Real Time-Based Advanced Approach for Abandoned Object Detection and Classification

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ABSTRACT

Real time-based application has vast area of research in image processing. One of them is abandoned object detection. Abandoned object detection and classification plays vital role in security field in different commercial, social places, but still some objects require manual interference. Taking advantage of these, terrorist attacks rises on airport, railway stations, shopping malls etc. Hence there is a desperate need of automatic object detector which can detect abandoned objects in crowded places. The main focus is to provide brief overview about work done in abandoned object detection and classification.

Keywords:- *Abandoned object detection, Background subtraction, classification, SVM, frame difference, temporal detection.*

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1. INTRODUCTION:

The abandoned object detection is a challenging research topic in the image processing area. Abandoned object means an object remains stationary for some threshold time. Now-a-days there is an increase in terrorist attack in public places by leaving bag or box behind for the sake of harm to society. It is necessary to detect such objects as early as possible. Now-a-days everywhere there are video surveillancesystem which needs manual involvement. So, there is need of automated system which can detect suspicious objects in public places. Object Classification is the categorization of the object based on a previously defined classes or types. It is needed to differentiate between different objects taking reference from the past objects classified during the attacks.

Abandoned object detection and classification has various stages namely: Object detection, Feature extraction and object classification. There are many different methods for identifying static objects [7]. Object detection deals with detecting instances of semantic objects of a certain class (such as humans, bag, box, buildings, or cars) in digital images and videos [11].Feature extraction a type of dimensionality reduction that efficiently represents interesting parts of an image as a compact feature vector. This approach is useful when image sizes are large and a reduced feature representation is required to quickly complete tasks such as image matching and retrieval [12].There are many different methods for classifying objects [8][9][10]. Object Classification is the categorization of the object basedon a previously defined classes or types. Next sections give overview of some literature review and conclusion of survey.

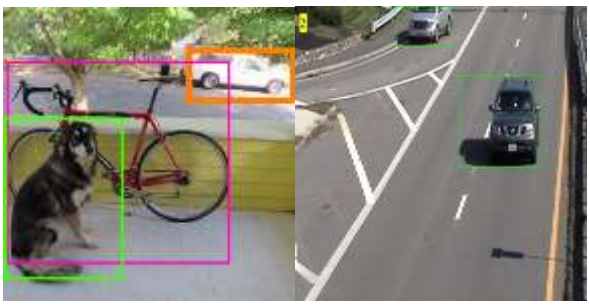

Figure 1: Example of Object detection [13] [14]

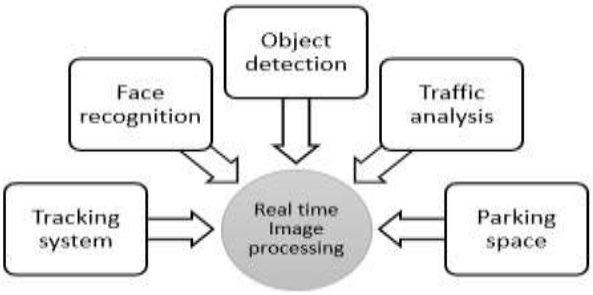

Figure 2: Real time image processing fields

Figure 3: Example of Abandoned object[15][16]

2. LITERATURE REVIEW:

2.1 A Novel Algorithm for Abandoned Object Detection.

- In [1]Weilong Huang, LizuoJin, Yi Luo, Yawei Li, Tong Cui, gives a novel detection algorithm for abandoned object detection by background modeling, HOG and blob separation techniques. The proposed system is suitable for more practical cases in which objects are located near each other. Background subtraction method is used for detection of object, HOG(Histogram of oriented gradients) is used as feature descriptor to detect change between two frames and blob separation is used for differentiate the objects located near each other. They have used PETS2006 dataset for test. The algorithm is stable for long-time abandoned detection.

2.2 Real Time Abandoned Object Detection Using Video Surveillance.

- In [2]Aditya Gupta , Vishal Satpute , Neeraj Dhanraj Bokde , K.D. Kulatpresents a system which can detect abandoned object in video surveillance in real time. Here, the dual background subtraction method is used for static object detection with ANDing operations of frames. Background modeling is done by median model. They have used PETS2006 dataset for test. The system gives satisfactory results under complex conditions of lighting, shadow and crowded conditions. Also, there is one false detection in one sequence. The future scope of the system is concatenating with classification to avoid false detection.

2.3 A Real Time Abandoned Object Detection Hardware Approach.

- In [3]Ketaki Shet, S.V. Khobragade,gives a hardware implementation of abandoned object detection with classification. They have combined long term and short-term background model for object detection which is background subtraction. Here, changes detection is done by fuzzy clustering using log ratio and mean ratio operators. SVM classifier is used for classification and location of object is traced by GPS. They have used embedded and IOT (Internet of Things) module for hardware implementation. The system gives exact result for human and animal detection. The proposed system gives accuracy between 60-70%. By using SVM classifier the classification accuracy is increased by large extent.

2.4 Real Time Objects Detection and Positioning in Multiple regions Using Single fixed Camera View for Video Surveillance Applications.

- In [4]H. V. Ravish Aradhya, Mohana Kiran, Anil Chikodigives object detection in multiple regions separately from single camera. System used two methods for object detection namely background subtraction and temporal detection. They have divided the region into four quadrants and detect objects separately. Because of these reasons, overall cost reduces as user will have control to select required regions. Background subtraction method is used for detecting stationary and moving objects where as temporal method can detect moving objects accurately.

2.5 Real Time Moving Object Extraction Based on Area Filling.

- In [5]PancaMudjirahardjo, HadiSuyono, RadenAriefSetyawanhas developed simple extraction method which is suitable for real time application. They have used background subtraction for object detection, edge labelling for edge detection and filling operation for extracting whole moving object. System can extract moving object in computation time of 116-296 ms, video rate of 15 frames/sec and image frame size of 640x480 pixels, which is suitable for real time.

2.6 Abnormal Behavior Recognition Based on Improved Gaussian Mixture Model and Hierarchical Detectors.

- In [6]Shuang Liu, Peng Chen, Denis Spelip,gives fall behavior recognition system for elderly persons. The system consists of four parts namely preprocessing, moving object detection, fall behavior recognition and experimental analysis. They have used corrosion and dilation, Gaussian and median filters for preprocessing, background subtraction based on Gaussian Mixture Model for object detection and at last three level hierarchical fall detectors for fall behavior detection. Accuracy rate for abnormal fall detection is more than 95%. Result of horizontal angle is better than other angels.

2.7 Object Detection and Classification in Surveillance System.

- In [17]Soumya Varma ,Sreeraj M,introduced system for detecting object and classify them in two classes i.e., human and non-human. Background subtraction method (Mixture of gaussian) is used for object detection and SVM classifier is used for classification of object. They have also evaluated with K Nearest Neighbour classifier. Accuracy of system is 86.925%. Its future scope is to classify objects in more than two classes and can detect objects under various conditions like shadow detection and elimination.

2.8 Efficient Object Detection and Classification on Low Power Embedded System.

- In [10]Shyam Jagannathan, Kumar Desappan, Pramod Swami, Manu Mathew, SoyebNagori, KedarChitnis, Yogesh Marathe, Deepak Poddar, Suriya Narayanan, Anshu Jain,gives combination of object detection and classification algorithm on low power embedded system. Author have used HOG features and AdaBoost cascade classifier for object detection and CNN (Convolutional Neural Network) classifier for object classification. Proposed system allows us to detect vehicles and traffic signs upto 45 meters. AdaBoost accuracy for pedestrian, vehicle and traffic signs are 74.6%, 79.4% and 79.6% respectively.

3. COMPARATIVE TABLE:

Table -1: Comparative Table[7]

Detection Method	Accuracy	Time Efficiency	Advantages	Limitations
Background Subtraction	Moderate	Moderate	• Don't need huge memory. • Gives complete information about object compared to other.	• It does not cope with multimodal background.
Optical Flow	Moderate	High	• It can produce complete movement information.	• Require large amount of calculation • Sensitivity to noise
Frame Differencing	High	Low to moderate	• Easiest method performs well for static background.	• It requires background without moving object
Temporal Differencing	Moderate	Moderate	• Easiest method	• Requires a background without moving objects

4. CONCLUSION:

An automated system for abandoned object detection and classification is highly useful for security purpose in video surveillance system. Object detection and classification plays major role in security field in different commercial, social space, but still some objects require manual interference in one or the other way. Because of these reasons some time major issue occurs like bomb blasts. Due to increase in attacks on public places there is requirement of an computerized system which can detect suspicious/unwanted objects.So, we can help government to avoid terrorist attacks as soon as possible.

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