady Extremal Area (MSER)

The calculation incorporates watching the possibility for movement signs among the laid out scene seek districts. MSERs are characterized to be areas that around keep up their shape notwithstanding a few picture edge levels. This area identifier is strong to lighting and difference varieties and recognizes high-differentiate areas, that make it reasonable for the identification of activity signs.[10]

B. Shade, Immersion, Esteem shading space(HSV)

Determines a sort of shading space. It has three segments: tint, immersion and esteem. Shade gives the shading. Immersion speaks to the dark range in the shading space. The shine of the shading which differs as per shading immersion is spoken to by the esteem channel.Traffic content sign competitors are likewise recognized utilizing HSV thresholding.

C. Shade, Immersion, Force shading space(HSI)

In HSI shading model, each shading is spoken to by three parts: hue(H), saturation(S), intensity(I). The Tint segment determines the shading itself. The Immersion segment flags how much the shading is contaminated with white shading. The Force go is between [0,1] HSI display is reasonable for street sign identification since it depends on human shading observation and the shading utilized for street signs is chosen to catch human consideration. Light (sun or shade) and shadows impact the estimations of immersion and force. On the other hand.

III. PROPOSED METHOD

The proposed algorithm, illustrated in Figure 1, is divided into two basic steps i.e. text recognition and text elimination.

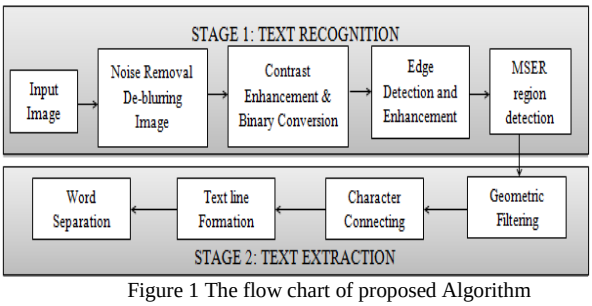

Figure 1 The flow chart of proposed Algorithm

The overall flow of the proposed algorithm is divided into two stages i.e. Text Recognition and Text Extraction as described below. The detection stage exploits knowledge of the structure of the scene, i.e., the size and location of the road in the frame, to determine the regions in the scene that it should search for traffic text signs. Once a potential traffic sign has been located, the next stage of the algorithm attempts to recognize text within the region.

Text Recognition Phase

Step 1: Load Image

In this step firstly load the traffic image as shown in figure 2 in which we have to detect text. Before preceding towards next step first of all the algorithm crop that portion of image that contains text.

Step 2: Noise Removal and De-blurring Image

Due to imperfections in the imaging and capturing process, however, the recorded image invariably represents degraded version of the original scene. The degradation results in image blur, affecting identification and extraction of the useful information in the images. The degradation phenomenon of the acquired images causes serious economic loss. Therefore, restoring the degraded images is an urgent task in order to expand uses of the images. In this step the proposed algorithm uses Lucy-Richardson Algorithm is used for noise removal and de-blurring the blurred image, as illustrated in Figure 4.

Lucy Richardson (LR) algorithm is an iterative non-linear restoration method. The L-R algorithm arises from maximum likelihood formulation in which image is modeled with poison statistics. Its performance in the presence of noise is found to be superior to that of other deconvolution algorithms.

Figure 2. De-burring of Image using LR algorithm

Step 3: Contrast Adjustment and Conversion RGB image to Binary Image

Image enhancement techniques are used to improve an image, where "improve" is sometimes defined objectively (e.g., increase the signal-to-noise ratio), and sometimes subjectively (e.g., make certain features easier to see by modifying the colors or intensities), illustrated in Figure 5. Intensity adjustment is an image enhancement technique that maps an image's intensity values to a new range. In this step, contrast or brightness level of the input image is enhanced.

Further in this step RGB Image is converted into gray scale Image (in Figure 6).The rgb2gray function converts RGB images to grayscale by eliminating the hue and saturation information while retaining the luminance.

Figure 3. Contrast Enhancement

Step 4: Edge Enhancement

In this step, Canny edge detection algorithm is used for image edge detection. The algorithm runs in 5 separate steps:Smoothing: Blurring of the image to remove noise. Finding gradients: The edges should be marked where the gradients of the image has large magnitudes.

Non-maximum suppression: Only local maxima should be marked as edges. Double thresholding: Potential edges are determined by thresholding. Edge tracking by hysteresis: Final edges are determined by suppressing all edges that are not connected to a very certain (strong) edge. To cope with blurred images the propose algorithm used the properties of Canny edges.

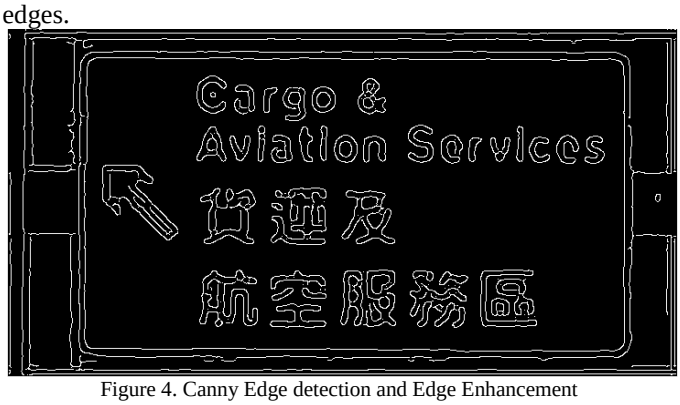

Figure 4. Canny Edge detection and Edge Enhancement

Step 5: MSER region detection

As the intensity contrast of text to its background is typically significant and a uniform intensity or color within every letter can be assumed, MSER is a natural choice for text detection. While MSER has been identified as one of the best region detectors due to its robustness against view point, scale, and lighting changes, it is sensitive to image blur. Thus, small letters cannot be detected or distinguished in case of motion or defocus blur by applying plain MSER to images of limited resolution. As shown in Figure 7, MSER regions are detected. This is achieved by pruning the MSER along the gradient directions computed from the original gray-scale image. The edge-enhanced MSER, which provides a significantly improved representation of the text where individual letters are separated. This not only improves the performance of geometric filtering but also increases the repeatability of MSER based feature matching under different image blur conditions.

Figure 5. MSER region detection and edge enhancement

Text Extraction Phase

Step 1 and 2: Geometric Filtering and Character Connecting

With the extraction of edge-enhanced MSER, we obtain a binary image where the foreground CCs are considered as letter candidates. As in most state-of-the-art text detection systems, we perform a set of simple and flexible geometric checks on each CCs to filter out non-text objects. First of all, very large and very small objects are rejected. Then, since most letters have aspect ratio being close to 1, we reject CCs with very large and very small aspect ratio. A conservative threshold on the aspect ratio is selected to make sure that some elongated letters such as 'i' and 'l' are not discarded. Lastly, we eliminate objects which contain a large number of holes, because CCs with many holes are unlikely to be letter candidates.

Figure6. Geometric Filtering

Step 3 & 4: Text line formation and Word separation

Text lines are important cues for the existence of text, as text almost always appear in the form of straight lines or slight curves. To detect these lines, we first pair-wise group the letter candidates using the following rules. The next stage of the algorithm locates lines of text within the detected candidate regions. This allows the total number of CCs to be reduced.

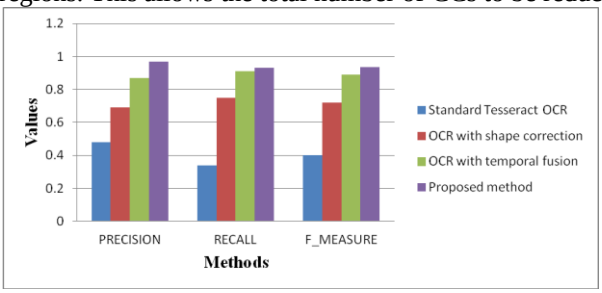

Figure 7: Result comparison

IV. CONCLUSION

In this paper, we studied and compared different techniques used for the detection and recognition of traffic signs. Much research have been focussed on the detection and recognition of traffic signs, but only less have been conducted on text contained on the traffic signs. MSER and OCR are the most popular and efficient method used for this purpose. MSER and HSV thresholding gives more performance for the detection process. Additonal structural and temporal constraints can be used to further reduce the false positives detected. OCR provides better recognition performance. Future scope in this area includes introducing more efficient techniques for text detection and recognition from traffic signs.

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