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Human Activity Classification for Surveillance using Machine Learning and Image Processing Algorithm

Arvind Malge[1*], Mallikarjuna Shastry P.M [2]

[1,2]Department of C&IT, REVA University, Bangalore, India

Corresponding Author: arvindpatil469@gmail.com

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Abstract— Today's world surveillance system plays a major role in the security industry. In the video monitoring system, moving object detection was frequently used. Motion estimation is also an important part of video processing monitoring, such as video filtering and compression of video frames. Video Surveillance System is a powerful tool for tracking people and their public safety operations. The reason for having a monitoring system is not only to place cameras in the human eye place, but also to allow them to automatically acknowledge activities. This paper creates a smart recognition of the system of human activity. At each stage of the suggested system, image processing techniques are used A system was built based on the Caltech database of human activity features acquired from frame sequences. Relevance Vector classifier used in the dataset to classify the model of activity. Classification results show high effectiveness throughout the training, testing and validation stages.

Keywords— Human activity recognition, relevance vector classifier, histogram of gradients, Background subtraction.

I. INTRODUCTION

Due to its effectiveness and wide-ranging application in image analysis, machine learning and interaction between humans and computers, the identification and analysis of everyday human operations is an appealing place for scientists. The purpose of processing surveillance video systems is usually to monitor human behaviour and operations. Any change in human movement should also be noted for safety and administrative purposes [1][2].

In manual video monitoring systems, the analysis is conducted by a person. Human interventions in video assessment and decision-making are partial in semi-automated monitoring while video input, assessment, processing and therapy with the suspicious case is totally independent of any human interference in the fully automated scheme.

The fundamental surveillance system process begins with the subtraction of the background, called movement and object detection, and is a method of extracting the region of concern from the constructed background [4]. The extracted area information was then used as an input for object detection and behaviour analysis [4]. Furthermore, the application of the monitoring system based on an assessment of conduct involving recognition of activity or descriptive pattern between the object [5]

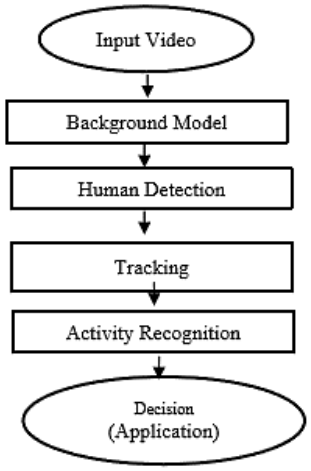


Fig 1. General Overview of Surveillance System

II. RELATED WORK

Researchers have developed numerous algorithms and methods for the recognition of human activity in the past.

The Background Modeling, Detection and Tracking of Human in Video Surveillance System Video Surveillance System, suggested by Kaur, Rajvir and Sonit Singh[4], is a strong instrument used to monitor individuals and their government safety operations. The reason for having a

monitoring scheme is not only to replace human eyes with cameras, but also to enable them to recognize activities automatically. Human The Weizmann dataset is used in this document to identify and monitor various activities like run, bend, hand wave, skip, etc. First background modeling is conducted with first n frames. Using the background subtraction algorithm, human detection is performed after this, and then tracking is performed using Kalman filter.

Htike, Kyaw Kyaw, Othman O. Khalifa, Huda Adibah Mohd Ramli, and Mohammad AM Abushariah[2] suggested Human Activity Recognition for Video Surveillance using Posture Sequences Human Activity Recognition has become a highly interesting area of studies as it has many prospective applications, including automated surveillance, sign language interpretation and human-computer interfaces. There has been comprehensive study in this sector in latest years. This article introduces a portion of a novel that uses one static camera to recognize a human posture for video surveillance. The training and testing phases were introduced using four distinct K Means, Fuzzy C Means, Multilayer Perceptron Self Organizing Maps, and Feedforward Neural networks. The precision recognition is calculated for used classifiers.

Meng, Binghao, Lu Zhang, Fan Jin, Lu Yang, Hong Cheng, and QianWang.[5] suggested detection of abnormal occurrences using deep video surveillance networks A novel technique for detecting abnormal events is suggested. This technique is based on profound spatio-temporal networks that can represent video frames in sequence. Abnormal occurrences in the true globe are uncommon and require tiny samples as well as big amounts of ordinary video information. Direct application with profound networks that generally involve quantities of labeled specimens is difficult. Our technique solves this issue by pre-training video networks that are meaningless to unusual occurrences and refining fine tuning networks.

III. METHODOLOGY

Caltech dataset collects human activities video in this job. The environment in which the video sequence obtained was an outdoor setting (which will be entered into the scheme). In addition, various individuals were regarded. The aim here is to test the system's ability to detect multiple human activity.

Figure 1 demonstrates the various recognition of human activity approach.The first stage in various human identification and recognition of human activity is to acquire the video datasets containing various human and distinct actions performed by each person. In this job datasets are regarded human activities such as walking, running, jogging, boxing. Recognition of activity begins with reading a video file. Once the next step is to transform this video into successive frames, 24 frames per second will be extracted.

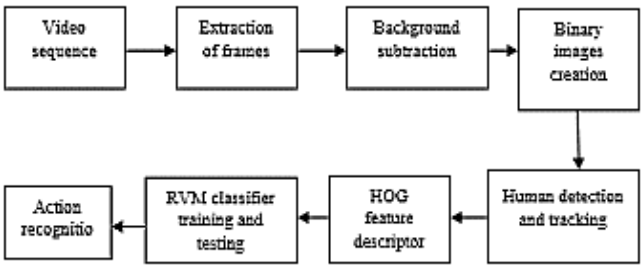


Fig 1. Block diagram of approach used in HAR

Frame extraction is essential as it is not possible to process videos straight. Later, the method of subtraction of the background is used to discover the moving people. A background picture is regarded in this method, where each frame is removed from the background picture in order to acquire foreground pictures showing the place of the moving beings. Convert the RGB picture acquired from the foreground to gray pictures.
The gray pictures will be transformed into 0s and 1s binary images, using binary 1 to depict a white colored human region, apart from the moving region., is used binary 0 representing human lack. Binary image development is therefore helpful to extract moving people and items in a video sequence.

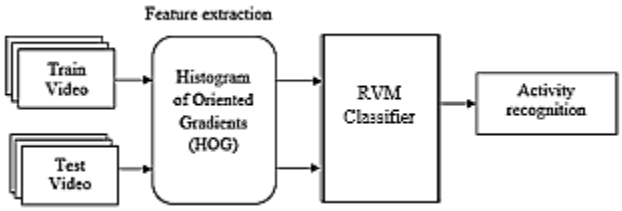


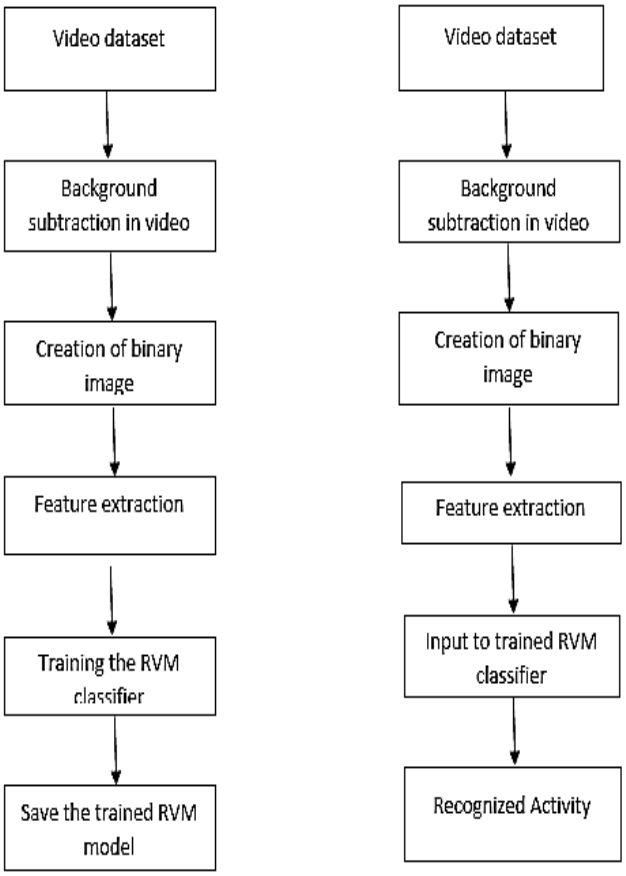
Fig. 2. Frame work of HAR

Figure 2 demonstrates recognition of human activity in which HOG and RVM classifier together with video train and test dataset. Once the next phase recognizes their operations after identifying each individual person. It is also necessary to determine the later number of people present, after detecting the moving people in a video, which activity recognition is performed. Activity recognition composed of two phases: phase 1 training and phase 2 testing.

As shown in Figure 3, the flow chart for the training and test stage. The dataset will first be loaded in the training stage, then frame extraction will be performed. It creates a training folder that includes the frames that belong to specific operations. For each activity being conducted, useful characteristics are extracted. The extraction method of the HOG function is used to extract characteristics. The RVM

classifier is used to train this extracted feature and saves this trained RVM model to be used for further testing. The testing video will be loaded in the testing stage and the extraction of frames, background subtraction, binary picture development and extraction steps of the HOG function will be performed on the charged test video Depending on the function match RVM classifier will acknowledge the specific operations conducted, the result obtained will be added to the earlier qualified RVM classifier.

Fig. 3. *Training and testing stage flow chart*



IV. RESULTS

Caltech dataset consists of 2-3 individuals who carry out various tasks such as walking, running, jogging. The video is 1:32 seconds long with 809 MB of memory size. Video pixel resolution is 640 X 480 with 20 frames per second frame rate. Human activity videos for walking, running and jogging are collected from Caltech database and are then converted into frames. Around 50000 images are given for training the data.

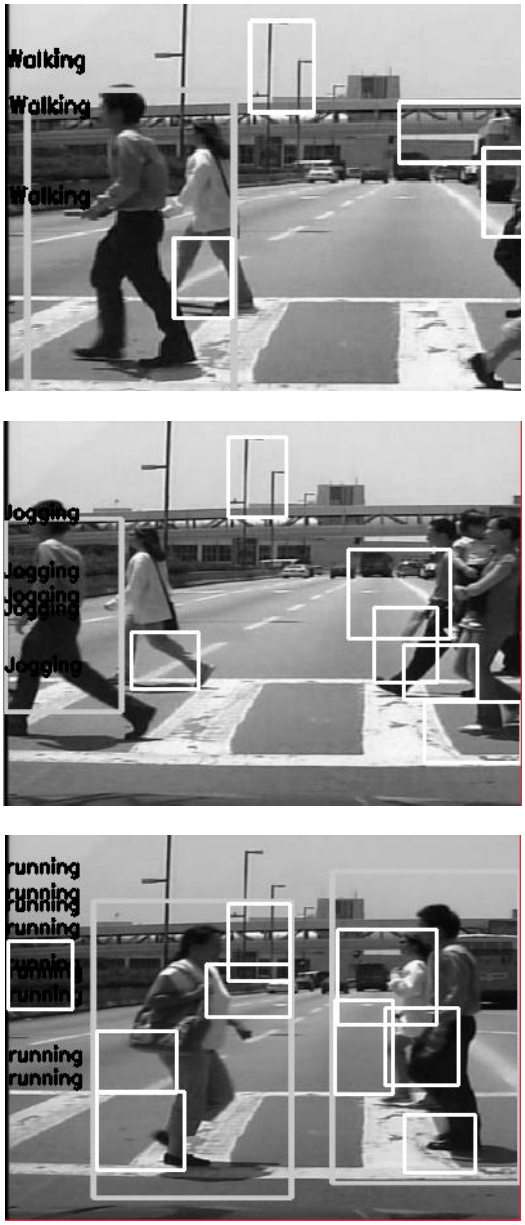
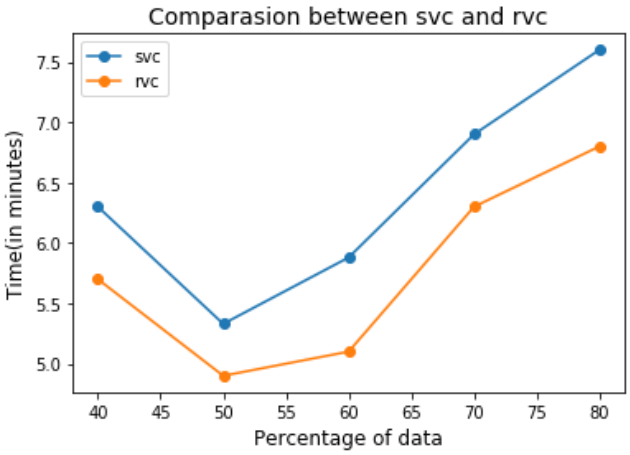


Fig .4. *Recogniton activities*

comparison between SVM and RVM

The data is trained for 5 iterations using 40%, 50%, 60%, 70%, 80% of training data using support vector classifier and relevance vector classifier. Relevance vector classifier takes less time for training then support vector classifier. Implementation of this approach using RVC using better results compared to SVC



V. CONCLUSION

The suggested work provides a solution to detect and recognize human activity. Although many works have been performed, the suggested work offers great outcomes for considering different types of video datasets. Human detection using background subtraction offers efficient results and with the extraction of HOG features and the recognition of human operations by RVM classifier offers excellent results of recognition with fewer false detections. The findings that have been collected show that the technique is effective. The suggested method can therefore be considered as the best option for video monitoring implementation for human detection and activity recognition.

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Authors Profile

Mr.Arvind Malge currently pursuing M. Tech in CSE at REVA University, Bangalore and completed B.E in EEE from Guru Nanak Dev Engineering College Bidar.

Mr.Mallikarjuna Shastry P.M holds Ph. D. on Fault Tolerance in Distributed Systems from VTU, M. Tech. in CSE from MSRIT and B. E. in CSE from Karnataka University Dharwar. He has totally 23 years of vast experience in teaching in CSE/ISE. He has published and presented several papers in International Journals and Conferences respectively. His areas of Interest are, Distributed Computing, Cloud Computing, Computer Architecture, Information and Networks Security. Image processing. Currently he is guiding two candidates for Ph. D. under VTU.

