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Real-Time Pedestrian Detection Using SVM and AdaBoost

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Abstract: *This project presents an application of pedestrian detection system to reduce the number and severity of vehicle- pedestrian accident by active safety vehicle. It is important to detect pedestrian efficiently and accurately in many computer vision applications, such as intelligent transportation systems and safety driving assistant systems. In this system, we are presenting a pedestrian detection method based on images. We are using Ada-Boost algorithm and cascading methods to segment pedestrian candidates from image. To confirm whether each candidate is pedestrian or not a pedestrian. Recognizing classifier is skilled with support vector machine (SVM). We are giving input features used for SVM training are mined from both the sample gray images and edge images to the system.*

Keywords: SVM, Pedestrian, ITS, SDAS, Feature Extraction

I. INTRODUCTION

Existing pedestrian catching systems are based on the investigation for pedestrians in the full region in front of a vehicle. Candidates are situated using pedestrian distinguishing, such as form, asymmetry, texture, movement, and regularity of human leg movement. When fusions between various sensing technologies are used, whether it is high level or low level, each sensor searches for pedestrian- specific features in the whole area in front of the vehicle[1]. We expound a system for the discovery of pedestrians based on a new plan of attack. It is designed to work in particularly challenging urban scenario, in which traditional pedestrian- detection approaches would yield non-optimal results. Pedestrians are the undependable player among all the objects active in the transportation system when clash occur, peculiarly those in movement on streets and roads under urban traffic situations. Therefore, road traffic safety has received much concern by governments and social organization in China, such as the evolution connected with clever transportation system and safety drive adjunct scheme engineering. The objective of this system is to raise consolation and condition of driver and road user. Among the factors that may contribute to traffic accidents, human error is one of the most important factors, such as driver's attention and wrong decisions. A World Health Organization report represented traffic accident as one of the major causes of death and injuries around the world. In developing countries such as India, Brazil and China, the problem is considerably poor. Accidents and the death on road are the result of reciprocity of a number of factors. Road users of those countries, especially in India, are multiplex in nature, ranging from pedestrians, bi-cycles, and tractor trolleys, to various categories of 3 wheelers, cars, coach, motor truck, and multiplex commercialized vehicles etc. India has the second big road network in the global with over 3 million km of roads, 46% of which are paved. As a result, there were 105,725 people killed in road traffic crashes in India in 2006, ranking the top of other nation Pedestrians, bicyclists and motorized two wheelers riders constitute 60%–80% of all traffic fatalities in India.

II. LITERATURE SURVEY

In year 2009 Alberto Broggi, , Pietro Cerri, Stefano Ghidoni, Has surveyed some technologies. From that they presented a method to urban pedestrian recognition for automatic breaking. in that they presented an application of a pedestrian detection System specific for situations in the city. This paper tells a new method to increase safety and probably avoid

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collision with susceptible pedestrian[1] In 2007 Tarak Gandhi and Mohan Manubhai Trivedi describe research on the improvement of walker safety to build up a better understanding of the environment, issues, approaches, and challenges nearby the problems. They conclude that The achievement of this research should finally to find systems in upcoming automobiles and help in saving lives and reduce injuries to walkers on the road.[2] In 2007 Ignacio Parra Alonso, David Fernández Llorca, Miguel Ángel Sotelo, Luis M. Bergasa, Pedro Revenga de Toro, Jesús Nuevo, Manuel Ocaña, and Miguel Ángel García Garrido they describe a complete grouping of feature extraction technique for Intelligent Transportation Systems. They focused on comparative work of feature extraction technique for vision- based pedestrian detection.[3] In july 2010 Tarak David Gero´ nimo, Antonio M. Lopez, Angel D. Sappa they have done research in Advanced driver assistance systems (ADASs), and particularly pedestrian protection systems (PPSs) .they divide the problem of detecting pedestrians from images into different processing steps, each with attached responsibilities Then, the altered planned method were analyzed with respect to each processing stage, to support a relative viewpoint.[4] In 2009 Alberto Broggi, Pietro Cerri, Luca Gatti, Paolo Grisleri, Ho Gi Jung, JunHee Lee presented new approach to pedestrian detection for automotive application in which a non-reversible system. The great advantage was that pedestrian recognition is performed on restricted image areas. This paper presented a new system to increase street protection with driving tools, such as driver advice and involuntary braking.[5] system based on Ada-Boost cascade meta-algorithm. The fundamental concept was used a Haar-features with an ad- hoc-features-based Ada-Boost collectively in order to reach a improved walker categozation. Results obtained with the proposed system were good. The method works both during day and night with particular algorithms for the two situations. In 2009 Ho Gi Jung, Seongkeun Park, Euntai

Kim, Heejin Lee , Jae Pil Hwang studied A multilayer perceptron (MLP) neural network is activated to classify the street walker and the probabilistic combination is conduct over time to advance the classification accuracy.their system was developed and its strength was confirmed through a real world testing. Target categorization system for an active protection system was studied with only microwave radar and a power reflected from the object was used as input feature. An MLP neural network was trained to categorize the object based on the radar outputs.The classification performance is improved by combining the categorization results over time in the structure. [7]

III. Proposed System

The proposed pedestrian detection system can be divided into two parts:

- Detection of the regions of interest (ROI)
- Classification of the pedestrian based on image processing.

3.1 Preprocessing

Video preprocessing is often increasing the clarity of the video. For that we performing the some task such as aspect ratio control, brightness adjustment, contrast adjustment, frame rate conversion, color space conversion etc. Video is given to the preprocessing to eliminate the noise form the video which is capturing from the camera. In preprocessing the quality of video is improved. It de-blurred the video and clears the view of the video. It also enhances the contrast of the video.

3.2 Video to Frame Conversion

In that process, we are converting the video in the set of the frames. Video is converted into the frames with the help of frame rate. Frame rate is defined as the frames captured in one second.

3.3 Filtration

Filtration process is the process in which we are eliminating mosquito noise, block noise and enhance the detail and edges of the frames. In this process, we compensate the motion from the frames of the video.

3. 4 Binary Conversion

Binary conversion is the process of assigning the binary number to each pixel of the frame. Typically the two colors are used for assigning the binary number this are white and black though any two colors are used. Binary conversion of video frames is produced using colors frames or images by segmentation. Segmentation is the process of assigning each pixel in the source images to two or more classes .if there are more than two classes then the usual result is several binary images

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3.5 Classification

The search for pedestrians is triggered in the specific areas only. We are specifying the area of interest in this area only this system is works. The image windows are defined using a perception mapping transformation, considering precise pedestrian's width and height. These image areas are resampled to fixed size pixel.

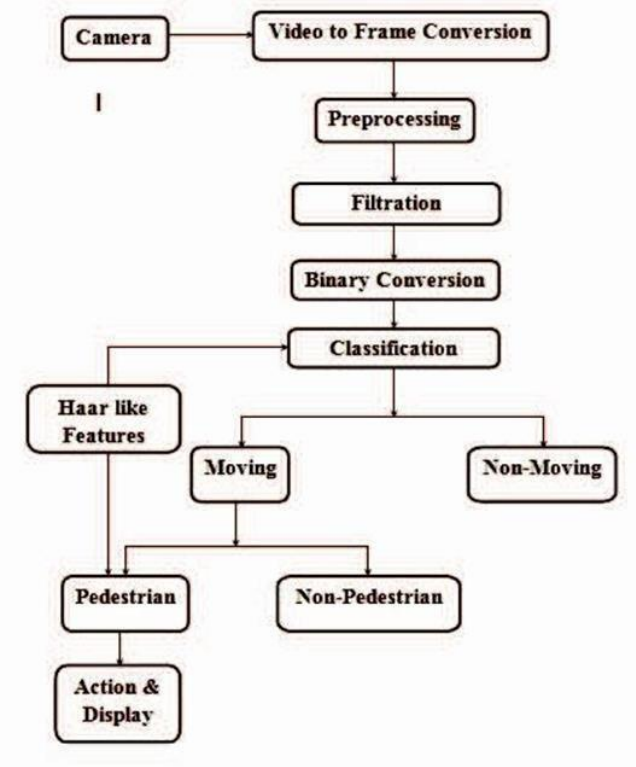

Figure 1: Architecture of proposed Pedestrian Detection System

Ada-Boost is taken for label each region of interest. Ada- Boost is a technique that is extensively used for the classification of pedestrians. Haar features were select for the weak classifier. Different Haar features are carefully chosen for each iteration. We are considering only moving object and neglect non- moving Object. Then we further classify the moving object into two types. This are

1. Pedestrian
2. Non-Pedestrian

Ada-Boost is trained using image determined by the previous steps of the algorithm. I mages are discarded and physically divided into classes. Pedestrian selection is a difficult and serious step for the Ada-Boost training process. Both normal and reversed samples are used in the training process. If two or more images are similar, only one of them is used in the training process. Different pedestrians in different postures must be chosen. Different light conditions are needed to be considered. Ada-Boost classification can be too specific on the images that are used during the training phase, a new sequence is used to to measure the obtained classifier performance. To make the classification more accurate misclassified images are added to the training set for a new training.

3.6 Action and Display

When the pedestrian will be detected we are slow down the speed of the vehicle or alert the driver to push the break or reduce the speed of the vehicle. We are deciding the action on the basis of the distance of the pedestrian.

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Figure 2: Pedestrian and non-pedestrian samples[1]

Figure 3: These are two frames of a sequence. (a) The system detects the pedestrian and issues an internal alert but no warning to the driver. (b) When a detection of pedestrian monitors the internal alert, a warning is quickly sent to the driver[1].

3.7 Feature Calculation

In order to reduce the difficulty in pedestrian detection we make classification easier with help of the simple features instead of sample raw pixel values are provide as the input to a learning algorithm. Features are usually containing knowledge about the object to be detected, which are difficult to learn from the raw and finite set of input data. We probably use the Haar- like feature. These features are in the form of pair of rectangle. They are simple 2D wavelet The simple features are consisting of significant domain- knowledge information. When the features are compare to pixel the speed of the operator increase. Haar-like features representing pedestrian are selected by Ada-Boost learning algorithm to efficiently neglect the non-pedestrian patterns.

3.8 Ada-Boost Algorithm

With the help of Ada-Boost algorithm, we can quickly remove most non- pedestrian sub-images and accelerate the detection algorithm. The Haar-like features are contain the basic elements to construct the cascaded classifiers, and each layer is calculated by the Ada-Boost algorithm. The basic knowledge of Ada-Boost algorithm is to use large capacity of general classification of the weak classifier by a certain method of cascade to form a strong classifier. It can automatically select the most discriminating features considering all possible input feature types, sizes and locations. At each stage, we are classifying the frames as per the given classifiers. Classifiers are trained to detect almost all the interested pedestrian and to reject the non-pedestrian objects. Therefore, all the negative sub-frames that do not contain any pedestrian can be

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discarded. Only the sub-frame passing all stages is identified to be pedestrian. The detection phase is an AdaBoost cascade on Haar-features. It works by using AdaBoost to learn a number of less classifiers, which are converted into strong classifiers. Various layers (called stages) of these strong classifiers are then bounded in a cascade to create the last detection. The cascaded construction makes the algorithm quickly, since most candidates are eliminated in first stages,

3.9 SVM (Support Vector Machine)

Support Vector Machine (SVM) is employed within the field of pedestrian recognition has become a typical approach for several researchers within the previous years. SVM provides a technique to calculate the hyper-plane that separates 2 high-dimensional categories of objects correctly. In spite of that, there area unit alternative vital options that require to be addressed once making a classifier, the employment of single or multiple cascaded classifiers, and therefore the feature extraction strategy. The primary call to form implies the event of a holistic classifier against a by- components approach. within the initial observation, the entire candidate, delineate by a bounding enclose the image and it's applied to the input of the SVM classifier.

On the opposite aspect, the by-components approach suggests the division of the candidate body into several elements. each pedestrian part is then severally learn by a specialised classifier during a initial stage. The body native elements area unit then incorporated by another classifier during a second learning stage. this permits for detection part ascertained pedestrians, as long because the system is changed to notice parts of form . By exploitation freelance classifiers for every part the training method is simplified, because of the actual fact that one classifier has solely to be told every and each options of native regions in bound conditions. Otherwise, it might be incorrectly acceptable learning result employing a holistic approach, for the looks of pedestrians within the scene presents among a high variability category because of lateral and longitudinal movements, totally different shapes, pose, clothing, etc.

IV. CONCLUSION

Pedestrians are the most vulnerable road users, and therefore, they require maximum protection on the road. The large number of fatalities and injuries show the importance of developing pedestrian protection systems. The current Pedestrian detection system does not work well for pedestrians overlapped or occluded seriously. To avoid this kind of false detection, the different views and partial overlapped pedestrian samples can be added to the training datasets. Furthermore, the pedestrian protection system has to warn the driver if there is possible. So the system has to detect all the pedestrians around the vehicle, but in addition, has to analyze their activity and movement.

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