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Density-Based Multi Feature Background Subtraction with Support Vector Machine

S. Mahipal[1], P. Sreenivasa Moorthy[2]

[1]M.Tech. Student, CSE Department, CMR Institute of Technology, Hyderabad, A.P

Email-id: srmahipal@gmail.com

[2]Associate Professor, CSE Department, CMR Institute of Technology, Hyderabad, A.P

Email-id: moorthypsm@gmail.com

Abstract

Video surveillance systems have long been in use to monitor security sensitive areas. The making of video surveillance systems "smart" requires fast, reliable and robust algorithms for moving object detection, classification, tracking and activity analysis. Moving object detection is the basic step for further analysis of video. It handles segmentation of moving objects from stationary background objects. Object classification step categorizes detected objects into predefined classes such as human, vehicle, animal, clutter, etc. It is necessary to distinguish objects from each other in order to track and analyse their actions reliably.

Index Terms: Video surveillance; classification; reliable; clutter.

1 INTRODUCTION

The motion of background objects once the coaching amount and foreground objects inactive during the coaching amount would be thought-about as permanent foreground objects. Additionally the approach cannot address gradual illumination changes within the scene. These issues cause the need that any answer should perpetually re estimate the background model. Several adaptative background-modelling methods are planned to affect these slowly-changing stationary signals. Milton Friedman and Russell modelled every picture element Associate in Nursing exceedingly in a very camera scene by an adaptative constant quantity mixture model of three Mathematic distributions. They additionally give some temporary discussion on the web update equations supported comfortable statistics. Koller at all used a Kalman filter to trace the changes in background illumination for each picture element. They applied a selective update theme to incorporate solely the probable background values into the estimate of the background. The strategies will cope well with the illumination changes but cannot handle the matter of objects being introduced or faraway from the scene. One answer is to use a multiple-colour background model per picture element. Grimson at all utilized Associate in Nursing adaptative statistic mathematician mixture model to resolve these issues. Their model also can reduce the result of little repetitive motions for instance, moving vegetation like trees and bushes furthermore as little camera displacement. Elgammal at all used a kernel computer for every picture element. Kernel exemplars were taken room a moving window. They additionally introduced a technique to scale back the results of little motions by using a abstraction coherence. This was done by examination merely connected elements to the background model of its circular neighbourhood. Though the authors conferred variety of speed-up routines, the approach was still of high machine quality. different techniques victimisation high level process to help the background modelling are proposed for example, the Wallflower huntsman that circumvents some of these issues victimisation high level process instead of endeavour the inadequacies of the background model. Our technique relies on Grimson at all is framework, the variations be the update equations, formatting technique and also the introduction of a shadow detection algorithmic program. A common optimization theme accustomed match a

mathematician mixture model is that the Expectation Maximisation SVM algorithmic program. The SVM algorithmic program is Associate in Nursing unvaried technique that guarantees to converge to a local most in a very search house. Owing to the frame of reference needs in modelling every picture element for the background image, an internet SVM algorithmic program is needed. Several on-line SVM algorithms are introduced. They can be classified into two teams. The primary cluster was within the realm of constant quantity estimation of probability density functions pdfs. In different words, to use new knowledge in change the previous estimate without modifying the structure of the previous model. The procedure was introduced by Nowlan and explained in terms of the results by Neal and Hinton . Traven derived Associate in Nursing N most up-to-date window version of the procedure. McKenna at all extended the results of Traven to Associate in Nursing L most up-to-date window of the results from L batch SVM runs and used it for chase a multi-colour foreground object. This parametric estimation approach cannot run effectively while not a decent initial estimate normally found by running the batch SVM algorithm. The second cluster is that of non-parametric approaches. Priebe at all introduced Associate in nursing adaptative mixture model with random thresholding for generating new mathematician kernels to the existing mixture model. Grimson and Stauffer, however, applied a similar theme with deterministic thresholding. In Our Approach System collecting foreground images and comparing that with background image. If any object is detected means we will get an alert message to our mobile number. This comparison is performed by using svm classifier.

2 BACKGROUND MODELING

We have a tendency to discuss the work of Grimson and Stauffer and its shortcomings. The authors introduces a technique to model every background picture element by a combination of K Gaussian distributions K is a small variety from three to completely different completely different Gaussians are assumed to represent different colours. The weight parameters of the mixture represent the time proportions that those colours keep within the scene. Unlike Friedman

at all is work, the background parts are determined by presumptuous that the background contains B highest probable colours. The probable background colours are those that keep longer and more static. Static single-colour objects trend to make tight clusters within the colour area whereas moving ones form widen clusters owing to totally different reflective surfaces throughout the movement. The live of this was called the fitness worth in their papers. To permit the model to adapt to changes in illumination and run in real-time, associate degree update theme was applied. It is based mostly upon selective change. each new picture element worth is checked against existing model parts so as of fitness. the primary matched model part are going to be updated. If it finds no match, a brand new Gaussian part are going to be additional with the mean at that time and a large variance matrix and a little worth of weight parameter.

3 RELATED WORKS

Each classifier uses *k* rectangular areas (Haar features) to make decision if the region of the image looks like the predefined image or not. Figure "Types of Haar Features" shows different types of Haar features.

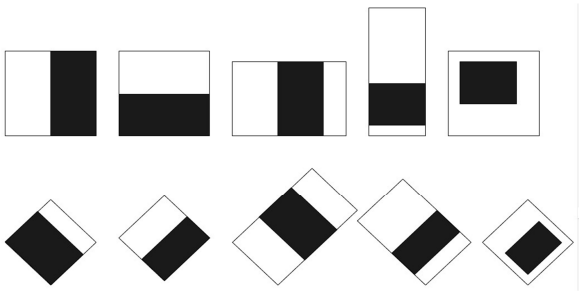


Fig: 1 Haar Like Features

4 SYSTEM IMPLEMENTATION

Although different, most bachelor's degree techniques share a typical denominator: they create the assumption that the discovered video sequence It is formed of a static background B a head of that moving objects area unit discovered. With the idea that each moving object of a colour or a colour distribution different from the one discovered in B, various bachelor's degree methods will be summarized by the subsequent formula.

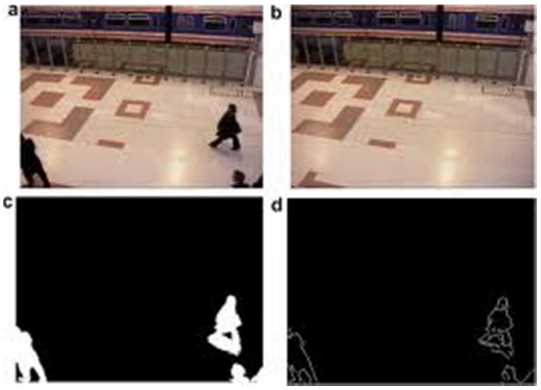


Fig 2: Background Subtraction

5 FEATURE ANALYSES

We describe the characteristics of individual features and the performance of multiple feature integration. The correlation between every pair of features. RGB colours and three Harr-like features are significantly correlated. We propose a pixel wise background modelling and subtraction technique using k-mean clustering algorithm. Where generative and discriminative techniques are combined for classification. The features improve background or foreground classification performance. In pattern recognition and in image processing, feature extraction is a special form of dimensionality reduction. When the input data to an algorithm is too large to be processed and it is suspected to be notoriously redundant (much data, but not much information) then the input data will be transformed into a reduced representation set of features (also named

features vector). Transforming the input data into the set of features is called *feature extraction*. If the features extracted are carefully chosen it is expected that the features set will extract the relevant information from the input data in order to perform the desired task using this reduced representation instead of the full size input. Template matching is a technique in digital image processing for finding small parts of an image which match a template image. If the template image has strong features, a feature-based approach may be considered; the approach may prove further useful if the match in the search image might be transformed in some fashion. Since this approach does not consider the entirety of the template image, it can be more computationally efficient when working with source images of larger resolution, as the alternative approach, template-based, may require searching potentially large amounts of points in order to determine the best matching location.

6 CLASSIFICATIONS

After background modelling, each pixel is associated with k 1DGaussian mixtures, where k is the number of features integrated. Background/foreground classification for a new frame is performed using these distributions. The background probability of a feature value is computed, and k probability values are obtained from each pixel, which are represented by a k-dimensional vector. Such k-dimensional vectors are collected from annotated foreground and background pixels, and we denote them by yj (j ¼ 1; . . .;N), where N is the number of data points. In most density-based background subtraction algorithms, the probabilities associated with each pixel are combined in a straight forward way, either by computing the average probability or by voting for the classification. The objective of colour clustering is to divide a colour set into *c* homogeneous colour clusters. Colour clustering is used in a variety of applications, such as colour image segmentation and recognition. This algorithm classifies a set of data points *X* into *c* .Homogeneous groups represented as fuzzy sets *F*1, *F*2, ..., *Fc*. The objective is to obtain the fuzzy *c*-partition $F = \{F1, F2, .., Fc\}$ for both an unlabeled data set$X = \{x1, ..., xn\}$. Fuzzy *c*-means algorithm for clustering colour data is proposed in the present study.

The initial cluster centroids are selected based on the notion that dominant colours in a given colour set are unlikely to belong to the same cluster

7 ALERTING SYSTEM

After detecting the changes in video frames, we are alerting the central control unit or the user through SMS using the GSM Modem. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

8 SVM IMPLEMENTATION

Definition:

A support vector machine (SVM) is a concept in statistics and computer science for a set of related supervised learning methods that analyze data and recognize patterns, used for classification and regression analysis. The standard SVM takes a set of input data and predicts, for each given input, which of two possible classes comprises the input, making the SVM a non-probabilistic binary linear classifier. Given a set of training examples, each marked as belonging to one of two categories, an SVM training algorithm builds a model that assigns new examples into one category or the other. 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 on.

Description:

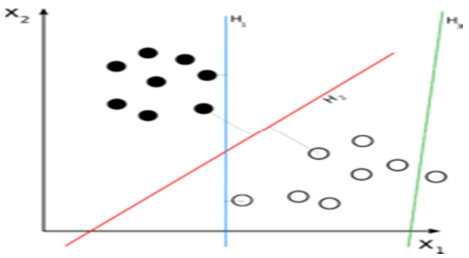
More formally, a support vector machine constructs a hyper plane or set of hyper planes in a high- or infinite- dimensional space, which can be used for classification, regression, or other tasks. Intuitively, a good separation is achieved by the hyper plane that has the largest distance to the nearest training data points of any class (so-called functional margin), since in general the larger the margin the lower the generalization error of the classifier.

Whereas the original problem may be stated in a finite dimensional space, it often happens that the sets to discriminate are not linearly separable in that space. For this reason, it was proposed that the original finite-dimensional space be mapped into a much higher-dimensional space, presumably making the separation easier in that space. To keep the computational load reasonable, the mapping used by SVM schemes are designed to ensure that dot products may be computed easily in terms of the variables in the original space, by defining them in terms of a kernel function $K(x,y)$ selected to suit the problem.[1] The hyper planes in the higher dimensional space are defined as the set of points whose inner product with a vector in that space is constant. The vectors defining the hyper planes can be chosen to be linear combinations with parameters α_i of images of feature vectors that occur in the data base. With this choice of a hyper plane, the points x in the feature space that are mapped into the hyper plane are defined by the relation:

$$\sum_i \alpha_i K(x_i, x) = constant$$

Note that if $K(x,y)$ becomes small as y grows further from x, each element in the sum measures the degree of closeness of the test point x to the corresponding data base point x_i. In this way, the sum of kernels above can be used to measure the relative nearness of each test point to the data points originating in one or the other of the sets to be discriminated. Note the fact that

the set of points *x* mapped into any hyper plane can be quite convoluted as a result allowing much more complex discrimination between sets which are not convex at all in the original space.



H3 (green) doesn't separate the two classes. H1 (blue) does, with a small margin and H2 (red) with the maximum margin. Classifying data is a common task in machine learning. Suppose some given data points each belong to one of two classes, and the goal is to decide which class a *new* data point will be in. In the case of support vector machines, a data point is viewed as a *p*-dimensional vector (a list of *p* numbers), and we want to know whether we can separate such points with a $(p-1)$-dimensional hyper plane. This is called a linear classifier. There are many hyper planes that might classify the data. One reasonable choice as the best hyper plane is the one that represents the largest separation, or margin, between the two classes. So we choose the hyper plane so that the distance from it to the nearest data point on each side is maximized. If such a hyper plane exists, it is known as the maximum-margin hyper plane and the linear classifier it defines is known as a maximum margin classifier; or equivalently, the perceptron of optimal stability.

9 CONCLUSIONS

In this application we are performing background subtraction by using SVM classifier. This application is used in security places where it is needed. It is less expensive. In this application we are using GSM modem to get the alert message when any object is found.

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AUTHORS' BIOGRAPHY

S. Mahpal had B.Tech from Sree Chaitanya College of Engineering Karimnagar. He is an M.Tech. Student in CSE Department of CMR Institute of Technology, Hyderabad. He is currently working for his M.Tech. research project work under the guidance of Mr.P.S.Murthy. His areas of interest include Network Security, Computer Networks, and Programming languages.

P. Sreenivasa Moorthy M.E., (Ph.D) he is currently working as Associate Professor in CSE Department of CMR Institute of Technology, Hyderabad. His areas of interest are Image Processing, DataBases, Networking and Security

