ISSN:0975-9646

Object Detection Using Background Subtraction Tolerating Sudden Background Variations

Aruna A S[1], Deepthi K[2]

[1] *Assistant Professor, Dept. of Computer Science, CEV, Vadakara, Kerala, India*

[2] *Assistant Professor, Dept. of Computer Science, CEV, Vadakara, Kerala, India*

Abstract: Background subtraction is a technique in the field of image processing where in an image's foreground is extracted for further processing. Low –rank and sparse representation method, which make few specific assumption about the background have really attracted wide attention in background modelling. Background subtraction is a widely used approach for detecting moving object in videos. The aim of this approach is to detect the moving objects from the difference between the current frame and reference frame. It constitutes of two terms, a low-rank matrix, which is the background and a structured sparse outlier matrix known as the foreground. Generally, an image region of interest are objects in its foreground. Both the background and foreground frames are converted into grey scale. After the stage of image pre-processing, object localization is required. In order to do that comparison of the two frames are done. The pixels below a predefined threshold value are converted to white where the new object is present. The white area is cropped and compared with the already trained patterns to identify the objects by pattern matching. Since the application of this technique is in the forest areas the object identification mainly involves the recognition of animals both indigenous or visitors in a habitat. The main advantage is that it is able to tolerate sudden background variations like change in weather conditions or turn on/off lights.

Keywords: background substitution, pattern recognition, training object detection

I. INTRODUCTION

A. Overview:

Information technology touches every aspect of our daily lives and it has various applications in our society. To survive this combination hungry world we need rapid and timely access to information. IT is the dominant partner in households, business, education, science and technology and entertainments. The computerized system presents a wide array of attractive features by increasing the reliability, accuracy and the speed of data retrieval. It lets the beneficiaries get hold of speedy information in a world in which every second count.

Foreground object segmentation from a video stream is a fundamental and critical step for many high level computer vision tasks, such as traffic control, object based video encoding, social signal processing and human-machine interactions. The accuracy of segmentation can significantly affect the overall performance of the application employing it. Background subtraction is generally regarded as an effective method for extracting the foreground. However, the background in a complex environment may include distracting motions and hence makes precise segmentation challenging. In the past decade, great progress in improving the performance of foreground detection has been reported. Background subtraction is a major technique used to detect moving parts by subtracting them from the established background. This means that video frames firstly are compared with a background model, and then changes are identified as the foreground. In this method, the new frame was projected onto the subspace spanned by the trained principle components, and the residues indicate the presence of new foreground objects.

Recently, low-rank and sparse decomposition methods have shown promising performance in foreground detection. The only assumption made on the background is that any variation in its appearance can be captured by the low rank matrix. In this simple form, a matrix composed of the observed video frames can be decomposed into a low-rank matrix representing the background and a sparse matrix consisting of the foreground objects treated as the sparse foreground.

B. Scope:

The main contributions are summarized as follows:

1. A clean background for training is not required.
2. The static setting of the regularizing parameter is replaced by the adaptive settings for image regions with distinct properties for each frame. Hence, this method is able to tolerate sudden background variations like the changing weather conditions or turn on/off lights, without losing sensitivity to detect real foreground objects. The proposed method achieves better accuracy in terms of both foreground detection and background estimation in comparison with state-of-the-art algorithms.

C. Existing System Analysis:

Video surveillance in the present world is turning out to be a mandatory part of life. Each and every second of our life is being captured under the careful and watchful eyes. The present technology uses the normal video surveillance cameras like CCTVs for this purpose. Using this technology it is true that all the movements and changes can be captured, but it may not be sure about the clarity and authenticity of the results.

The normal video cameras placed in order to detect intrusion has a higher chance of failure due to the fact that it may not be able to detect the minute changes or variations occurring in the surroundings. When placed in the dynamic scenarios the effectiveness of these cameras can't be guaranteed. The constant variation in the light settings, color and the surroundings can result in the poor performance. The CCTV requires large memory space to store all of the data captured. It is highly complex and high

risk of being tracked. This can be overcome by using much more adaptive techniques.

II.RELATED WORKS

A novel method called background subtraction is introduced in the proposed system, which involves the comparison of two frames in order to identify an intrusion. The two frames are the background frame and the foreground frame. Background frame is a constant view of the overlooking background scene and the foreground is the new or instantaneous view of the said background. The Gray scale conversion of the two frames are done so as to eliminate any pixel variations. The gray frames are overlaid in order to find the intrusion, if there is any variations in the pixels over a given threshold value.

Advantages: More reliable than usual technique. It can be used in a dynamic environment. The light variations causes little to no effect on object detection .Less memory required for storage.

III.PROPOSED SOLUTION

The steps to follow are image capture, noise reduction , cropping unwanted area, object detection and pattern matching. After image capturing, the background subtraction algorithm is performed. Starting with processing the live image using software the stationary image which is captured by camera mounted on the pole at the required location. The extraction of raw digital data is converted from RGB to gray scale in order to process the particular image further by taking the reference picture of forest when there is not a single object present.

Once done with noise reduction process our next step will be image cropping technique. The purpose of image cropping technique is to identify the interested region (forest area) and to exclude the unnecessary background information. The background information will be stationary for every captured image as a reference frame. First a binary image having the same dimension is created as a reference image then the forest area has been shaded white and leftover region as black .Finally the multiplication of reference image with the cropping black and white results in the final desired targeted area.

The next step after cropping the image is nothing but object detection method in order to identify the animal present in the targeted frame. To perform object detection firstly the captured frame from real time image capturing process is extracted then by using the technique of noise reduction and image cropping we convert the real time image into the gray scale to determine the absolute difference of two image and the difference image only highlights the presence of animal in the forest. By taking in consideration the presence of animal in desired target area but due to the poor visibility (night view) the image captured will not be cleared. In order to improve the scenario, the image gets converted into binary value based on the threshold value. With the help of this the presence of any object gets improved. Now the object detection is performed.

Pattern recognition follows the object detection technique. It uses the pattern matching algorithm for this purpose. The trained patterns are already provided to the system as required to be identified. Once an object is detected the trained images are compared with the detected object. The object is recognized if it the same as that of the given one. The algorithms generally aim to provide a reasonable answer for all the possible inputs and to perform “most likely” matching of the inputs, taking into account their statistical variations.

Design is concerned with identifying software components specifying relationship among components. Specifying software structure and providing blue print for the document phase .Modularity is one of the desirable properties of large systems. It implies that the system is divided into several parts. In such a manner, the interaction between parts is minimal clearly specified. Design will explain software components in detail. This will help the implementation of the system. Moreover, this will guide the further changes in the system to satisfy the future requirements.

Modules:

Image Processing Module

This module mainly focuses on the image capturing and processing. This requires the usage of camera for image capturing purposes. The captured image is then undergoes the background subtraction algorithm. In this algorithm, image capturing is done with the help of a timer. The captured image at each instant is set as both background and foreground image, converted to gray scale and difference between them (object) is converted into a white region, if the said difference is above a predefined threshold valueThe downloading process request for the particular data and the searching is done; if it is available the data is downloaded.

Object Detection Module

In this module, the white region or the object detected is cut out into rectangular blobs. The objects identified of size above a particular given values are separated out as rectangular regions from the original captured image and those regions are used for pattern matching. The value is set in such a way that only significant changes which are above the given size are cut out so that no small movements like the movement of leaves are caught unnecessarily.

Pattern Matching Module

Here the objects detected are matched with the patterns stored in the server. There may be about tens different patterns of same objects (here, animals) already stored for this purpose. With the help of pattern matching algorithms such as PCA the objects can be identified.

Management Module

This module is mainly the user module which manages and controls the system. The initiation and termination of the cameras, the identified objects details, etc. are some of the functions of this module

III.RESULTS AND DISCUSSION

Background subtraction is one of the technique used in video surveillance system for detecting moving objects in a video. This systems gives output even in the dynamic environment. Here the algorithm works in such a way that the input frames are compared and compensated with reference frame then separating the foreground object with respect to background.

This is developed mainly to work in the forest area. The current world faces a very drastic problem of animal extinction. The knowledge regarding the presence of an animal in its habitat is now being a great concern to the Forest and Wildlife Ecologists. The present background subtraction technique is not so efficient in the changing and movable surroundings. But this technique can work effectively even with constant moving objects and change in the light. Hence it can be used in external surroundings such as forests which is under constant scenery change.

The implementation is performed by the two algorithms:

Background subtraction :The background subtraction algorithm involves the noise reduction by RGB to Gray scale conversion, assigning a threshold value of the pixels above which only the changes are identified if an object is encountered, conversion of the pixels above the threshold into white and the rest black and finally, the object is cropped out for pattern matching

Pattern matching : Pattern matching is a branch of machine learning that focuses on the recognition of patterns and regularities in data. Principle Components Analysis is used for this purpose. Pattern recognition systems are in many cases trained from labelled “trained” data. The algorithms generally aim to provide a reasonable answer for all the possible inputs and to perform “most likely” matching of the inputs, taking into account their statistical variations.

IV.CONCLUSION AND FUTURE WORK

Background subtraction is a technique in the field of image processing where in an image’s foreground is extracted for further processing. Low –rank and sparse representation method, which make few specific assumption about the background have really attracted wide attention in background modelling. Background subtraction is a widely used approach for detecting moving object in videos.

The aim of this project is to detect the moving objects from the difference between the current frame and reference frame. It constitutes of two terms, a background and a foreground. Generally, an image region of interest are objects in its foreground. Both the background and foreground frames are converted into gray scale. After the stage of image preprocessing, object localization is required. Then the comparison of the two frames are done. The pixels below a predefined threshold value are converted to white where the new object is present. The white area is cropped and compared with the already trained patterns to identify the objects by pattern matching. The application of this is in the forest areas the object identification mainly involves the recognition of animals both indigenous or visitors in a habitat. The main advantage of this technique is that it is able to tolerate sudden background variations like change in weather conditions or turn on/off lights. It also has less memory requirement since it stores only the necessary information.

The current procedure mainly focusing on the recognition of the trained patterns. Only the known patterns are matched and identified. In the future, the technique is to be modified in order to save the unrecognized pattern in the database and is used to train the system so that next time the same object is identified it can be recognized automatically without manual help.

REFERENCES

[1] Xin Liu, Guoying Zhao, Senior member, IEEE, Jiawen Yao and Chun Qi,Member IEEE,” Background Subtarction based on Low Rank and Structured Sparse decomposition” 2015,IEEE Transaction on Image Processing

[2] Rahul Rana, Sayali Pathak, Aruta Oak, “Real Time Traffic Control using Image Processing”,IJSRD/Vol.3/Issue 03/2015/094.

[3] www.wikipedia.com

[4] Yuanqing Luo, “Moving Object Detection based on Background modeling”, August 2014, Uppsala Universitet

[5] A Survey on Moving Object Detection using Background Subtraction Methods in VideoAseema Mohanty ,Sanjivani Shantaiya,DIMAT, CSVTU Raipur, India