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HUMAN ACTIVITY RECOGNITION SYSTEM

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Abstract
In this modifying and developing world there are many vision based intelligent system which attracts the attention of many researchers to work on it, modify and develop it to the next level.

- *Human Activity Recognition System (HAR)* has multifaceted application all over the world due to usage of acquisition devices such as smartphones, video cameras, which are used for human activity data recordings
- The human Activity which are fetched or stored in the form of videos are based on the analyzation of video *frames* by the usage of computers to impulsively find the human activity without manual computations.
- Most of all networks for recognition of task use convolution neural network with the help of convolution and pooling layers followed by a few numbers of fully connected layers which identifies similar patterns in the frames in the intervals of video to recognize the activity by providing *79-80% accuracy* based on the activity is done in the video from the human being.
- The main aim of Human Activity recognition system is to identify and understand the actions of people in video and export corresponding tags which can be achieved through the machine learning algorithm which identifies the human activity in video or an image .

The aim of Human Activity Recognition System (HARS) is to identify activities from the set of datasets on the movement of human being to the environment conditions. There are many applications like video surveillance, healthcare, and interaction of computer and human, are based on the HAR research. This study highlights improvements in advanced activity detection techniques, especially in activity representation and classification techniques.

We discuss various widely used approaches for classification. We categorize existing literatures with a thorough taxonomy that includes representation and classification methods, as well as the datasets they worked, with the goal of giving the brief to these algorithm and the ways to compare them.[1]

***Keywords*:** Classification Model, Frame Rate Algorithm, Pooling Frames Kinetic-400 Dataset

I. Introduction

Human Activity Recognition system (HARS)is a field of research which contain the machine learning algorithm which helps in the identifying the human activity with the use of some sensors. HAR is an important field of study that have applications in many industries, such as security, sports, and healthcare. In order to detect and identify diverse human activities, like Jumping, Swimming applying lipstick, etc., HAR algorithms can evaluate data from a variety of sources, including wearable sensors, smartphones, and webcams.

1.Why HAR is required?

In this growing and developing world identifying of activity by the machine algorithm is in the main topic of research, a multiple activity detection system is now necessary for many applications, such as robotics, surveillance cameras, etc. for characterizing human behavior. The creation of HAR systems has the ability to improve people's lifestyles by offering remote health monitoring, behavior analysis, and personalized coaching. In this regard, HAR is an essential element of the developing Internet of Things (IoT) industry, which requires connecting devices to the internet to facilitate communication and data exchange between them.

2. Types of HAR

According on the type of data they use, the human activity methods can be differentiated in two different approaches:

I. unimodal activity approach
II. Multimodal activity approach

The main types in unimodal method which identifies human action using the data of a single subject like image on the basis of rule based method, Stochastic method, and center square method. .

- Human actions are shown by space-time methods as a collection of comprehensive features or approach.
- Stochastic approaches use various statistical techniques, such as hidden Markov models, to recognize human activities or behaviors.

- A set of rules that characterize human behaviors form rule-based techniques.
- High level reasoning actions are effectively depict by shape based approaches via stimulating movements of human body.
- Multimodal methods, however combine different attributes obtained from various sources and are categorized into three types: affective, social networking and behavioral techniques.
- The key parameters to represent human actions in affective approaches are the experience of sensing a person's underlying emotional state and the emotional communications.
- Using all of the collected data, behavioral approaches aim to identify human activity by extracting behavioral features, non-verbal multimodal clues, such as gestures, facial expressions, and aural cues, from the photos.
- Social networking techniques simulate human traits and behavior at several levels of human-to-human interactions in social settings, including gestures, body language, and speech.[2]

II. Literature Review

A system that automatically recognizes and categorizes human activities based on video data is known as a video-based human activity recognition system. It uses computer vision and machine learning techniques to do this. By offering real-time analysis and insights on human behaviour, this system has the potential to transform several industries, including healthcare, sports, security, and entertainment. Video-based human activity detection systems have improved in recent years in terms of accuracy and efficacy thanks to developments in deep learning techniques and the accessibility of sizable annotated video datasets. Applications for this technology are numerous and include tracking patient movements in medical facilities, assessing sports performance, and spotting irregularities in security footage, among others.

Using the well-known machine learning classification, the concept of human activity recognition was originally put forward, and results showed up to 84% accuracy in terms of the activities involved.[4] Moreover, studies have been conducted using a sequential classification created by a Gaussian Continuous Emission HMM. In order to expand the SVM model to multiclass classification,[5] Hardware Friendly Support Vector Machine (HFSVM) was a later introduced, this technique uses a fixed-point in the feed-forward phase.[6] Later, a binary-classifier using a one-vs-all technique was added to this research, further evolving it.[7]

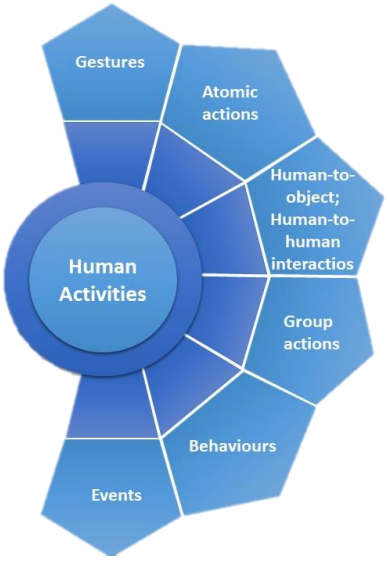
In a more sophisticated interactive cognitive environment, Human Activity Recognition System is also used to identify Activity Problems. In order to deal with the postural transition and to makeover it classification outside the pre-made class, Ortiz has created the TAHAR (Transition Aware Human Activity Recognition) framework. The supervised learning technique is typically used to obtain records of human activity. Predictive models like threshold-based classifiers and binary decision trees are used in some supervised learning techniques with regression and Bayesian models. These models include statistical classification techniques such as Artificial Neural Network (ANN), K-Nearest Neighbor (KNN) and Support Vector Machine (SVM).

To categorize Human Activities and Postural Transitions, the modified random forest method was implemented using relevance score driven random forest (HAPT). The technique was further developed by including max-min attributes and crucial positions. The Logistic Regression method, in contrast to the other ones, combines statistics and supervised learning techniques. Because it differs from the ANN technique in that it selects the outcomes with the highest probability, this method offers a comparatively high accuracy.[3]

Types of activities of human to be recognize –

[9]

Main Categories Human Activities Are Distributed –



[10]

Future Scope -

Human Activity Recognition (HAR) systems has the power to revolutionize various industries including healthcare, sports, gaming, and smart homes. Some of the future scope of human activity recognition system are –

1. **Healthcare -** Human activity recognition system can be used to track the activities of the patient, which can be used by doctors and nurses to monitor their daily routine and habits which can be help in detecting the illness and doctor can provide personalized treatment plan with respective the illness detected by human activity recognition system
2. **Smart Home –** Human activity recognition system can be embedded into smart homes enabling device to respond with human activities e.g., Lights can turn on when human activity is recognized into the room.
3. **Sports and Fitness –** Human Activity Recognition system can be used to track and analyse the performance of an athlete and fitness addict. Data generated by it can help human to improve training techniques and identify the area of improvement.
4. **Security and Surveillance –** Human activity recognition system can be used detect and alert the security authority regarding unusual activity or suspicious activity. It can be useful in public places such as airports, shopping malls and train stations.
5. **Gaming –** Human activity recognition system can be used to create more impressive and interactive gaming experience. Players can control their movement with their actions.

III. Proposed Methodology

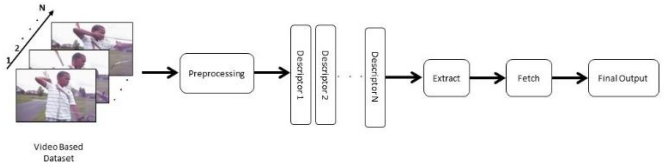
Steps included in Human Activity Recognition System –

1. Start
2. Importing Necessary modules and libraries.
3. Providing utilities and helper functions for UCF101 dataset.
4. Fetching the label from Kinetic-400 labels.
5. Importing the UCF101 Dataset.
6. Training to fetch the video from the UCF-101 Dataset.
7. Analysing the video and provide output from the video.
8. Checking for sample video
9. Stop

Algorithm

1. Start
2. Def list ucf videos (Listing of videos and categorization of videos with the label in kinetic 400 using **classification model**)
3. Def fetch ucf videos (Fetching of videos from the dataset)
4. Def crop centre square (Crop each centre point of a frame with the help of **frame rate algorithm**)
5. Load video (to load videos)
6. Def to_gif (converted images [Frames] from video)
7. Getting labels from the kinetic 400 labels
8. Importing the UCF 101 dataset.
9. Fetching videos
10. Predicting
11. Stop

Flowchart



I. **Video Based Dataset -** ucf videos dataset contains multiple videos which are based on the main categorization of human activities.

II. **Data Pre-processing -** Data is processed from the the dataset using kinetic 400 to label the data

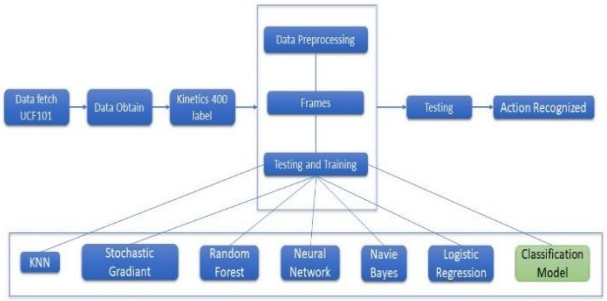
III. **Descriptor -** The data is descripted with the labels using kinetic 400

IV. **Extract –** It extracts the data from the descripted data with labels

V. **Fetch –** It fetches the data according to the data asked from the video with the multiples frames from the video using frame rate algorithm.

VI. **Final Output –**
The descriptor data is displayed according to the activity of a human.

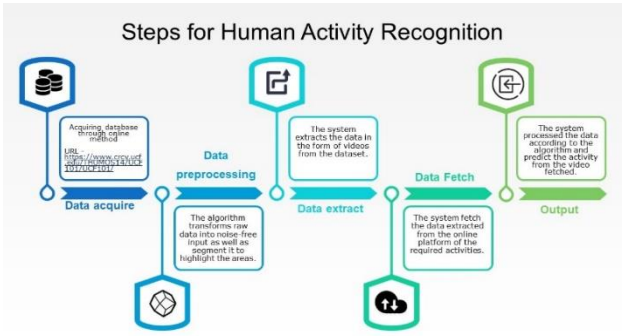
There are many types of methods to detect the human activity –



[8]

This diagram shows the systematic working of the algorithm to detect the human activity from the dataset video from each video frame which helps to acquire best result regarding the human activity.

Steps for human activity recognition system –



I. Result and Discussion

With the help of TensorFlow and OpenCV the human activity is classified from the UCF101 data set and the result from it is shown below -

Fig: Playing the guitar

As each frame consist of different human activity so to classify it
In this result each frame is recognized and classified from the frame rate algorithm and classification algorithm to detect the human activity in the form of percentage so the activity is recognized accurately.

The activities in the predictions are labeled from the kinetic 400 label which is used to give label to each frame of the dataset.

There is some the sample result from the dataset which are recognized with the use of this UCF101 and kinetic label 40 dataset.

The output shows each frame result -

1. Playing guitar
2. Strumming guitar
3. Busking
4. Playing drums
5. Recording music

This output and the actions shown are displayed from the Kinetic 400 Label which provide a label to each frame.

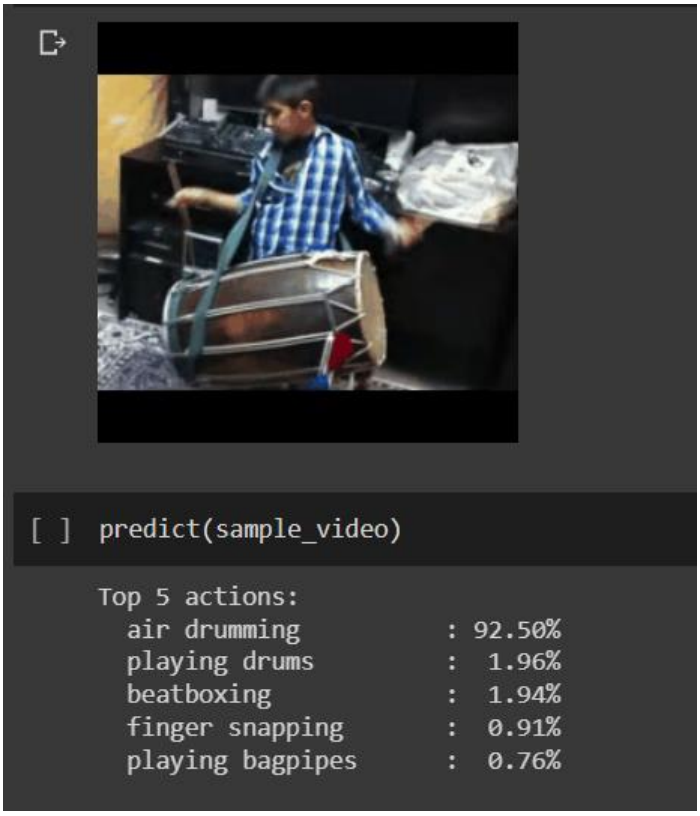


Fig: playing the drum

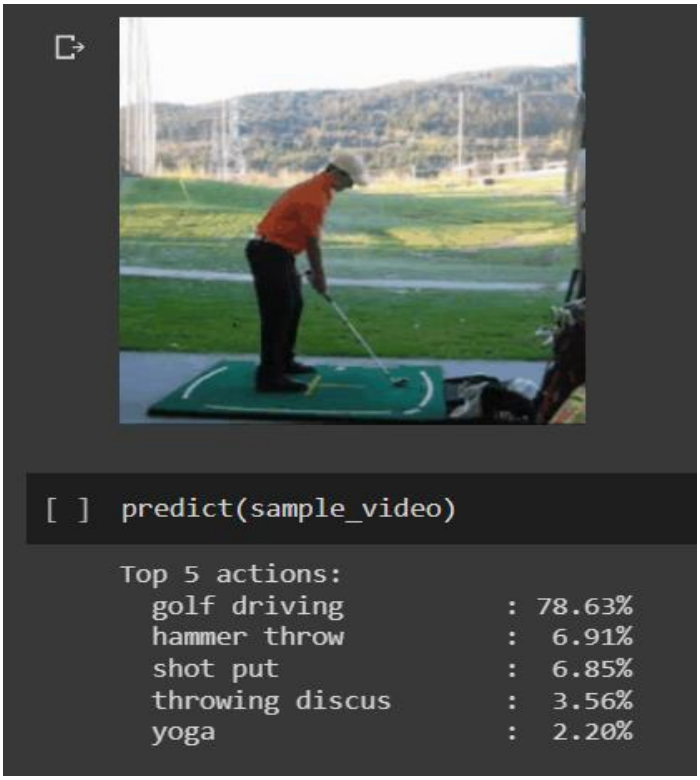


Fig: Playing Golf

II. Conclusion

Now a days human activity analysis has the great scope in the growing industry and multiple algorithms are present to analyze the human activity and classify according to it.[8]

In this paper Human Activity Recognition System, we proposed a model trained using video-based methods using TensorFlow and open cv.

In this survey, we researched about study of classification methods of human activity recognition system. We surveyed different methods which proposed hierarchical study for classifying these methods. Two main categories which approach to recognize human activities are unimodal and multimodal. Unimodal methods are developed for exploring complex activities, atomic actions and motions. Multimodal methods are utilized for studying interactions of humans and behavior. Here we have given a proper method of developing an ideal human activity recognition system.

Due to limitations concerning about computational issues many studies are unable to explain human activities in a precise way. Annotation and collecting data to respective topic is also a huge problem.[10]

We summarize that as there are many problems in annotating data, modelling of human poses and data collection there is rise in human understanding models.

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