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A Comparative Survey on Human Action Recognition

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Abstract: This survey paper describe the progress made towards video human action recognition. It's divided into the three parts. First part describes the core technology of system. Middle part describes the system of human action recognition. Third part describes the application of human action recognition. In human action recognition mainly three types are covered: single person action recognition, multiple people interaction and crowd behavior, abnormal action recognition. This paper also provides some challenges of the system.
Keywords: Human action recognition, segmentation, features representation.

I. INTRODUCTION

Human action recognition is widely accepted over the world. It is provide huge amount of information from video, image. Basically the application of human action recognition system is healthcare, security etc. here in the given figure we can see the basic diagram of human action recognition system. It is divided in to the three parts and each parts carries the individual information about the system. Here all the section is shown in Fig. 1. First section is core technology, in this mainly the process stage is consider, i.e., segmentation, feature extraction, algorithm etc. In segmentation first object is segmented from the video and identify the shape, color, poses, body motion and after that feature extraction and representation is done. Action detection and classification algorithm mainly used for the recognize various human activities. Second part is system where single person activity recognition, multiple people interaction and crowd behavior and abnormal activity identification.
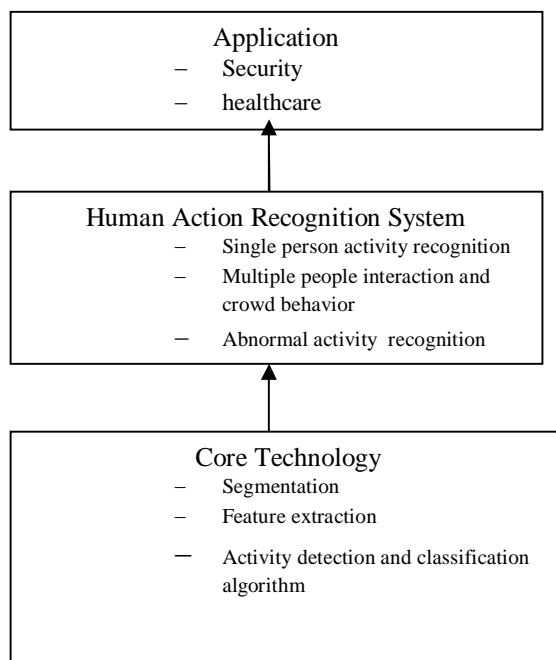
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Fig 1: basic diagram of system[1]

Last part is application which means all the things are applied in this section. Application is in security, healthcare etc.

II. MOTION AND SEGMENTATION

In first part is core technology segmentation is performed on each frame in video and extract the target object. Segmentation is divided in to the two parts: (A) static camera segmentation and (B) moving camera segmentation which is shown in Fig. 2.

A. Static Camera

For the static camera segmentation, the camera is fixed in a specific position with a fixed angle. Hence, the viewpoint of the object and the background are fixed. The most popular method for static camera segmentation is background subtraction[1]. first image is subtracted from video for getting foreground object. Background model can built by the GMM for each pixel, by static parameter include intensity of the object.
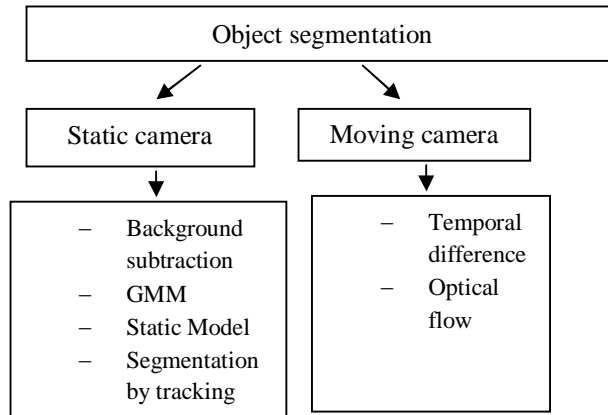

Fig 2: basic flow diagram of object segmentation

B. Motion Camera

In moving camera the camera is moving. It is more difficult in compare to static camera because here camera is moving so here we have to consider motion in object as well as background also. Common method for moving camera segmentation is temporal difference between two consecutive frames. Here background is also changing as per the moving camera. The second method is optical flow, it is vector based approach that estimates motion in video by matching points on objects over multiple frames.[2]

III. FEATURE EXTRACTION AND REPRESENTATION

Second step is feature extraction and representation. In Fig. 3 we can see the categories.
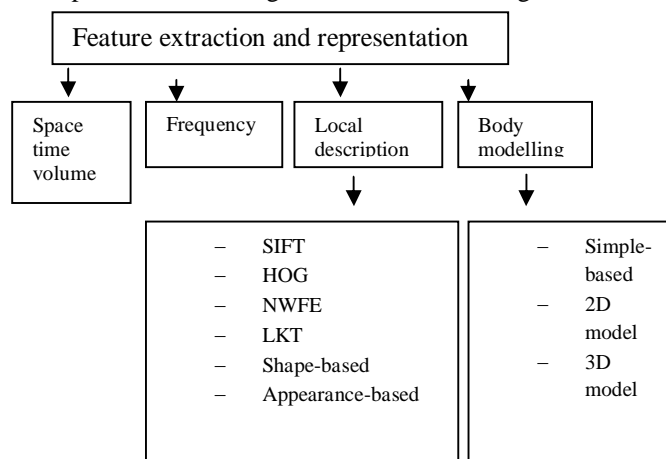

Fig 3: Types of feature extraction and representation

A. Space time volume

This method mainly focus on recognition of activity based on space-time feature or trajectory matching. It consider activity in 3D space time volume and concatenation of 2D spaces in time. An activity is represented by a set of space time features or trajectories extracted from a video sequence. [5]

B. Frequency

In this method intensity variation of an image is consider. DFT is the example of this method. DFT is an small block of an images hich used for identify the selected features for action recognition. It is also used for identify the information of the geometric structure in spatial domain. Both frequency and space time volume are global feature.[1]

C. Local Description

local descriptors are designed to be more robust to noise and occlusion, and possibly invariant to rotation and scale, such as SIFT feature is invariant for scaling, translation, rotation. SIFT feature is enable by using staged filtering approach.HOG feature is used for descriptor of human action..[1] NWFE is used for taking the distance information and width feature of silhouette. NWFE feature extract from the pose contour by combining distance and width feature. [1] LKT is an point tracking method based on the sum of squared intensity difference. Shape based feature, It is well known that activity recognition algorithms based on the human silhouette play an important role in recognizing human actions. As a human silhouette consists of limbs jointly connected to each other, it is important to obtain exact human body parts from videos. [5] Appearance based method is basically used for finding discriminative information such as colure, pose estimation. It is also used for human tracking.

D. Body Modeling

This model is basically used for tracking of human body, pose estimation, action recognition. In simple based approach it is used for detect the foreground, detect blob and track blob.2D model is also known as indirect model which is used for identifying the edges from the moving human body from the video sequence. It is basically used for identifying head-shoulder-upper body. 3D model is known as direct model which is used for constructs a kinematic model by using skeletal representation. They clearly model the geometric relationships between various body parts using geometric functions like translation and rotation in 3D space.[3].

IV. ACTIVITY DETECTION AND CLASSIFICATION ALGORITHM

To extract or identify the behavior of an object there is essential requirement occur for classify the moving object. There are mainly two method used for classification of an object which are shape based method and motion based method. Here figure 4 describe the classification algorithm.
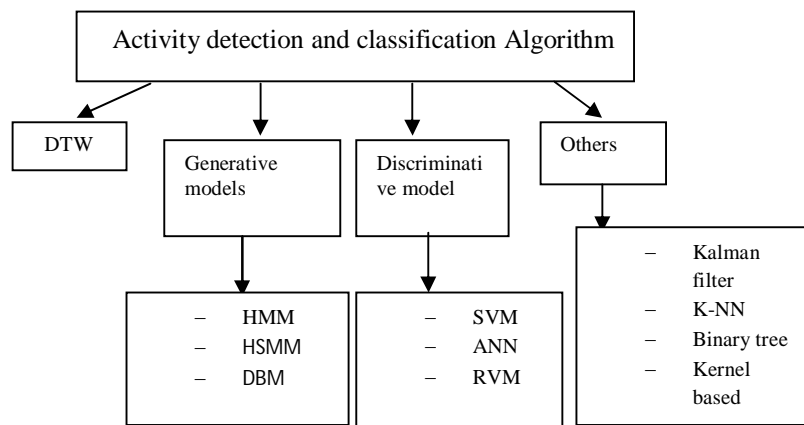

Fig 4: Types of activity detection and classification algorithm

A. Dtw

It is basically used for identify structure or identify meaningful data from the organization.*[2]*

B. Generative Model

Most popular model in generative model is HMM. A HMM is consist of a number of a states each of which is assigned a probability of transition from one state to another state.[4]

C. Discriminative Model

It is basically condition based probability distribution. In discriminative model mainly three methods are used which are SVM, NN, RVM. SVM is an margin based supervised algorithm. It is used for divide the data into the two class and it is an supervised learning approach so supervisor is present in this method. ANN is a mathematical model to describe the problems in a network of directed graphs, where nodes represent weight.[1]

D. Others

Along with DTW,SVM there are other methods are also used for classification such as KF,K-NN, Binary tree etc. KF is basically used for reduce or minimize the mean square error. Binary tree is also known as classification tree. A decision tree is constructed using a top-down, divide-and-conquer approach: for the more group problem, select feature, differentiate into sub groups and then identify and follow up to complete .[2]

V. HUMAN ACTION RECOGNITION SYSTEM

Basically system is divided in to three parts: single person activity recognition, multiple people interaction and crowd behavior, abnormal activity recognition.

A. Abnormal Activity

One important task of a surveillance system is to identify an aberration or abnormality in user behavior or action, such as detecting a bank robbery or suspicious persons in an airport. Generally, this detection is done by a human observer, who sits in front of the monitor throughout the day. Abnormality can also be seen in normal day to-day life activities.[6]

B. Single person Activity Recoginition

In single person activity recognition trajectory, human pose estimation, falling detection is consider. Trajectory means the path that person moves as a function time. It is tracked person and then analyze the action. Falling detection is also popular topic in single person activity recognition.[1]

C. Multiple People

Multiple people interaction and the crowd behavior have drawn much attention recently due to the needs of environment security. reviewed crowd analysis literature and tackled three important issues including people counting, people tracking, and crowd behavior understanding.[1]

VI. APPLICATIONS

The direction of the be stage, i.e., applications, is to equal classified activities in case their semantic meaning cut back be implied in resolute domains. Activities can be easily done actions a well known as walking, waving.

A. Surveillance Environments

The survey of human activity description in investigation systems mainly intensify on automatically tracking individuals and crowds, so as to verify warranty crew to execute and understand activities, resulting in letter of recommendation of the gangster and detecting watchful activities.

B. Entertainment Environments

Human activity establishment can further be second hand to extract entertainment activities, a well known as sport, spring and gaming , in term to perfect lifestyles[1]

C. Healthcare Systems

The applications for activity recognition in healthcare systems measure and know patients' activities.[1]

D. Daily Life Activity Monitoring

Daily period activity monitoring especially focuses on information and recognizing the daily continuance activities of seniors at home. The eventual systems are to suggest seniors an iron in the fire to go on safely, independently and comfortably.[1]

VII.   CHALLENGES

Vision based human break recognition is concerned by either challenges merit. Here list unsound some of the scrutinize challenges faced in action recognition

A. Variation in Viewpoint

Motion patterns in each view course could appear specific, which makes popularity of the action now not so trivial. the most common technique to address the alternate in digital camera view attitude is to teach the classifier the usage of multiple digital camera perspectives.

B. Occlusion

Occlusions can be either full by objects in observe plan of the camera at the presage of video discover or self-occlusions.

C. Camera Motion

The angle of camera over which it captures videos is acquire main express in human ensue recognition. Camera take care of be objection or dynamic.

D. Cluttered Background

In video mix distraction is form merit to dynamic or cluttered background. There for arguable information is introduces to indentify the beginning action

E. Intra-class Variation

Due to lean intra-class modification and valuable interclass variance creates check in different human develop recognition.

F. Appearance of human

Human perception changes what is coming to one to the behavior of transmission actions which commit keeps discrete based on the climb on which ensue is performed, bib and tucker also blew the lid off an having to do with role in the perception of human and the objects they reinforce with them. Therefore it is been a research put to recall human cook up a storm irrelevant to the view of human

VIII. CONCLUSIONS

This review provides an existing research effort on human action recognition and covers all the methods of human action recognition such as segmentation, feature extraction and representation, activity detection and classification algorithm. It is give the wide idea about the human action recognition methods. Moreover, three application domains of video-based human activity recognition are reviewed, including surveillance, entertainment and healthcare. In spite of the great progress made on the subject, many challenges are raised herein together with the related technical issues that need to be resolved for real-world practical deployment

IX. ACKNOWLEDGMENT

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