Survey on Detection and Recognition of Road Marking

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Abstract* − *Information about the painted road markings and other painted road objects play an important part in keeping safety of drivers. Some researchers have presented research approaches and dealt with road markings detection. In this paper, we present comprehensive survey of these techniques, and review some of them like a machine learning method, template matching method for road markings detection and classification, method of detection and classification of road markings using curve-based prototype fitting, signed edge signature method.

Keywords - ***Road markings detection; Road markings recognition;***

I. INTRODUCTION

Road markings can be found along the road or across the road to provide awareness to hazards, to give drivers rules or for directions. For these reasons, road markings detection and recognition have been an important issue and several different methods were presented by researchers. To extract road markings, some researchers use Hough transform [1] commonly. And other method of detection and classification of road marking is based on template matching method. Moreover, in this paper, we survey the signed edge signatures method, machine learning based method, curve-based prototype fitting method, and other methods through following papers.

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II. PREVIOUS RESEARCHES

DETECTION & CLASSIFICATION OF ARROW MARKINGS ON ROAD USING SIGNED EDGE SIGNATURES [2]

The proposed method follows three steps: (1) Signed Edge Maps Generation (2) Hough Transform Computation (3) Arrow Signature Detection in Hough Accumulation Space. First the region of interest (RoI) is defined. Next, arrow markings detected. To detect arrows they only tried to detect the arrow markings which located inside of lane markings where lane markings are already detected.

In the First step, edge detection process is generated. Simple and unique signatures are derived based on signed edge maps. And the Hough transform is applied to generate Hough accumulation spaces. And then arrow signatures are searched. To do this arrow signatures defined which are different for each of arrows and scale-invariant and rotation-invariant also defined.

The entire algorithm to detect different arrow markings is illustrated in Fig.1, showing all the processing steps.

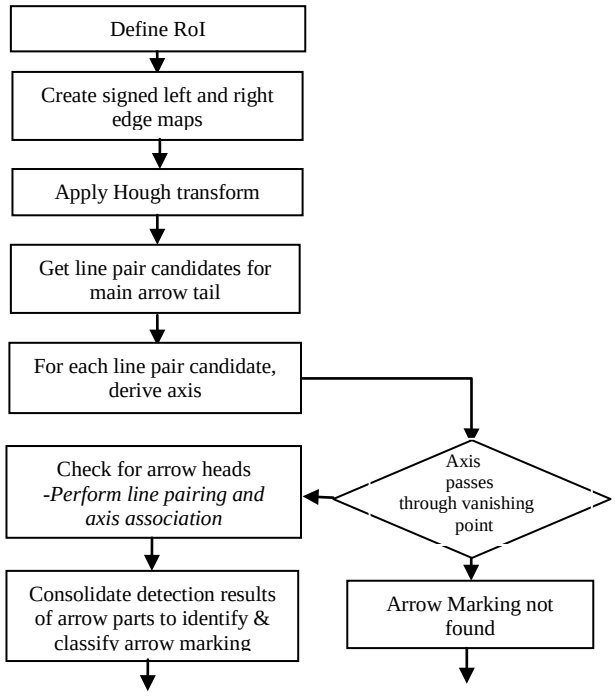

Fig.1. Block diagram showing the proposed method to detect different arrow markings

EFFICIENT ROAD-SIGN DETECTION BASED ON MACHINE LEANING [3]

This paper proses a general framework for road-sign detection and analysis using vision, which is able to support various types of markings. They tried to detect arrow road-sign because arrow road-sign is more important than other road-signs and arrow markings are similar in different

countries. In this paper in order to detect road-signs, a machine learning method is used. They first generate database using some image processing steps such as Otsu threshold [4] and contour filter for image normalization. And then HOG (Histogram of oriented gradient) [5] algorithm used for feature description. In the road marking detection and identification step, they used SVM [6] for this task. Road-sign's detection and identification process is applied after get lane detection result. The designed method is applied using various video images from black box, and is verified to be robust and efficient.

DETECTION AND CLASSIFICATION OF PAINTED ROAD OBJECT FOR INTERSECTION ASSISTANCE APPLICATIONS [7]

In this paper they focused on detection and classification road markings. They did not detect lanes, just road objects were detected individually and classified. But most researchers focused on lane detection before detect road markings. They first they first identify the painted road object using road edges. They used dark light dark transition detection to extract the feature of road markings, and refined the segmentation by a mixture of Gaussian. And next step is 3D reconstruction. To extract the 3D information perspective geometry used. Then object classified. To classify the objects a decision tree and size constraints were used.

REAL-TIME DETECTION OF ROAD MARKINGS FOR DRIVING ASSISTANCE APPLICATIONS [8]

In this paper, they propose model-detect-track approach. A LabVIEW [9] based system is presented in order to detect, measure and classify painted objects. LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a graphical programming language that uses dataflow. They presented a LabVIEW for rea-time automated recognition of the road markings. By this system they can be able to calibrate monocular video sources.

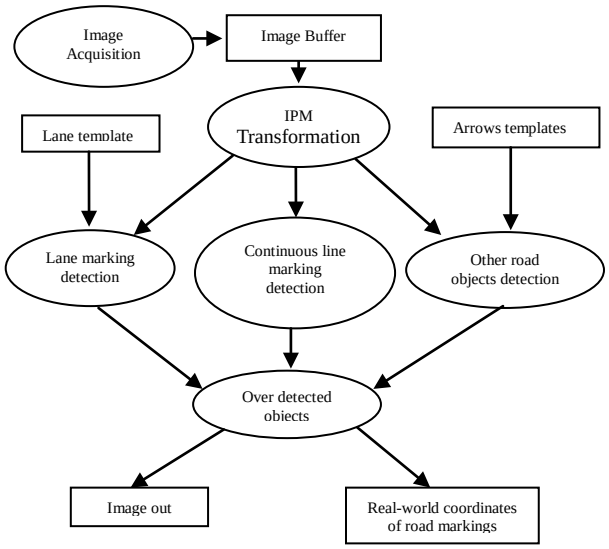

Fig. 2. Flowchart of events for road markings detection

The system gives an advantage to define the features of the object and detect them and give an advantage to detect edge. In this paper they tried to extract objects individually and to get information about their position. To detect the arrow markings they used feature based geometric pattern matching. And to detect the lane markings they used edge based geometric pattern matching.

REAL-TIME DETECTION AND CLASSIFICATION OF ARROW MARKINGS USING CURVE-BASED PROTOTYPE FITTING [10]

Usually arrow detection processes is applied where lane markings are already detected, because lane detection can provide detection of arrow markings with important information. In this paper they first concentrated on lane markings detection and classifying it. And then they focus on the detection and the classification of arrow markings. They present a general geometric approach using curve-based prototype fitting. They used monocular gray value camera, but their method can process data from various sensors like stereo systems or laser scanners. In order to define the region of interest (RoI) where the arrow markings being looked for, they used some preliminary knowledge. Length of a region of interest they have chosen is from 4 to 20 m. Prototypes encoded as arc splines in order to use them to compare the extracted contours of arrow candidates (Fig. 3).

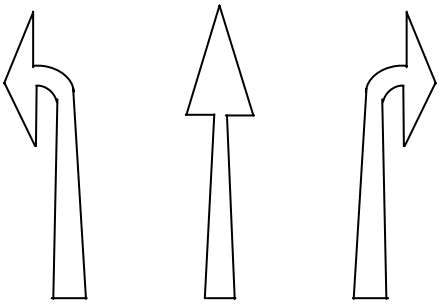

Fig. 3. Spline models of the arrow markings (left, ahead, right).

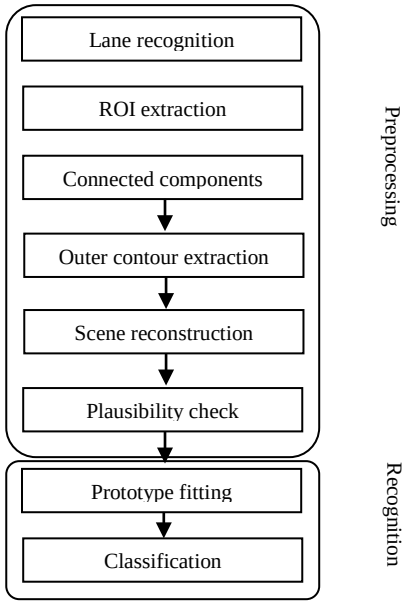

Fig. 4: Overview of the processing chain

They presented a two approach step, a preprocessing step and a recognition step as shown in Fig. 4. Most of research approaches have been presented in common a two-step approach, extraction of candidates and a classification but they presented curved based geometric approach for detection and classification.

III. CONCLUSION

In section II, we show the method about road marking detection. Some researches to detect road objects such arrows use the already detected lane. Arrows are in the middle of the lane and it helps to guess possible locations of arrows. And to extract road markings some researchers use Hough transform. A disadvantage of these methods is that it is only suitable for straight lines, which is why these methods only support arrows, and it is difficult to extend to other shapes. And other method of detection and classification of road marking is based on template matching method. Matching algorithm is always with more features in the image, that is why takes more time.

ACKNOWLEDGEMENT

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