Intellectual System For Protection of Bike Riders Using Image Processing

J.Thilagavathy[1], Sundara Lakshmi.S[2], Sudalai Vadivoo.K[3], Mercy.L[4]
Department of Electronics and communication Engineering
[1] Assistant Professor, Dr.SivanthiAditanar College of Engineering Tiruchendur
[2,3,4] Student, Dr.SivanthiAditanar College of Engineering Tiruchendur

Abstract- *Helmet detection has a wide area of applications in image processing. A new helmet detection technique is proposed using embedded and image processing techniques. One of main reason for death is due to head injuries during accident. The identification of persons who are violating the traffic rules by not wearing helmet is a mandatory one in the society. This project is to detect the persons who are not wearing helmets and thereby efficiently prevent them from head injuries and accidents. Then tracking their number plates and sending warning by using GSM to the near by police station. Innovative techniques are used to detect the object. This technique combines two methods HOG and Neural network techniques for helmet detection to achieve better detection rates. The first method HOG is used as an object detector. It is used to find humans from other objects. That is it is employed for human or non-human detection. The second technique does the job of extracting only the head portion of the human image after it is detected by the HOG algorithm. And further the SVM/CNN algorithm is one of the best algorithms for feature classification. The number plate of the bike-rider who is violating the rules is identified by the number plate recognition system. Subsequently an intimation is send to the concerned authority by use of a GSM module. Thus person violating he traffic rules are easily identified by the respective authorities by messaging and sending their images.*

Keywords- Classification, HOG, SVM

I. INTRODUCTION

An accident is a specific, unexpected ,unusual and unintended external action which occurs in a particular time and place, with no apparent and deliberate cause but with marked effects. The traffic authorities give a lot of instructions to the vehicle operators but many of them do not obey the rules .Now a days in India the traffic authorities are forcing the motor riders to wear the helmet and not to use the vehicle when the person is in drunken condition. But still the rules are violated by riders. The serious road accident in the country occurs every minute and 16 die on Indian roads every hour.1214 road crashes occur every day in India.Tamil Nadu is the state with the maximum number of road crash injuries. As per the report given by Ministry of Road Transport & Highways, During 2016, 13 States accounted for 86 per cent of the total road accidents in the country which include Tamil Nadu. Similarly, 13 States accounted for 84 per cent of the total persons killed in road accidents during 2016which also once again include Tamil Nadu.Among the vehicle categories, two wheelers accounted for the highest share in total number of road accidents (33.8 per cent). The share of two wheelers in total road accidents has increased from 28.8 per cent in 2015 to 33.8 per cent in 2016.

In Indian road system widening of roads is not an alternative solution to avoid traffic in cities. The proposed work is related to prevention of accidents and safeguarding the lives of riders using image processing and embedded system technologies. motorcycle fatalities are increasing as the number of riders wearing helmets decrease. By wearing a helmet we can avoid injuries and safeguard us from accidents. A new detection technique is used in this project such as HOG algorithm for analysis of helmet detection in surveillance video and real time environment. It also uses Support Vector Machine and face detection algorithm for classify the person with and without helmet. Along with hardware GSM module are used for communicating the information about the violated people to the nearby police station . This system helps to prevent server accidents and head injuries which is the major reason for death.

II.BLOCK DIAGRAM

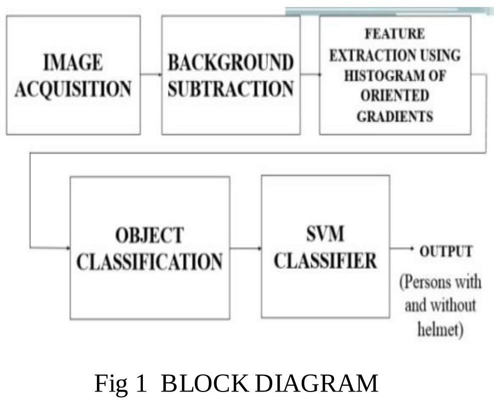

Fig 1 BLOCK DIAGRAM

III. FLOW CHART

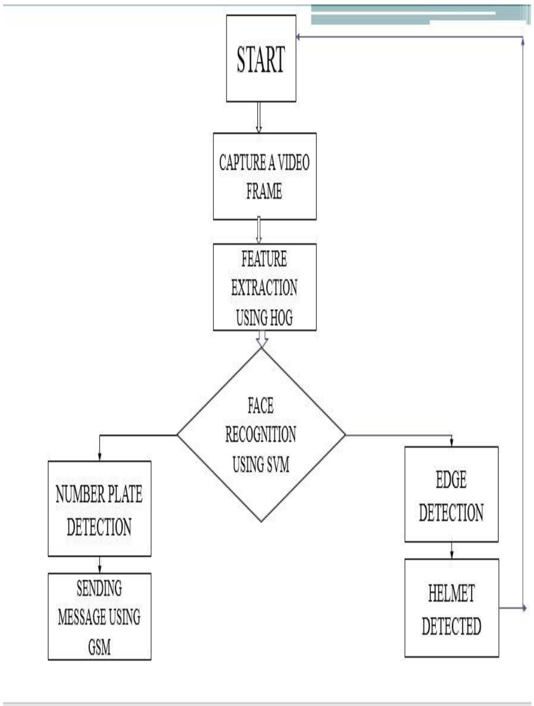

Fig 2 FLOWCHART

IV.METHODOLOGY

- The first method is object detection by HOG algorithm. It is a feature extraction technique for detecting humans.
- The key advantage over most other features is its calculation speed and accuracy.
- The second method is SVM. The SVM is a feature classification technique for helmet or non helmet classification
- Edge detection is a fundamental process in image processing particularly in areas of features detection and extractions.
- Here we used Sobel edge detections.
- The number plate of rider is notified by number plate recognition.
- The detection of Indian vehicles by number plate is most challenging research topic from past few years.
- When a vehicle passes the number plate location and time of observations are recorded.

V. HOG AND SVM

The histogram of oriented gradients (HOG) is a feature descriptor used in computer vision and image processing for the purpose of object detection. The technique counts occurrences of gradient orientation in localized portions of an image. This method is similar to that of edge orientation histograms, scale-invariant feature transform descriptors, and shape contexts, but differs in that it is computed on a dense grid of uniformly spaced cells and uses overlapping local contrast normalization for improved accuracy.

VI. ALGORITHM IMPLEMENTATION

Gradient computation: The first step of calculation in many feature detectors in image pre-processing is to ensure normalized color and gamma values. According to the reference paper point out, however, this step can be omitted in HOG descriptor computation, as the ensuing descriptor normalization essentially achieves the same result. Image pre-processing thus provides little impact on performance. Instead, the first step of calculation is the computation of the gradient values. The most common method is to apply the 1-D centered , point discrete derivative mask in one or both of the horizontal and vertical directions. Specifically, this method requires filtering the color or intensity data of the image with the following filter kernels. It was tested other, more complex masks, such as the 3x3 Sobel mask or diagonal masks, but these masks generally performed more poorly in detecting humans in images. They also experimented with Gaussian smoothing before applying the derivative mask, but similarly found that omission of any smoothing performed better in practice.

VII. ORIENTATION BINNING

The second step of calculation is creating the cell histograms. Each pixel within the cell casts a weighted vote for an orientation-based histogram channel based on the values found in the gradient computation. The cells themselves can either be rectangular or radial in shape, and the histogram channels are evenly spread over 0 to 180 degrees or 0 to 360 degrees, depending on whether the gradient is “unsigned” or “signed”. It was found that unsigned gradients used in conjunction with 9 histogram channels performed best in their human detection experiments. As for the vote weight, pixel contribution can either be the gradient magnitude itself, or some function of the magnitude. In tests, the gradient magnitude itself generally produces the best results. Other options for the vote weight could include the square root or square of the gradient magnitude, or some clipped version of the magnitude.

VIII. DESCRIPTOR BLOCKS

To account for changes in illumination and contrast, the gradient strengths must be locally normalized, which requires grouping the cells together into larger, spatially connected blocks. The HOG descriptor is then the concatenated vector of the components of the normalized cell histograms from all of the block regions. These blocks typically overlap, meaning that each cell contributes more than once to the final descriptor. Two main block geometries exist: rectangular R-HOG blocks and circular C-HOG blocks. R-HOG blocks are generally square grids, represented by three parameters: the number of cells per block, the number of pixels per cell, and the number of channels per cell histogram. In the human detection experiment, the optimal parameters were found to be four 8x8 pixels cells per block (16x16 pixels per block) with 9 histogram channels. Moreover, they found that some minor improvement in performance could be gained by applying a Gaussian spatial window within each block before tabulating histogram votes in order to weight pixels around the edge of the blocks less. The R-HOG blocks appear quite similar to the scale-invariant feature transform (SIFT) descriptors; however, despite their similar formation, R-HOG blocks are computed in dense grids at some single scale without orientation alignment, whereas SIFT descriptors are usually computed at sparse, scale-invariant key image points and are rotated to align orientation. In addition, the R-HOG blocks are used in conjunction to encode spatial form information, while SIFT descriptors are used singly. Circular HOG blocks (C-HOG) can be found in two variants: those with a single, central cell and those with an angularly divided central cell. In addition, these C-HOG blocks can be described with four parameters: the number of angular and radial bins, the radius of the centre bin, and the expansion factor for the radius of additional radial bins. It was found that the two main variants provided equal performance, and that two radial bins with four angular bins, a centre radius of 4 pixels, and an expansion factor of 2 provided the best performance in their experimentation(to achieve a good performance, at last use this configure). Also, Gaussian weighting provided no benefit when used in conjunction with the C-HOG blocks. C-HOG blocks appear similar to shape context descriptors, but differ strongly in that C-HOG blocks contain cells with several orientation channels, while shape contexts only make use of a single edge presence count in their formulation.

IX.BLOCK NORMALIZATION

Let v be the non-normalized vector containing all histograms in as given block, ||v||k be its k-norm for k=1,2 and e be some small constant (the exact value, hopefully, is unimportant). Then the normalization factor can be one of the following:

L2-norm: $v/\sqrt{(||v||22+e2)}$

L2-hys: L2-norm followed by clipping (limiting the maximum values of v to 0.2) and renormalizing, as inL1-norm: $f=v/(||v||1+e)$

L1-sqrt: $f=\sqrt{(v/(||v||+e))}$

In addition, the scheme L2-hys can be computed by first taking the L2-norm, clipping the result, and then renormalizing. In their experiments, It was found that L2-hys, L2-norm, and L1-sqrt schemes provide similar performance, while the L1-norm provides slightly less reliable performance; however, all four methods showed very significant improvement over the non-normalized data. Object recognition.HOG descriptors may be used for object recognition by providing them as features to a machine learning algorithm. HOG descriptors are used as features in a support vector machine (SVM) however, HOG descriptors are not tied to a specific machine learning algorithm.

X.SUPPORT VECTOR MACHINE

A support vector machine is a supervised learning algorithm that sorts data into two categories. It is trained with a series of data already classified into two categories, building the model as it is initially trained. The task of an SVM algorithm is to determine which category a new data point belongs in. This makes SVM a kind of non-binary linear classifier. An SVM algorithm should not only place objects into categories, but have the margins between them on a graph as wide as possible.

Some applications of SVM include:

- Text and hypertext classification
- Image classification
- Recognizing handwritten characters
- Biological sciences, including protein classification

Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier (although methods such as Platt scaling exist to use SVM in a probabilistic classification setting). An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall.

In addition to performing linear classification, SVMs can efficiently perform a non-linear classification using what is called the kernel trick, implicitly mapping their inputs into high-dimensional feature spaces.

When data is unlabelled, supervised learning is not possible, and an unsupervised learning approach is required, which attempts to find natural clustering of the data to groups, and then map new data to these formed groups. The support-vector clustering algorithm, applies the statistics of support vectors, developed in the support vector machines algorithm, to categorize unlabeled data, and is one of the most widely used clustering algorithms in industrial applications

XI. BACKGROUND SUBTRACTION

We examine the problem of segmenting foreground objects in live video when background scene textures change over time. We formulate background subtraction as minimizing a penalized instantaneous risk functional--- yielding a local on-line discriminative algorithm that can quickly adapt to temporal changes. We analyze the algorithm's convergence, discuss its robustness to non-stationary, and provide an efficient non-linear extension via sparse kernels. To accommodate interactions among neighbouring pixels, a global algorithm is then derived that explicitly distinguishes objects versus background via maximum a posterior inference in a Markov random field (implemented via graph cuts). By exploiting the parallel nature of the proposed algorithms, we develop an implementation that can run efficiently on parallel graphics processors, suitable for real-time video analysis >=75 fps on a mid-range GPU.

XII. RESULTS AND DISCUSSION

Background subtraction is the process in which the background of the image is masked.

HISTOGRAM OF ORIENTED GRADIENTS EXTRACTION FOR WITHOUT HELMET

Fig 5.Histogram of Oriented Gradients

EXTRACTION FOR WITH HELMET
HISTOGRAM OF BACKGROUND SUBTRACTED IMAGE

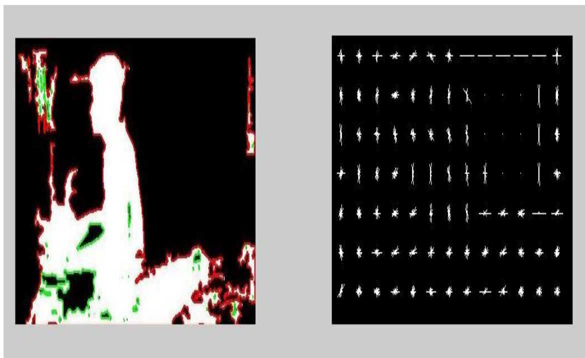

Fig 6.Feature extraction of background subtracted image

X.CONCLUSION

Histogram is the plot between the number of pixels and the intensity values. Feature extraction of Person with and without helmet is studied using HOG based feature extraction method. Accuracy was calculated using three image Obtained at various intensity level. Accuracy is obtained as .We have developed a computer program for detecting motorcyclists who are not wearing helmets using CCTV cameras. Evaluation results show that the program can detect 81 % of all motorcycles passing through the intersection with accuracy of 76 for detection of motorcyclists without helmet.

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