ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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

Website: www.ijircce.com

Vol. 6, Issue 4, April 2018

Human Action Recognition System for two Person Interaction using Edge Detection, Colour and Texture Features Classified using KNN

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ABSTRACT: Due to the universal presence of video data, Computer Vision is gaining importance with wide applications in video surveillance, video retrieval and analysis, and human computer interaction. The purpose of this project is to meet the growing demand for automated analysis and understanding of human actions. A real time human activity recognition system based on Edge detection, Colour extraction and Texture Extraction is presented. The aim is to develop a proficient recognition system in real time by the combination of local and global features. UT Interaction Dataset which consists of 6 actions: kicking, handshaking, hugging, pushing, pointing and punching is used. KNN Classifier is used to recognize different human activities in real-time.

KEYWORDS:Computer Vision, Human Action Recognition, KNN Classifier, Canny Edge Detection, Colour extraction, Texture Extraction, UT Interaction Dataset

I. INTRODUCTION

Action recognition in videos has applications in intelligent health care, video surveillance, human computer interaction and visual content retrieval systems. Video based real time human activity recognition is a complex and challenging task due to variation in peoples appearance, illumination changes and the amount of data generated.The main step of real time human activity recognition system involves person detection, tracking and recognition.Due to the increase of digital video cameras used in everyday life, more and more video content is generated and uploaded to the Internet or stored in large video data-set.

Human action recognition is a popular research area due to its potential application in visual surveillance, content based video retrieval, human-computer interaction and sports annotation.For example, with successful human action recognition, the visual surveillance system in large public area can automatically extract high-level semantic information from the surveillance video.

Early attempts at human action recognition used the tracks of a person's body parts as input features. However, most recent research moves from the high-level representation of the human body (e.g. skeleton) to the collection of low-level features (e.g. local features) since full-body tracking from videos is still a challenging problem. Recently, the rapid development of depth sensors (e.g. Microsoft Kinect) provides adequate accuracy of real-time full-body tracking with low cost. This enables us to once again explore the feasibility of skeleton based features for activity recognition. Past research proposed algorithms to classify short videos of simple periodic actions performed by a single person (e.g. 'walking' and 'kicking). In real-world applications, actions and activities are seldom periodic and are often performed by multiple persons (e.g. 'pushing and 'hand shaking). Recognition of complex non-periodic activities is important.

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II. REVIEW OF LITERATURE

The purpose of this paper [1] is to retrieve the images from a database using texture and color features of an image. Features like Gray Level co-occurrence Matrix (GLCM) with color features are extracted in RGB, HSV, and YcBcR color spaces. Images are retrieved using similarity measures with the help of Euclidean, Manhattan and Canberra distances [1].

A detailed survey of video based motion and activity recognition systems is discussed in [2,3].In paper [2], the data extracted using optical flow is converted to binary image. Then Histogram of Oriented Gradient (HOG) descriptor is used to extract feature vector from the binary images. These feature vectors are given as training features to Support Vector Machine (SVM) classifier to prepare a trained model [2].

In paper [3], video based action recognition is performed on KTH dataset using four combinations of two feature descriptors and two classifiers. The feature descriptors used are Histogram of Oriented Gradient Descriptor (HOG) and 3-dimensional Scale Invariant Feature Transform (3D SIFT) and classifiers used are Support Vector Machine (SVM) and K Nearest Neighbor (KNN). Features are extracted from frames of training videos using descriptor and clustered to form Bag-of-words model. [3].

Human Activity Recognition Using an Ensemble of Support Vector Machines is employed to improve the classification performance by fusing diverse features from different perspectives. The Dempster-Shafer fusion and product rule from the algebraic combiners have been utilized to combine the outputs of single classifiers [5].

Human motion capture continues to be an increasingly active research area in computer vision with over 350 publications over this period. A number of significant research advances are identified together with novel methodologies for automatic initialization, tracking, pose estimation, and movement recognition. Recent research has addressed reliable tracking and poses estimation in natural scenes. Progress has also been made towards automatic understanding of human actions and behavior [6].

In paper [7] the visual contents of an image such as color, shape, texture, etc. are used in CBIR to retrieve the image.Texture is one of the important features used in CBIR system.Color and texture feature entropy are combined to form a feature vector for kNN classifier [7].

III. PROPOSED METHODOLOGY

The proposed work is a human activity identification system using two person interactions, using UT Interaction dataset. In our proposed work, feature extraction which is to be done using Edge detection, colour extraction and Texture Extraction techniques respectively. K-nearest Neighbor (KNN) is used to classify test videos into its class using features extracted.

The system contains one module, i.e. User. User makes a request and system gives response.

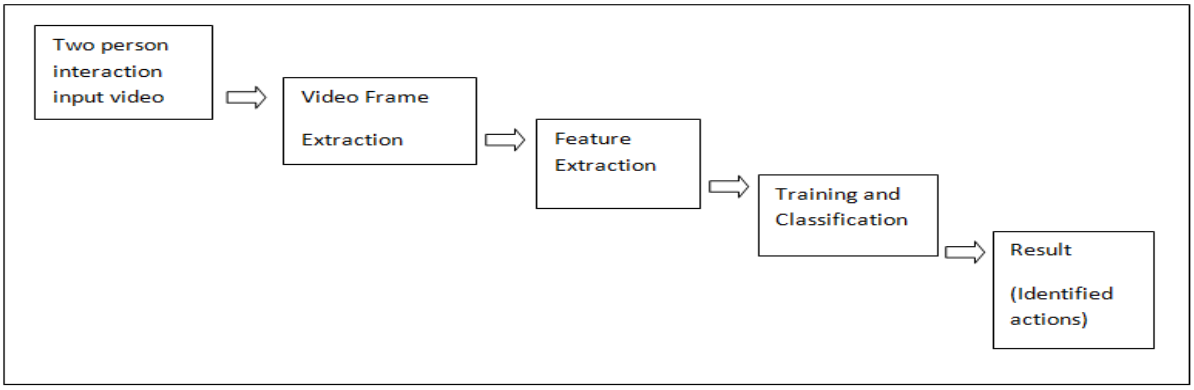

Fig1: Block diagram for the system

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Colour Extraction: Colour isolation is achieved by extracting HSV (hue, saturation, value) from an image. The two steps used are RGB to HSV conversion and applying a threshold mask.
Texture Extraction: In a general sense, texture refers to surface characteristics and appearance of an object given by the size, shape, density, arrangement, proportion of its elementary parts. A basic stage to collect such features through texture analysis process is called as texture feature extraction. There are four major application domains related to texture analysis namely texture classification, segmentation, synthesis and shape from texture.
Canny Edge Detector:The Canny edge detection algorithm is known popularly as the optimal edge detector. The Canny algorithm uses an optimal edge detector based on a set of criteria which include finding the most edges by minimizing the error rate, marking edges as closely as possible to the actual edges to maximize localization, and marking edges only once when a single edge exists for minimal response.
K-nearest Neighbor(KNN): The input consist of k nearest training examples in feature space and output is a class membership. An object is classified by a majority vote of its neighbors, with the object being assigned to the class most common amongst its k-nearest neighbors

IV. RESULTS

Below graph shows the action recognition accuracy of our proposed work. Our proposed work successfully classifies the human actions based on various feature extraction techniques. The final accuracy result as shown in following graph and table respectively.

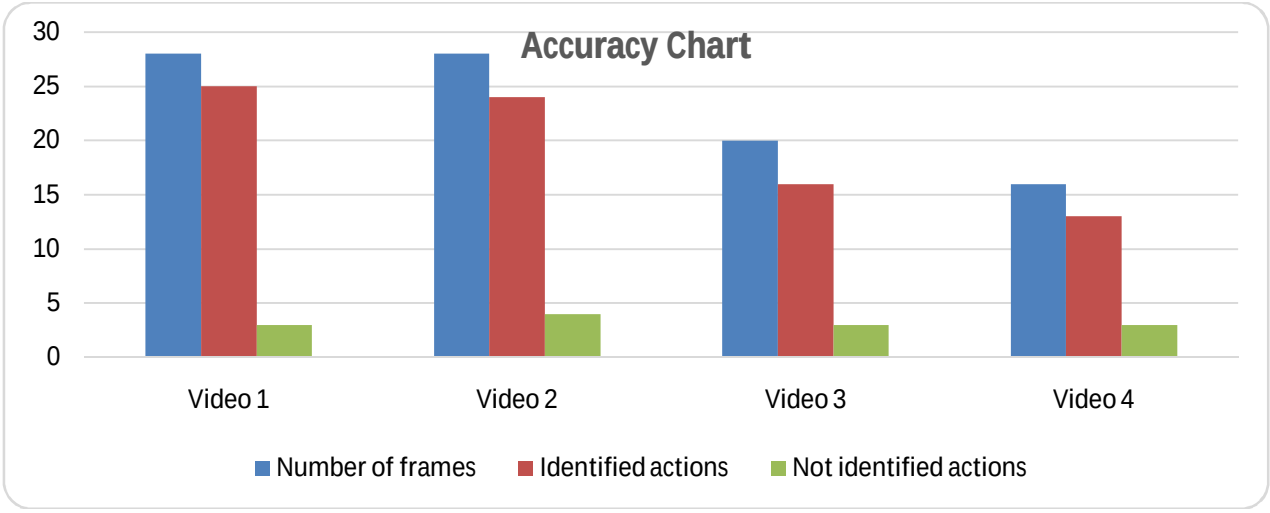

Fig2 Accuracy Graph

Table1: Accuracy Table

	No. Of frames	Identified Actions	Not Identified - Actions
Video 1	**28**	**25**	**3**
Video 2	**28**	**24**	**4**
Video 3	**20**	**17**	**3**
Video 4	**16**	**12**	**4**

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Identified actions (hugging, pushing, punching, kicking, handshaking and pointing) are the actions present in the dataset which have been correctly identified.
Non identified actions include those actions that are present in the videos but do not have clearly defined features like turning, bending etc.

V. CONCLUSION

In this project, a feature extraction and activity recognition system for human activity recognition is proposed. The feature extraction algorithms are used are Canny Edge detection, Colour extraction and Texture Extraction. The action recognition is performed using k nearest neighbour algorithm for recognition of different actions in the videos.

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