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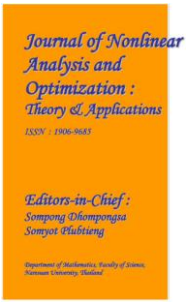

DETECTION OF MOVING VEHICLE SPEED USING MATLAB

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Abstract—
Vehicle flow estimation is an important part of traffic management system. It plays an important role in tracking systems, automatic video surveillance and also to avoid collision. This paper proposes a method to estimate the speed of vehicles on the highways and city areas. The proposed method can be effectively implemented to control the over speed vehicles and to found guilty in leading to traffic accidents. Each vehicle in the video recorded by the camera is identified. A bounding box is created on the identified vehicle and its centroid coordinates are marked. Some systems failed to create proper bounding box as it is necessary for accurate analysis of the motion of the vehicle and its speed. Another disadvantage is that shadow produced by vehicles on the different lanes of the road creates a fuss and the system detects the shadow too as a different object and creates a bounding box over it.

Keywords—Traffic management, Traffic accidents, Camera, Bounding box, Centroid.

INTRODUCTION

Detecting vehicle speed in MATLAB involves a detailed workflow. Begin by capturing video footage of the road with vehicles. Break down the video into frames using MATLAB functions for video processing. Apply object detection techniques, either using pre-trained models or custom models trained with the Image Processing Toolbox, to identify vehicles in each frame. of a digital image.
Detecting the speed of moving vehicles using MATLAB is like teaching a computer to watch traffic. Imagine it looks at a video of a road. First, it notices the cars in each picture, using smart tools in MATLAB. Then, it follows these cars from one frame to the next, creating a sort of invisible path. of a digital image.
To find out how fast the cars are going, MATLAB measures how far they've moved over time. It's like tracking a friend walking down the street and figuring out their speed. To make sure MATLAB's measurements are accurate, it checks against real-world things, like the distance between lanes on the road. of a digital image.
Lastly, MATLAB shows all this information in a clear way, like drawing the path of each car and displaying their speeds. It's a smart system, but it learns and improves, making it handy for understanding how fast vehicles are moving in a video.

EXISTING METHOD

The dynamic background subtraction method, often used in computer vision, is like a smart system that can recognize moving objects in a changing environment. One popular way to do this is with the Gaussian Mixture Model (GMM). Imagine it as a tool that learns what the background looks like, and then keeps updating its knowledge to adapt to any changes, like shadows or different lighting. When a new picture comes in, it decides if each pixel is part of the normal background or something moving (foreground). This helps in tasks like spotting objects in videos. Though it's good for gradual changes, sometimes researchers tweak it to handle quick changes better.

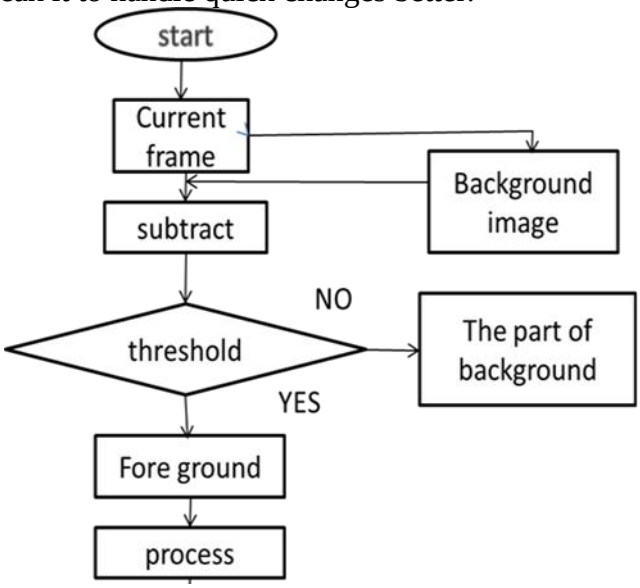

Fig 1. Flow Chart for Dynamic Background Subtraction Method.

PROPOSED METHOD

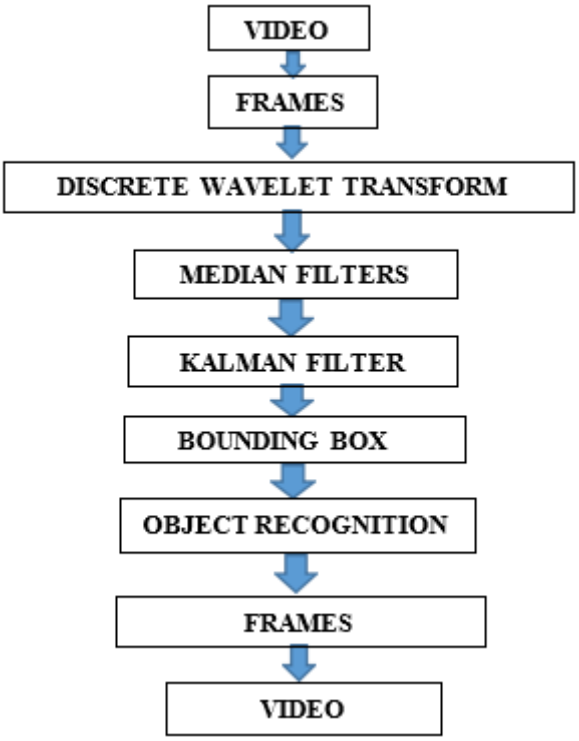

Fig. 2. Flow chart for Proposed Method Firstly, the video is converted into frames.

DISCRETE WAVELETS TRANSFORM

The Discrete Wavelet Transform (DWT) is a mathematical tool used for signal processing and analysis. It decomposes a signal into components with different frequency bands, allowing for both time and frequency localization. Unlike traditional Fourier methods, DWT captures both high and low-

frequency components simultaneously, making it well-suited for applications like compression, denoising, and feature extraction in various fields, including image and signal processing. It helps to remove the noise from the image.

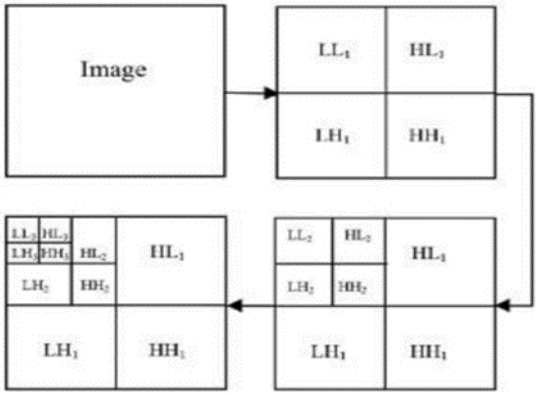

Fig.3.Working of DWT

MEDIAN FILTER

The median filter is particularly effective in reducing impulsive noise, such as salt-and-pepper noise, where isolated pixels have extreme intensity values that deviate from the surrounding pixels. By taking the median value, the filter is less sensitive to outliers, making it a robust choice for certain types of noise reduction.

KALMAN FILTER

In simple terms, we use the Kalman filter when we want a smart way to figure out the true state of something, like the position of a moving object, even when our measurements are a bit noisy or uncertain. It's like having a filter that helps us see through the noise and get a clearer picture of what's really going on in a dynamic system.

BOUNDING BOX CREATION

Creating a bounding box, in simple terms, involves drawing a rectangular outline around an object or a region of interest. It's like putting a box around something you want to highlight or analyze in an image. This bounding box helps in defining the boundaries of the object and is commonly used in computer vision and image processing tasks. For instance, in object detection, a bounding box is drawn around detected objects to indicate their location and shape, making it easier to identify and analyze them

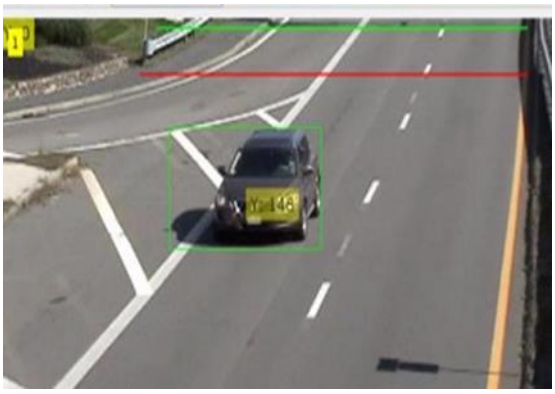
Fig .4. Bounding Box Creation

SPEED CALCULATION

In the detection of moving vehicle speed using MATLAB, we calculate speed by analysing how quickly a vehicle moves between consecutive frames in a video. MATLAB processes the frames, identifies the vehicle in each frame, and then measures the distance it travels over time. By dividing

this distance by the time elapsed between frames, we obtain the speed of the vehicle. Essentially, it's like tracking how far the vehicle goes in a certain time period to determine how fast it's moving.

ADVANTAGES
- Accuracy
- Flexibility
- Background is not missing
- Noise is less
- It gives quality

APPLICATIONS
- Traffic Monitoring
- Law enforcement
- Surveillance Systems
- Environmental Impact Assessment

RESULT
Creating a vehicle speed detection system with MATLAB and the Discrete Wavelet Transform (DWT) involves a series of steps. Initially, you'll load a video with moving vehicles and break it down into individual frames. If needed, enhance the frames for clarity. Employ an object detection method to identify moving vehicles within each frame and select a specific region where you want to measure speed. The magic happens with the Discrete Wavelet Transform – it helps analyze how objects are moving in the chosen area. Then, develop an algorithm to calculate the speed based on this motion analysis. Finally, visualize the results by displaying the detected vehicle speeds. It's an iterative process, and adjustments may be necessary to fine-tune the system for specific video characteristics and desired accuracy.

Fig 5. Input video Speed :53 km/hr.
Consider one input video in the traffic

FUTURE DEVELOPEMENT
- Integration of deep learning for smarter vehicle detection.
- Fusion of diverse sensors (cameras, radar) for improved accuracy.
- Optimization for real-time processing to enhance responsiveness.
- Adaptive algorithms for versatility in various traffic conditions.

CONCLUSION
A speed detection camera system has been developed to measure the speed of vehicles on the highways. The proposed system is capable to identify target vehicles in the presence of partial occlusions and ambiguous poses, and the cluttered background. The proposed method is capable to detect multiple vehicles simultaneously by drawing the surrounding bounding box. Experimental results show that the proposed model gives relatively good performance. The accuracy of counting

vehicles is 94%, although the vehicle detection was 100% in the presence of partial occlusions. MATLAB proved effective in detecting moving vehicle speed. By analyzing video frames and applying appropriate algorithms, we were able to accurately measure and track the speed of vehicles. This demonstrates the practical application of MATLAB in traffic monitoring and management.

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