

**TITLE OF THE RESEARCH WORK**

**Event Detection in Surveillance Video**

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# INTRODUCTION:

A lot of automated surveillance systems, like CCTV cameras, have been installed at various traffic junctions to assist in monitoring, managing and improve the movement of vehicles on Indian roads. These multiple cameras produce loads of video data all throughout the day which are monitored by a human operator to identify any abnormal. However, it would be highly difficult for the human operator to analyze these traffic videos and come up with useful insights that might help in actual cause because of interruptions and exhaustion. This motivates to bring up with a solution where abnormal activities are identified by the system and these events are alerted to the operator at appropriate times. However, automatic abnormal event detection is a challenging task because of the constraints like camera resolution, occlusion in the scene, data availability, wide range of abnormalities, ambiguity in appearance, perspective distortion, etc.

An abnormal event is identified as an event which does not occur normally. These events can be classified as traffic jams, breaking of traffic rules, accidents, non-vehicular (animals, cattle) objects in the middle of the road, vehicle break-down, chain snatching, theft, etc. These events are un-common events in any traffic and road condition and do not occur frequently. The proposed work presents an approach to identify, classify and localize these abnormal events from the real-time CCTV footage of traffic on Indian roads.

# LITERATURE REVIEW:

Based on the density of objects in the video frames, different approaches have been developed to detect anomalous events in the video footage. Tracking based approaches are used when the density of number of objects are less in the video frames, whereas object motion based approaches are used in the case of high object density video footages.

Tracking based approaches:

In [5], [Shifu Zhou](https://www.semanticscholar.org/author/Shifu-Zhou/2527043) and et.al., uses KLT feature tracker to obtain trajectories, and these trajectories are grouped to form the motion patter of the crowd. Later, the trajectories are modeled using Multi-Observer Hidden Markov Model (MOHMM) to determine of the frame is normal or abnormal. In the journal “Abnormal Behavior Detection via Sparse Reconstruction Analysis of Trajectory”[6], B-spline curves are used for motion trajectories of objects via fixed length vectors. Then the vectors are classified as normal or abnormal using sparse reconstruction analysis.in which the classifier is constructed with sparse linear coefficients by computing L1-norm minimization.

Object motion based approaches:

In [1], spatio-temporal features, based on optical flow information that are used to model general concepts, such as orientation, velocity, and entropy, are used to detect anomalous events in video footages with crowd. Normal patterns in videos are trained. During test, events that significantly differ from the normal patterns are classified as anomalous. Md. Haidar Sharif in [2] has proposed an approach using eigen values to detect the flows and events in a crowd. Spatio-temporal features of two consecutive frames are extracted to retain appearance and velocity information. Later polynomial function of different degrees are fitted by analyzing Zero flow, single flow and multiple flows and interesting (anomalous) events are detected using frame basis. In the paper, Abnormal Event Detection in Video Using Motion and Appearance Information [3], the video sequence is divided into spatio-temporal non-overlapping local patches. Later for each patch motion features like velocity and acceleration of optical flow and appearance features like texture and gradients are extracted. These features are trained using minimum distance classifier. Classification based on local features is performed to avoid perspective distortion. Yong Shean Chong et.al. in [4], makes use of deep nets to efficiently detect anomalies in crowded scenes. The input video is subjected to spatial encoding using convolution filters and the the temporal features are detected using temporal encoders namely convLSTM(Long Short Term Memory) nets. Later each frame is classified as normal or anomalous using thresholding method.

# OBJECTIVE OF THE PROPOSED RESEARCH WORK

The aim of this research work is to identify and alarm abnormal incidents (or events), like chain snatching, accidents, vehicle breakdown, and non-vehicular objects that occur on Indian roads. Later, these events are reported to the operator in real-time so that necessary action can be discharged on time.

The objectives of the research work are listed below:

1. To survey existing literature for various state-of-the-art anomalous detection algorithms and compare them with their understanding of their advantages & limitations.
2. To collect suitable video data for the development of algorithm.
3. To design and implement suitable computer vision and machine learning algorithm for abnormal event detection.
4. To test the algorithm on the benchmarking datasets.
5. To compare the result and performance of the algorithm with other existing methods.
6. To develop a software prototype for integration of the developed algorithm with actual surveillance systems.

# STUDY AREA AND METHODOLOGY

This section describes the methods and methodology used for the research work to achieve the proposed objectives.

Literature review of the existing anomalous event detection algorithms and feature calculation/matching techniques will be carried out by referring reviewed journals, books, manuals and related documents. Based on the literature survey, video dataset for development of the system will be procured. The video dataset will be obtained by using

real-time traffic videos(from Bangalore Traffic Police) **OR**

available datasets on the internet

A suitable video processing workflow (proof of concept algorithm) will be designed for the selected video dataset. The processing workflow will be based on the inputs from the literature and the dataset used for development and benchmarking. Proof of concept algorithms will be developed using existing software libraries like OpenCV, Python, CNN, Scikit. Processing algorithms will be developed in C/C++ and/or Python.

The algorithm will be constantly tested against the benchmarking datasets for result tabulation and comparison against the existing methods. Once the algorithm is fixed, the parameters of the algorithm will be fine-tuned to improve the results. After final modifications, the developed solution will be deployed on one of the production servers for analyzing the actual behavior.

# EXPECTED OUTCOME

The current research work is being pursued in order to reduce the manual load and human error on the Government body to maintain the traffic sense. The research work after realization is aimed to assist Government in the maintenance of the road safety principles with minimal cost. This will assist the Government body to reduce crime, prevent traffic congestion that will eventually result in better living for the citizens.

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