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Review on Detection of Pedestrian Crossing for Safe Driving

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ABSTRACT: Sudden pedestrian crossing (SPC) is the major purpose behind person on foot and vehicle crashes. In this paper, we concentrate on identifying SPCs around evening time for supporting anadvanced driver assistance system utilizing a far-infrared (FIR) camera mounted on the front-rooftop of a vehicle. Despite the fact that the warm temperature of the street is comparative or higher than that of the people on foot during summer evenings, numerous past looks have concentrated on person on foot recognitionduring the winter, spring, or pre-winter seasons. In any case, our research concentrates on SPC during the hot summer season because the number of collisions between pedestrians and vehicles in Korea is higher at that time than during the other seasons. For constant handling, we first choose the optimal levels of the picture scaling and hunt range. We then utilize our proposed strategy for recognizing virtual reference lines that are connected with street division without utilizing shading data, and change these lines as per the turning course of the vehicle. Pedestrian detection is conducted using a Cascade Random Forest Classifier with low-dimensional Haar-like features and Oriented Center Symmetric-Local Binary Patterns. The SPC prediction is done using Kalman Filtering for tracking pedestrians. The proposed method was effectively applied to different pedestrian dataset caught by a FIR camera, and the outcomes demonstrate that its SPC detection is superior to those of different strategies.

KEYWORDS: Cascade random forest, FIR image, KMU pedestrian dataset, sudden pedestrian crossing, Kaman Filter.

I. INTRODUCTION

Intelligent vehicles have moved from being a mechanical utilization of tomorrow to current area of extensive research and development. The most striking standard for a smart vehicle framework is that it needs to work in progressively unstructured conditions, which are naturally unverifiable and dynamic. ADAS help drivers to perform complex driving assignments to keep away from risky circumstances. Help assignments include: cautioning messages in dangerous driving circumstances (e.g., conceivable crashes), initiation of security gadgets to moderate up and coming impacts, independent moves to maintain a strategic distance from obstructions, and consideration less driver notices. Specifically, person on foot discovery is turning into developing some portion of an ADAS attributable to the expansion in the quantity of vehicle and pedestrian accidents.

In this paper, we address a specific issue that can have a huge effect on individual's lives, to be specific, the detection of sudden pedestrian crossing to help drivers in avoiding accidents. Our work is encouraged by two agents. One is that the proposed issue has incredible social significance and the other is application esteem. Pedestrian-vehicle accidents that happen during the evening are a noteworthy social issue around the world. Advanced Driver Assistance Systems (ADAS) that are furnished with cameras have been intended to consequently avoid such mishaps. Among the different sorts of cameras utilized as a part of such frameworks, far-infrared (FIR) cameras are ideal since they are invariant to enlightenment changes. Accordingly, this paper concentrates on SPC detection by utilizing a recursive algorithm which is a Linear Quadratic Estimation (LQE) algorithm also called as Kalman Filtering.

II. MOTIVATION

Every year there are thousands of pedestrians in India and millions of pedestrian across the world were meeting with severe road accidents. Especially in night times the chances of accidents were more due to varying light conditions and

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cluttering backgrounds. Till few years automobile industry concentrates about protection measures for the driver and his accompanies in the vehicle by means of many inventions such as seat belts, air balloons, central locking system, and automatic braking systems etc. but from last few years automobile industry and its researches were concentrating on developing the systems which safe guard the members in the outside world such as pedestrians from the vehicles.

III. PROBLEM DEFINITION

Applying techniques of image processing to pedestrian detection and tracking has become a popular research in Intelligent Transportation Systems (ITS) in the most recent decade. Automatic pedestrian detection increases the safety and efficiency of traffic management and control. Furthermore, the discovery of sudden pedestrian crossing (SPC) through an examination of the person on foot practices expected from the activating of their movement is an extremely difficult issue for any ADAS. This paper concentrates on SPC recognition utilizing a dream camera introduced in a vehicle for collision avoidance.

IV. OBJECTIVES

1. Real time pedestrian detection and tracking for driver assistance systems.
2. To propose an SPC detection algorithm.
3. Design an advanced driver assistance system that is equipped with camera to automatically prevent such accidents.

V. LITERATURE SURVEY

In literature, the problem and the previous techniques of pedestrian crossing is described.

1. Detection of Pedestrian using Visible Light Images

Felzenszwalbet al. [1] described an object detection system based on mixtures of multiscale deformable part models. The system depends largely on new methods for discriminative training of classifiers that utilizes latent information. It also largely depends on efficient methods for matching deformable models to images. The resulting system isefficient andalso accurate, leading to state-of-the-art results on difficult data sets. This leads to a repetitive training algorithm that varies between fixing latent values for positive examples and optimizing the latent SVM objective function.

P. Vinicius and K. Borges [2] presented efficient detection metrics that consider the fact that human movement presents distinctive motion patterns. For detecting pedestrians, they used the cues of a cyclic behavior in the trajectory of blob and an in phase relationship between the difference in blob size and position. The Advantage of the system is that they can be easily applied to no static cameras, as they do not rely on background segmentation. To achieve improvement in performance they combined these features by utilizing the Bayes Classifier.

Limitation of using visible light images is that detection of pedestrians in color images is not having the desired effect in environments with poor illumination such as that on rainy days, at night or in darkened tunnels.

2. Detection of Pedestrian using Infrared Camera

To overcome the limitations of visible light images, infrared (IR) camera based detection of pedestrian has been gaining focus in recent years.

IR cameras include near-infrared (NIR) and far-infrared (FIR) cameras.NIR cameras are less expensive as that of FIR cameras and are accompanied by an illuminator for using at nighttime.

J.Ge, Y.Luo and G.Tei [3] presented an evening time vision framework for real-time person on foot recognition and tracking from a vehicle which is moving. A course of three modules is included in the framework, and each module uses integral visual elements to progressively recognize the articles from the cluttered backgrounds. To adjust the strength and effectiveness at a high performance level they proposed efficient adaptive dual-threshold segmentation and tree-structured two-stage detector for candidate generation and to reduce the complicacy of pedestrian classification. Advantage is low implementation cost, as only one NIR camera is required but Disadvantage is that there are missing detections which needs to be reduced.

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Broggi, Fedriga and Tagliati [4] proposed "Pedestrian detection on a moving vehicle: an investigation about NIR images", they created an algorithm which firstly improves luminous areasin the images and encloses them with a rectangular perimeter (bounding box), so that it reduces the areas that will enter the second phase evaluation. It then calculates the contentsof such bounding boxes with a weighted combination of the twomatching processes.
On the other hand FIR cameras are precise to the radiations emitted by the human body and therefore are very useful for pedestrian detection especially at night time.
Xu et al. [5] proposed a pedestrian detection and tracking method depending on the idea that the human body looks brighter than the background. Many detection phases are conducted to find the hotspot regions by using a SVM size-normalized pedestrian candidates andthe tracking phase is made up of association of Kalman filter prediction and mean shift tracking.

3. Detection of Sudden Pedestrian crossing

This is nothing but detection of pedestrians before they come in full view.
Xu et al. [6] proposed "Detection of SPC's for driving assistance systems"; they proposed a three-level coarse-to-fine video-based system that recognizes partially visible people on foot just as they enter the camera seen, with low false alert rate and high speed. Disadvantage is that there is a need to improve classification accuracy.
B. C. Ko et.al [7] They have demonstrated that HWM with a divide-and-conquer algorithm gives the optimal levels of image scaling for human detection in surveillance video sequences. In addition, a versatile ROI for image scaling enhances the identification precision and diminishes the recognition time. They additionally demonstrated that CaRF based on Haar-like elements and an OCS-LBP descriptor displays unmistakable examples for human location and is an appropriate descriptor for recognizing people from background objects when utilized together with a CaRF classifier. Later on, they planned to enhance the algorithm to diminish the processing time, and allow the articulated deformations of humans to be handled in video sequences for real-life surveillance applications.
B.Dalal and B.Triggs[8] mentioned that Highlight extraction is an imperative element for enhancing the execution of a classifier. In spite of the force being the most straightforward component for question order, it is less discriminative in light of the fact that the power in the person on foot class is excess and contains a vast inconstancy. Hoard highlights are the most prominently utilized elements for human recognition and have a lower false-positive rate. However; high computational requests are a noteworthy disadvantage of HOG components.
As of late, there have been various datasets created for passerby identification in video successions, for example, the Caltech Pedestrian [9] datasets. Notwithstanding, these datasets are for camcorders, and just a little measure of FIR test information has been presented. The delegate warm test information is the OTCBVS benchmark information [10].

VI. EXISTING SYSTEM

SPC location is a critical factor for safe driving on the grounds that a driver can get alarms concerning sudden intersection of people on foot as right on time as conceivable to stay away from an impact. To distinguish a SPC, we propose three estimations for evaluating the SPC with respect to the virtual reference lines i.e., the overlapping ratio, movement direction ratio, and movement speed ratio. These three proportions are then connected to the comparing ordinary appropriation, and a ultimate choice is made utilizing the likelihood estimation.
A. Overlapping Ratio between a Pedestrian and Virtual Reference Lines
B. Movement Direction Ratio
C. Movement Speed Ratio
D. SPC Decision
To assess the risk of a SPC, the proposed decision technique assesses the probability of such an occasion. After three proportions (covering, development bearing, and development speed speed ratios) are registered, we gauge the restrictive likelihood of each proportion on the SPC class in light of the presumption that the three proportions have a normal distribution.
Disadvantage: The existing system still results in false positive in SPC detection during rapid change in vehicle direction or after an incorrect detection of a virtual references line.

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VII. PROPOSED SYSTEM

The block diagram is given below

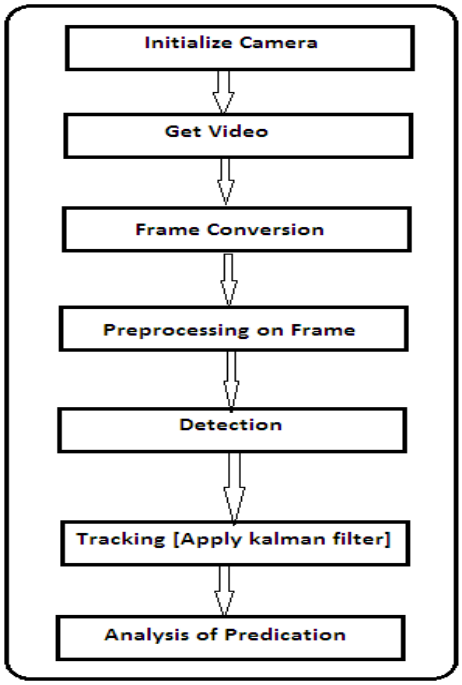

Fig.1: Proposed system block diagram

Fig 1: shows the overall view of the pedestrian detection system which has been proposed. Firstly camera is initialized and video is captured. After capturing video it is necessary to extract frames from the captured window because processing needs to be done on each frame. Variouspreprocessing steps such as resizing,blurring,HSVconversion are done on each frame.After preprocessing step detection step follows. The first stage of the detection system deals with detection of pedestrians using a scanning window with Haar cascade detector, which eliminates most of the non-pedestrians and second stage, makes the system more robust by validating the detected pedestrians with OCS-LPB detectorand pedestrian is detected by using CaRF classifier.

After detection, tracking is done using Kalman filter. Pedestrian tracking is to determine the pedestrian correspondences between frames. In order to real-time track moving pedestrian, our approach works in two stages: prediction step and correction step. The prediction step is to determine the search area in which the pedestrian might be seen in next frame. A search window is defined for each precious object, which centers on its predicted centroid and has an area adapted to the scale of the measurement error in the Kalman model. The correction step is to search the corresponding object in the predicted area. After tracking analysis of prediction is done.

Advantages:

1. Accurate detection of multiple pedestrians due to use of Kalman filter for tracking.
2. Easy to implement

VIII. CONCLUSION

In this paper a pedestrian detection method is presented which uses CaRF classifier along with Haar-like features and OCS-LBP patterns which perform well and good. While recognizing pedestrians and wiping out non pedestrians in first stage by using Haar features, false alarm rate is bit more in the situations like cluttered backgrounds, but in second

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stage, OCS-LBP combination makes the detection strong, by reducing the false alarm rate. Prediction of SPC is done using LQE (Linear Quadratic Estimation) algorithm also called Kalman filter. The proposed system method reduces the processing time and increases accuracy as compared to other methods.

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