ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 8, Issue 3, March 2019

Human Object Behavior Monitoring System based on Machine Learning Algorithm

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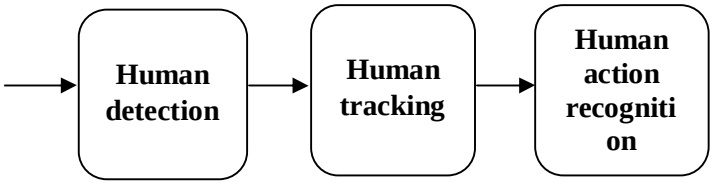
ABSTRACT: An automatic human action recognition technique is proposed in this paper. The main intention of this paperwork is to provide a new approach for image recognition using an artificial neural network. In multimedia processing and traditional techniques, human-machine interaction is a research topic for communication that allows disabled people to communicate easily with machines. Human body shapes which cause the change in appearance is also in the study for human action recognition. This paper focuses on human behavior analysis from a video scene. The image is preprocessed by Gaussian filter and a mean eigenspace is produced by taking a mean of the similar postures. In addition to these observances, we used Artificial Neural Network which produces the robustness.

KEYWORDS: Image extraction, Human action recognition, K-nearest neighbour, Artificial neural network

I. INTRODUCTION

The analysis of human behavior is important for detection, monitoring, and understanding of the physical behavior of the people. Actions can be described in various and different ways. The widely adopted interpretation describes actions as single periods of human motion patterns. Action execution styles and human body size variations appearing between different persons are addressing the action recognition methods. The video is subdivided into frames.

The mean and standard deviation of the frames are calculated to find the threshold image. The frames are preprocessed to remove the unwanted noise present in it and transform the image as necessary for further processing. Convert the RGB image into a grey scale image. The frames are given a value for feature extraction using Laplacian Smoothening Transform. Most of the videos are unlabeled or weakly labeled. Collect well-labeled videos for consuming time and labor intensive. In order to make use of unlabeled videos, a semi-supervised classifier is trained based on the heterogeneous features in videos domain.



K-Nearest Neighbor is a classifier used here to find the nearest image in the dataset. The value of K should always be odd for any two classes otherwise there may be a tie. Hence it is favorable to choose an odd value. The value of K should not be equal to the multiple of the number of classes. When the dataset is large, it is complex to find the nearest neighbor. Hence we employ Artificial Neural Network which is useful for fast computation and less stimulation time. Artificial neural networks have been chosen for image compression due to their massively parallel and distributed architecture. The idea following this training commands is the backpropagation algorithm. Multilayer perceptrons are

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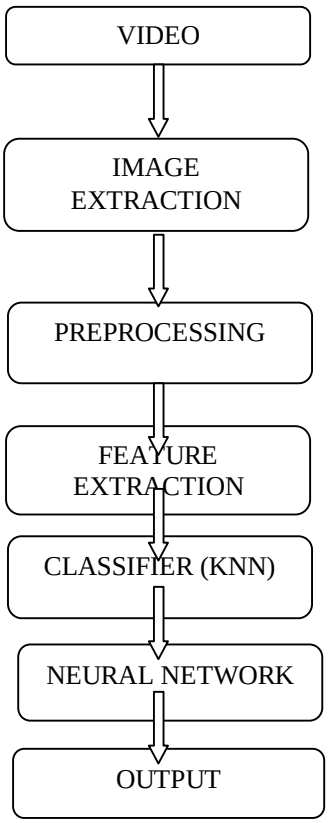
used for action classification. The combination of the recognition outcomes that correspond to different viewing angles leads to action recognition with high recognition accuracy.

II. EXISTING SYSTEM

Human action recognition is an active research field, due to its significance in a wide range of applications, such as intelligent surveillance, human-computer interaction, content-based video compression, and retrieval, augmented reality, etc. An action or movement is referred to as a single period of a human motion pattern, such as a walking step. By perceiving the human body from different viewing angles, a view-invariant action representation is obtained. This portrayal is subsequently used to describe and recognize actions. The background subtraction is widely used in video processing. It simplifies subsequent processing by locating regions of interest in the image. [1] Thus, in order to perform action recognition at high frame rates, the use of a simpler action portrayal is required. Neurobiological studies [9] have concluded that the human brain can perceive actions by observing only the human body poses [3].

Some researchers have been already reported on the estimation of human behaviors. For example, there were some approaches in [1], [2], [3], [4] as methods with using 2D camera, which aimed at constructing a system that can understand the human behaviors using the time series images for the movement of the human, and estimate the human behaviors by inspecting the action and the target. These studies designate that human behavior recognition must be established in human action and the environment associated with human action**.**

III. PROPOSED SYSTEM



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A. IMAGE EXTRACTION

In our method, we extract the image (static) feature from both images and key frames of videos.Considering computational efficiency, we extract key frames by a shot boundary detection algorithm.The color histogram of every five frames is calculated.The histogram is subtracted with that of the previous frame.The frame in the middle of the shot is considered as a key frame.

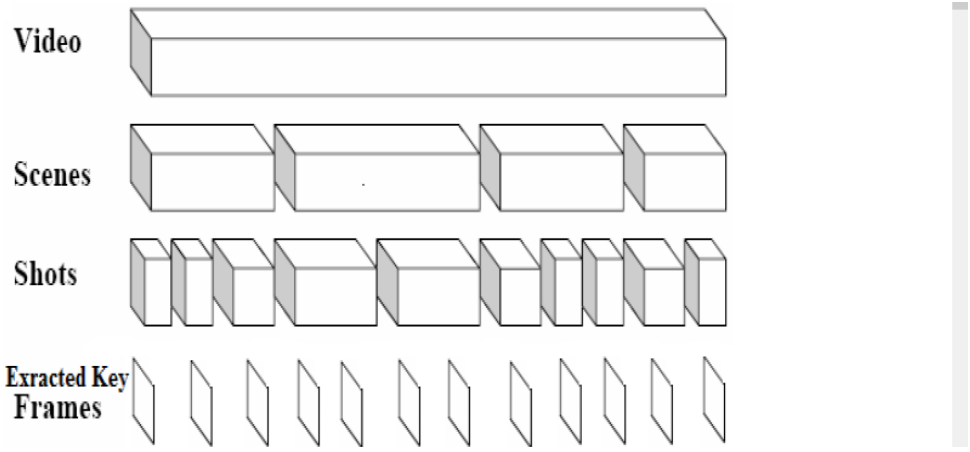

Fig: Overview of key frame Extraction

Key frame extraction is a necessary part in video analysis and management, providing a suitable video summarization for video indexing, browsing and retrieval. The use of key frames reduces the amount of data required in video indexing and provides the frame work for dealing with the video content. The purpose is to remove the redundant frames, reduce the computational complexity and improve recognition efficiency.

Shot Boundary Detection Algorithm:

Let F (k) be the kth frame in video sequence, k = 1, 2...Fv（ Fv denotes the total number of video). The algorithm of shot boundary detection is described as follows:

Step 1: Partitioning a frame into blocks with *m* rows and *n* Columns, and *B* (*i*, *j*, *k*) stands for the block at (i, j) in the *k*th Frame.

Step 2: Computing x2 histogram matching difference between the corresponding blocks between consecutive frames in video sequence. *H* (*i*, *j*, *k*) and *H* (*i*, *j*, *k* +1) stand for the histogram of blocks at (*i*, *j*) in the *k*th and (*k* +1) th frame respectively. Block's difference is measured by the following equation:

$$D_B = (K, K+1, i, j) = \sum_{i=0}^{L-1} \frac{[H(i,j,k) - H(i,j,k+1)]^2}{H(i,j,k)}$$

Where, L is the number of gray in an image;

Step 3: Computing x2 histogram difference between two consecutive frames:

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$$D(k,k+1)=\sum_{i=1}^{m}\sum_{j=1}^{n}w_{ij}D_B(k,k+1,i,j)$$

Where, w_{ij} stands for the weight of block at (i, j).

Step 4: Measure Threshold Automatically: Computing the Mean and standard variance of x2 histogram difference over the whole video sequence. Mean and standard Variance are defined as follows:

$$MD=\sum_{K=1}^{F_V-1}D(K,K+1)/F_{V-1}$$

$$STD=\sqrt{\sum_{K=1}^{F_V-1}(D(K,K+1)-MD)^2/F_{V-1}}$$

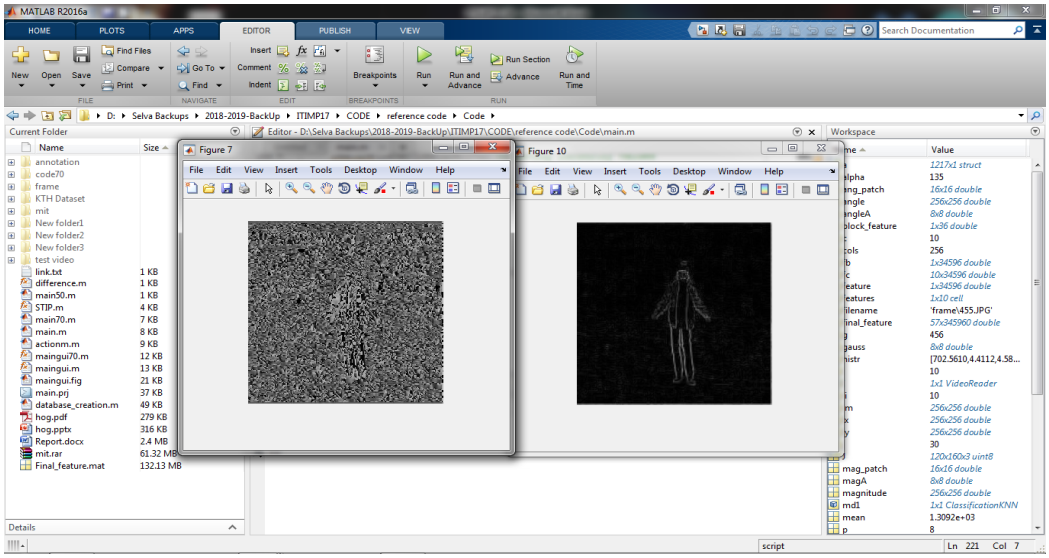
Step 5: Shot boundary detection.

Let threshold $T = MD + a \times STD$.

B. PREPROCESSING

The aim of preprocessing is an advancement of the image data that suppresses unwanted noise or enhances some image features important for further processing. Image preprocessing methods use the reasonable redundancy in images. Neighboring pixel corresponding to one object in real images have essentially the same or similar brightness value.

The RGB image is converted into grey scale image by using Laplacian Smoothening Transform. Grey scale transformations does not depend on the position of the pixel in the image. Grey scale transformations can be performed by using look up tables. Grey scale transformations are mostly used if the result is viewed by a human.



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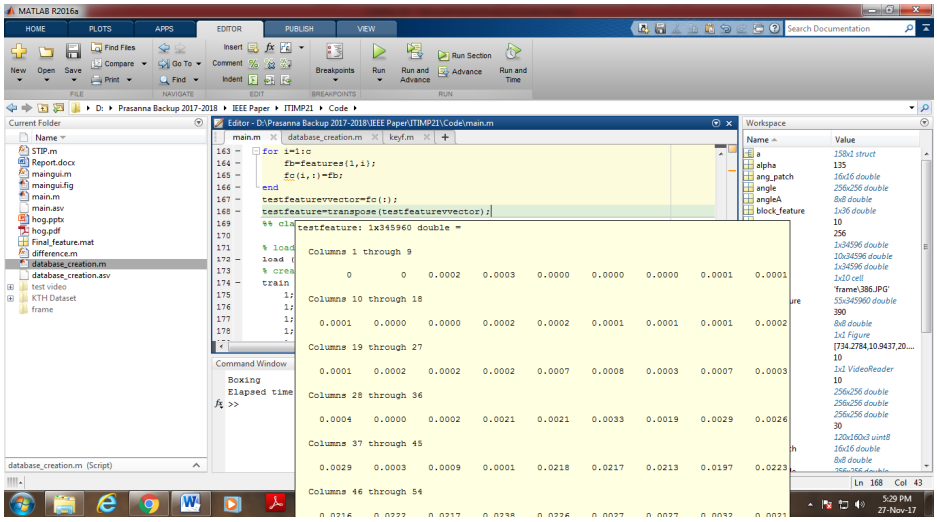
C.FEATURE EXTRACTION

Feature extraction is a notable form of dimensionality reduction. It is done after pre-processing techniques in character recognition. It is the process by which certain features of curiosity within an image are detected and represented for further processing. The main aim of feature extraction is to procure the most pertinent information from the original data and represent the information in a lower dimensionality space. It involves clarifying the number of resources required to describe a large set of data accurately by using Laplacian Smoothening Transform algorithm. Feature extraction is a habitual term for methods of constructing combinations of the variables. It reduces the number of random variables. If the feature is analysed with large number of variables, then it requires large amount of power computation and memory. A good feature set contains discerning information which can differentiate one object from the other. It has been used in many applications such as character recognition, document verification, script recognition, check sorting etc.

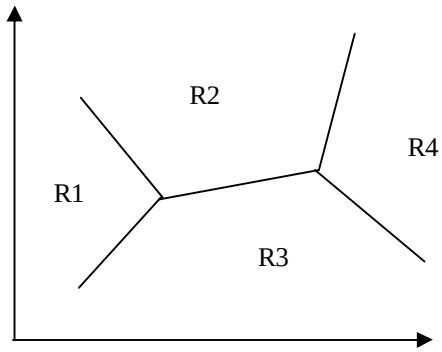


D. CLASSIFIER

K-Nearest Neighbour is one of the machine learning algorithms. KNN is the simplest machine learning algorithm. The training process of this algorithm consists of storing feature vectors and labels of the training images. The KNN binary is given more accurate data classification. It is an object which is classified through a mainstream selection of its neighbors. Euclidean distance is used as the distance metric. It works built on a minimum distance from the interrogation instance to the training samples to regulate the K-nearest neighbors. The information of KNN can be any dimension scale from insignificant, to a measurable scale. When there are two classes, k must be an odd integer. However, there will be a tie when k is an odd integer when performing multiclass classification.

When K=1,

$$R_i = \{x: d(x, xi) < d(x, xj)\}; i \neq j$$



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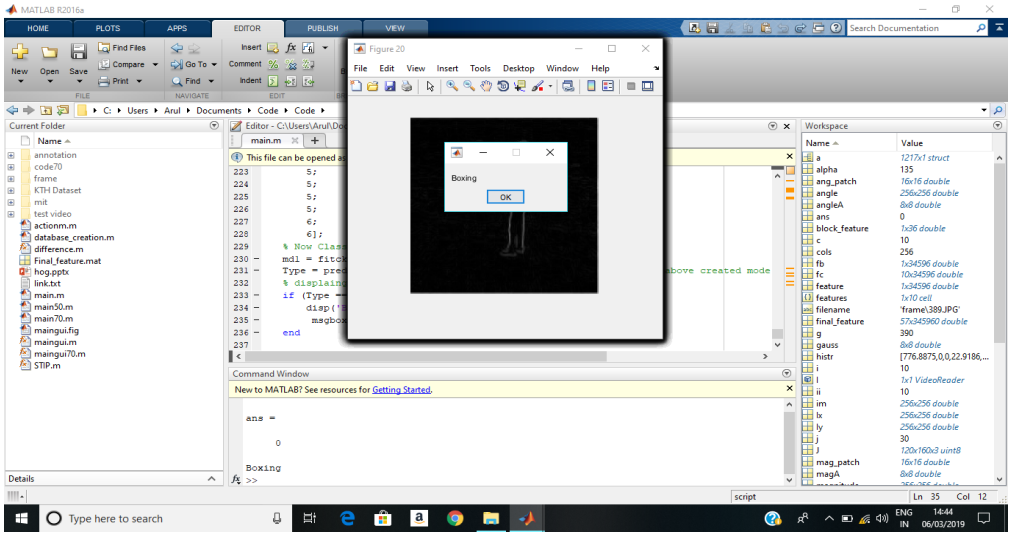
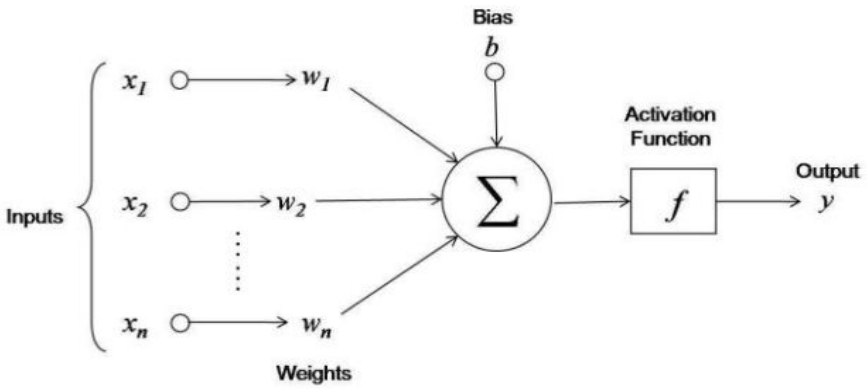
A main advantage of the KNN algorithm is that it performs well with multi-modal2 classes because the basis of its decision is based on a small neighbourhood of similar objects. Therefore, even if the target class is multi-modal, the algorithm can still lead to good accuracy. The major disadvantage of the KNN algorithm is that it uses all the features equally in computing for similarities. This leads to classification errors, especially when there is only a small subset of features that are useful for classification.



The K-NN method is a lazy algorithm unlike many other machines learning methods such as artificial neural networks, kernel methods, wavelet networks etc. it has not a phase of parameters determining of a function by bias of a mathematical optimization. When the dataset is large, it is complex to find the nearest neighbor. Hence we employ Artificial Neural Network because it is useful for fast computation and less stimulation time.

E. ARTIFICIAL NEURAL NETWORK

The computers can solve a problem by a set of instructions which should be programmed by a human. But neural network acts like a brain. It need not to be programmed, it learns through examples or experiences. Hence, it needs data set to train. Artificial neural network is a computing system i.e., designed to stimulate the way the human brain analysis and processes the information. It has self- learning capability that enable as to produce better results. A single artificial neuron called perceptron is used. The modes of perceptron are training mode and using mode



. $Y=\psi\left(\sum_{i=1}^{n} w_i x_i + b\right)$

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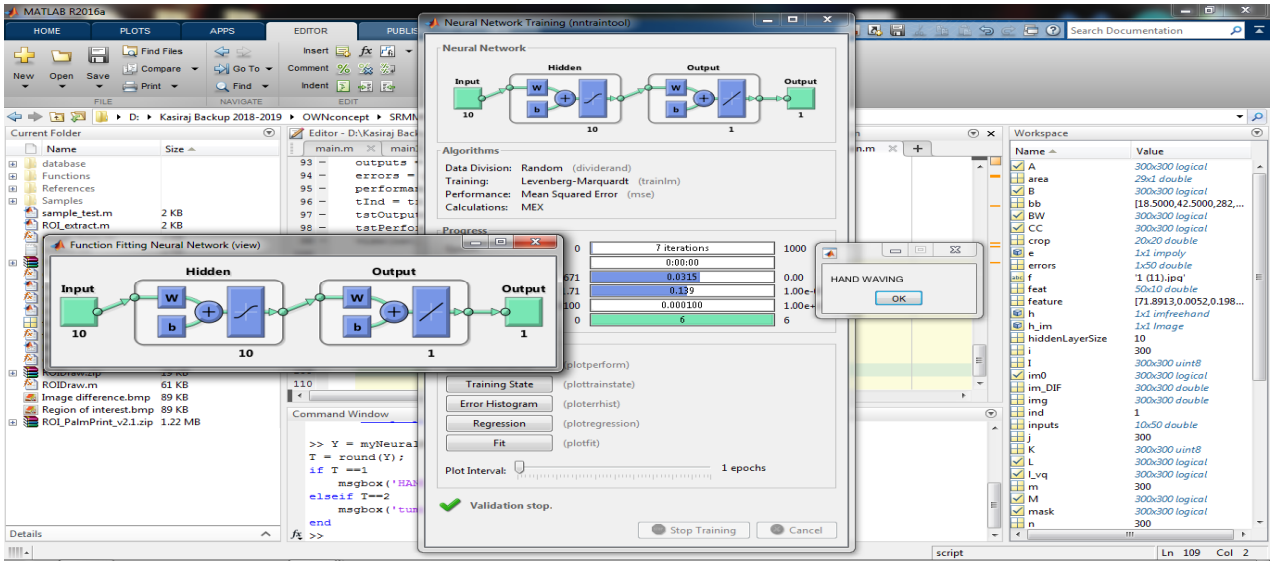
IV. RESULT

The multilayer perceptron is used for image recognition. The input image is dispatched to the input layer where the patterns of local contrast are recognized.The multilayer perceptron is composed of two hidden layer.The hidden layer one recognizes the features of the face such as eyes, nose and mouth where the hidden layer two is used for reconization of face.The output of the hidden two is forwarded to the output layer which is an ANN output.



V. CONCLUSION

In this paper, we narrate the steps to analyze the behavior of an individual human in a video scene by the recognition of actions. Especially, we have focused on the classification of videos, in this part we used the classification of KNN method on the KTH basic of videos. Artificial neural network can be applied to train and test the image for the purpose of recognition. The test image is recognized and profitably matched with original image. ANN reduces the time for training and testing. It is more suitable for practical application. Compared with other works, our approach is easier to be implemented and has better performance.

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