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Pedestrian Detection Technique's – A Review

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ABSTRACT
Pedestrian is a main part of the road system.To detect pedestrian is a critical thing in a computer vision .There are many methods are available to detect pedestrian and subsequently to take some action.In this review based paper we have discussed some popular techniques.

General Terms
Pedestrian, Safety, Object Classification, Region of Interest(ROI)

Keywords
Pedestrian Detection System, Tracking of Pedestrian, Reaction of system.

1. INTRODUCTION
'HUMAN being' is an important part of the living world, same way Pedestrian is also a principle part of the transportation system. There are lots of pedestrian detected in the road accidents[1]. To develop the system for the safety of pedestrian is the important thing to save people.To develop pedestrian detection system there are some targets to achieve ,which are as follows:

1)People are moving as well as stationary,

2)The system mounted vehicle is also in a motion,

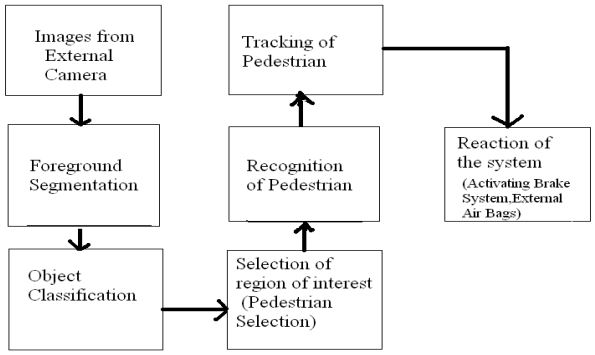

Fig 1: General Diagram of Pedestrian Detection

3)Pedestrians features such as height,colour,their cloths,front side,back side,

4)Stuctures around the vehicle like builduings,trees,cars etc,

5)The varying intensity of light as day time and nigh time.

These targets should be achieved to develop a good detection system. The general diagram of a pedestrian detection system is shown in fig.1:

To detect the pedestrian we must fix the external camera to the vehicle, which captures the images. After that Background and foreground segmentation is done which gives only objects are present on road. From that object classification is a next step. Then selection of pedestrian that is region of interest from other object are done. After selection recognition (or verification) of pedestrian is complete by system.Then tracking of the pedestrian, which is followed by reaction of the system (in the form of activating brake system or warning siren or opening of external air bags) for the safety of pedestrian[1],[2]. In this paper we review different techniques used for pedestrian detection.

2. VARIOUS APPROACHES USED INA PEDESTRIAN DETCTION SYSTEM
There are some approaches based on features and classifier architecture which are as follows:

1) Haar wavelet based cascade. 2) Neural network using LRF features.3) Histogram of oriented gradients combined with a linear SVM. 4)Coarse to fine shape matching with a texture based classification(monocular variant). 5) Local Binary Pattern.Lets see one by one.

2.1 Haar Wavelet Based Cascade Method
The Haar wavelet based cascade framework gives an effective extension to the sliding window approach by establishing an increasingly complex detector layers[17].A set of non adaptive Haar wavelet features are used by each layers.Haar wavelet features at different scales and locations comprising horizontal and vertical features,corresponding titled features point detectors.The training samples are free for location of wavelet that is they are not forced to lie completely within the training samples[2].

2.2 Neural Network using local receptive fields
With the combination of multilayer feed forward Neural network architecture[16]the adaptive local receptive field[](NN/LRF)is a strongest feature in the field of pedestrian detection.To train the NN/LRF requires large memory.Due to this SVM/LRF is not used.The SVM/LRF that is nonlinear support vector machine classification with the LRF features is

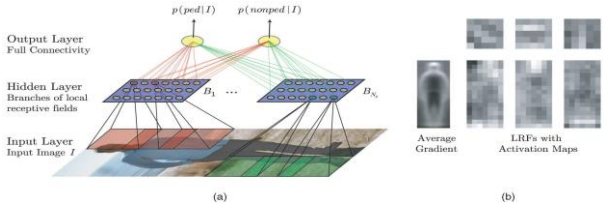

Fig.2 (a) Overview of NN/LRF architecture. (b) Average gradient image along with three exemplary 5 _ 5-pixel local receptive field features (hidden layer weights) and their activation maps (output layer weights) for the "pedestrian" output neuron, highlighting regions, where corresponding LRFs are most discriminative for the pedestrian class.[2]

also gives a good performance. The NN/LRF proposed the concept of Nb branches Bj (j=1,…Nb),where each neuron in each branch receive input from it's receptive field that is local region of the input layer.This concept is different from the multilayer perceptrons,in which the hidden layer is completely joint to the input layer[2].

2.3 Histogram of oriented gradient with linear SVM

The approach of Dalal and Triggs[3]is used to process local shape and appearance with the help of well normalized dense histogram of gradient orientation (HOG).By measuring the magnitude in a spatial grid of cell with overlapping blockwise contrast normalization, according to their orientation a local gradient are stored.From the contributing spatial cells, a feature vector is derived by sampling the histogram,in an each overlapping block.

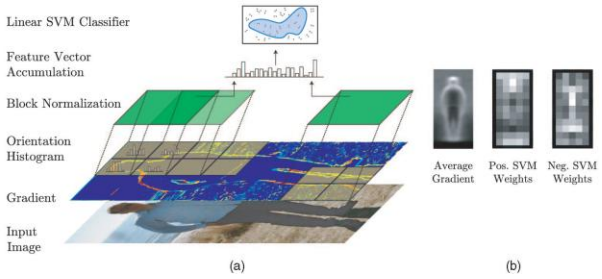

Fig.3 (a) Overview of HOG/linSVM architecture. Cells on a spatial grid are shown in yellow, whereas overlapping normalization blocks are shown in green. (b) Average gradient image along with visualization of positive and negative SVM weights, which highlight the most discriminative regions for both the pedestrian and non pedestrian classes [2].

The feature vectors for all blocks are link together to produce a final feature vector,which is based on classification using a linear support vector machine.As training set becomes more complicated the complexity of the linear SVM is adjusted naturally during training throw rising the number of support vector which is adverse to NN/LRF classifier[2].

2.4 Combined Shape –Texture-Based Approach

A monocular version of the real time protector system[]by cascading shape based pedestrian detection with texture based pedestrian classification.Shape based detection is accomplished by coarse to fine matching of an exempler based ranking(hierarchy)to the image data at hand.

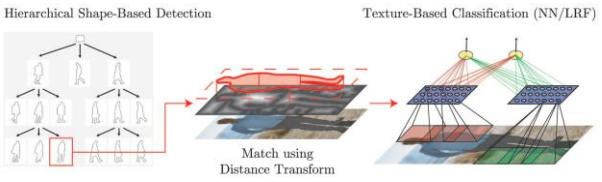

Fig.4 Overview of combined shape-based detection and texture-based classification [2].

From a manually illustrated shape labels,the shape hierarchy is destined offline in an automatic mode.Texture based pattern classifier is a next step for detection of shape matching .At this step the multilayer feed forward neural is apply on local adaptive receptive field features.

2.5 Local Binary Pattern Appraoch

The concept of LBP (local binary pattern) is originally presented by Ojala et al. in [8] to achieve the texture classification, which is afterward extended for different fields, like face recognition ,face detection ,facial expression recognition etc.LBP 's invariance to monotonic gray-scale changes, low computational complexity and convenient multi-scale extension are the famous and useful advantages. The concept of LBP is easy and sophisticated: combined statistical and traditional structural methods [5].

3. RELATED WORK

There is a vast study is done by different researcher on pedestrian detection using various techniques.Like S.Wang,Li Zhu et al.[15] proposed a multiscale handling method for the fast pedestrian detection in which the tactics detection from sparse to dense is used.Where as Pawan Sinha,Tomaso A.Poggio et al.[14]used wavelet templates for pedestrian detection.In which the wavelet template interpret the shape of an object entitled as a subset of the wavelet coefficient of the image.Therefore they proves that the invariant properties and computational efficiency of the wavelet template becomes an successful tool for object detection.A.Broggi,M.Bertozzi et at.[12]proposed a pedestrian detection system based on shape,in which a vision based algorithms used.This algorithm is rooted on the localization of human shape,based on symmetry,size,ratio and shape.From the combination of shapelet feature and Haar detector,Wentao Yao et al.[13] gives another approach.In this double stage algorithm, using shapelet feature the non pedestrian objects are removed so at second stage only some objects are need to be recognize. On the contrary Bastian Leibe,Edgar Seemann et al.[6] presents a series of iterative evidence aggregation steps for a pedestrian detection in a crowded scene ,where they combine local and global cues by means of an automatically computed top down segmentation.

4. CONCLUSION

In this paper, we have reviewed many techniques of the pedestrian detection.As adaptive cruise control is used by many vehicles now a day's therefore pedestrian detection system becomes the magic wand for reducing the road accidents between vehicle and pedestrian.So finally we can say a research in pedestrian detection system is slightly different.The approaches which gives better performance are similar from various point of view.

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