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HUMAN ACTIVITY RECOGNITION THROUGH MICROSOFT KINECT: A REVIEW

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Abstract— This is small summary about Human activity recognition. I display a technique for perceiving human exercises utilizing data detected by a Microsoft Kinect. Movement acknowledgment expects to perceive the activities and objectives of at least one specialists from a progression of perceptions on the individual's activities and the ecological conditions. Human activity recognition method is consisting of single-layered approaches and hierarchy approaches. Human activity recognition performed using kinect sensor for taking images as an input and Sequence of Skeleton matrix obtained from kinect is further applied to various classification algorithm .Classification algorithm taken into account are such as K-NN, SVM, J48 classification.

Keyword— Activity recognition, Skeleton, Kinect sensor.

I. INTRODUCTION

Biometric recognition is the automatic recognition of person on the basis of their behavior feature. Biometrics used to confirm an identity of a person. We can use the behavior feature of face, voice, activity, gait and many more [9].

Biometrics recognition used the knowledge of person's identities. It also uses Features calculation and each time feature calculated measure different results than the previously measure results Hence, it can withstand such variations [7]. Example of biometric are finger print, Hand written signature, Facial recognition, speech recognition, Gait recognition ,Activity recognition .

Activity recognition is the process of classifying action which uses observing person's movement as a sequence of performing activity[1]. Activity recognition can be performed by taking single person's under observation or more person's under observation. Activity under recognition are describe based on their levels Such as, low level activities and High Level activity.

High level activities are collected of more than one low level activity which is needed for human activity recognition approach. Many real time application require automatic recognition of high level activities[3].

Human activity recognition Method is applicable with two approaches as, single layer approaches and hierarchy layer approaches . if the single layer approach are considered there are space-time approach and sequential approach .space time approach considers input video as a 3D volume. where sequential approach consider input video as a sequence of observation[3].

Technologies used in Human activity recognition are Mainly : Depth sensor and wearable sensor, RGB Camera. Sensor plays important role in Human activity recognition such as, Sensor capture information and determine the type of activity performed commonly ,Microsoft kinect sensor is used as a depth sensor in activity recognition .It extracting skeleton Matrix which has 20 joints and then it uses classification algorithm for classify activity[12]

Application of activity recognition are : Content based video analysis ,Animation and Synthesis, Interactive application and environment ,security and surveillance [12],Human computer interaction[12],Abnormal event Detection[3], application of radial distances on depth data, in 3D joint tracking[1].

- Kinect sensor

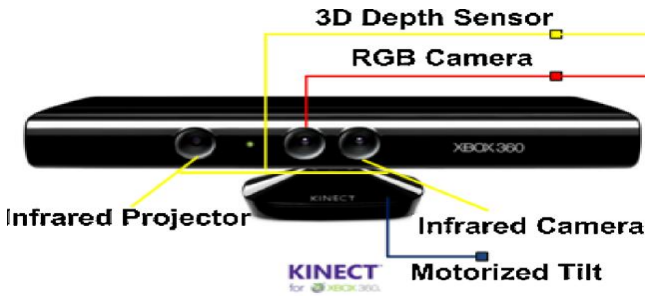


Fig 1.kinect sensor[11]

Kinect sensor Detect 3D image representation of person under observation using kinect. Person observed using kinect sensor required stands at a distance of 1.3 to 3.5 meter or 3.9 to 11 ft kinect detects the object that is person/human using 20 body joint coordinate[11].

II. LITRETURE REVIEW

Monalisa Pal in year 2016 has proposed[2] Gesture recognition perform feature extraction using kinect sensor .it takes into account 16 body joints in stand of 20 body joints. Each joint is taken as a vector hence using three body joints one angle is created " principle angle". i.e. between each pair of vector.

Hence, 16 body joints and 14 angle are used in order to extract the feature. Hence it uses angle feature for gesture recognition .[2]

G. Akilandasowmya in year 2015 has proposed[3] Distance Matching algorithm has been taken into account. in this author use K-NN classifier. K-NN Classification is the Nearest Neighbor classification algorithm .distance is calculated using Euclidian distance formula[3] :

$$d= \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2}$$

Similar data are grouped using Distance of Testing data to nearest neighbor data points.

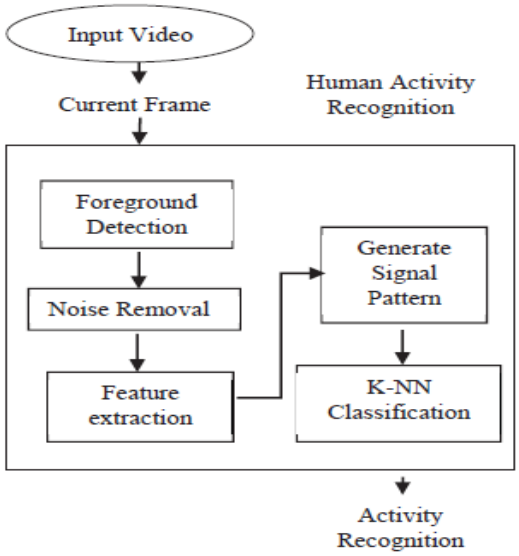


Fig 2. Architecture Human Activity Recognition[3]

The process is repeated until it comes all the data point K-NN classifier classify data set from one group to other[3]

Megha D Bengalur in year 2013 has proposed It process a method for human activity recognition for different activity types which are recorded and captured by kinect camera using SVM classifier. it propose to get good result using skeleton joint feature obtain by kinect. Thus, method performs Activity recognition using SVM Classification .SVM use two type of data sets which are Training dataset and Testing dataset .The Training set as a learning data and Test set for Validation Data[4].

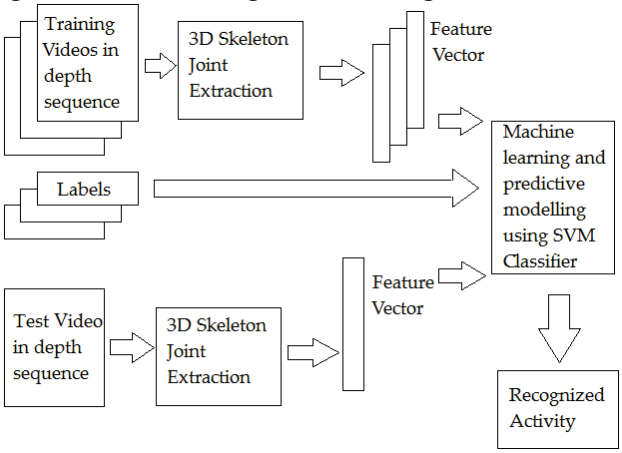


Fig 3. Overview of the method[4]

It collects activity dataset in the form of video's by kinect sensor, as a sequence of some action. After collecting activity dataset feature are extracted in the form of skeleton metrics. It can extract the feature based on different dataset of activity as, skeleton joints body posture motion and velocity information etc[4].

Bojan Dikovski in year 2014 has proposed[13] Set up for kinect sensor data Recording:

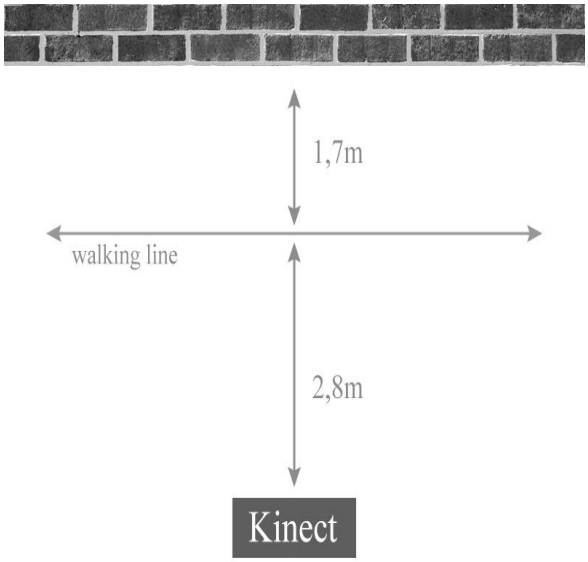


Fig4. Distances and used setup when recording the sequences with the Kinect sensor[13].

Here Author uses the kinect sensor to record the data as a sequence of action and extracts skeleton image from kinect. using skeleton image it calculate knee angle feature used for classifying gait .

walking style of the person used as a person recognition purpose from skeleton data. classification using adaptive neural network on feature.

Such as, area of upper and lower body parts and distance between the Centroid of upper body part and the Centroid calculated from other body part.

Euclidean distance calculated in three dimensional space between the angle joint points for each frame, after calculating the distance the smoothing feature is applied[13].

Kinect sensor provide user with kinect skeleton image in a mastics from in order to given information of 20 joint in the dimensional space.

Feature used can be,

- Distance between each adjacent joint pair,
- Height of person ,
- Distance between three angle joints.

Above mentioned Features are calculated with the use of following formulation, Let as take in to account two joints joint I and joint j

There for,

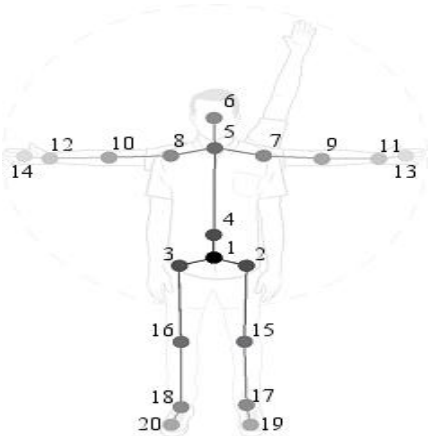
By Euclidian distance formula

d(1; 2) =

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

The height is calculate as the sum of the following distances between joints[13]:

Height = (d(l ankle; l knee)
+ d(l knee; l hip) + d(r ankle; r knee)
+ d(r knee; r hip))=2 + d(c hip; spine)
+ d(spine; c shoulder) + d(c shoulder; head)



1 Center Hip	11 Left Wrist
2 Left Hip	12 Right Wrist
3 Right Hip	13 Left Hand
4 Spine	14 Right Hand
5 Center Shoulder	15 Left Knee
6 Head	16 Right Knee
7 Left Shoulder	17 Left Ankle
8 Right Shoulder	18 Right Ankle
9 Left Elbow	19 Left Foot
10 Right Elbow	20 Right Foot

Fig 5.The available joints in a Kinect skeleton image[13].

Accuracy of the result can be Increase by averaging over the length of both legs.

- Centroid between triple of joint points is calculated using Centroid formulate.
- Let us take the angle between joints as follow[13]:

$$A=\sqrt{(r_x-s_x)^2+(r_y-s_y)^2+(r_z-s_z)^2}$$

$$B=\sqrt{(r_x-t_x)^2+(r_y-t_y)^2+(r_z-t_z)^2}$$

$$C=\sqrt{(s_x-t_x)^2+(s_y-t_y)^2+(s_z-t_z)^2}$$

$$\Theta=\cos^{-1}\frac{B^2-A^2-C^2}{2AC}$$

A Centroid of N joints is calculate as[13]:

$$C=\sum_i^N \frac{\{x_i,y_i,z_i\}}{n}$$

Joint 1	Joint 2	Joint 3
Head	Center Shoulder	Center Hip
Left Wrist	Left Elbow	Left Shoulder
Right Wrist	Right Elbow	Right Shoulder
Left Ankle	Left Knee	Left Hip
Right Ankle	Right Knee	Right Hip
Left Hip	Right Hip	Left Knee
Left Hip	Right Hip	Right Knee
Left Shoulder	Right Shoulder	Left Elbow
Left Shoulder	Right Shoulder	Right Elbow

Table 1. Triples of joint points used to calculate angle features[13]

Ahmad Jalal in year 2015 has proposed[14]

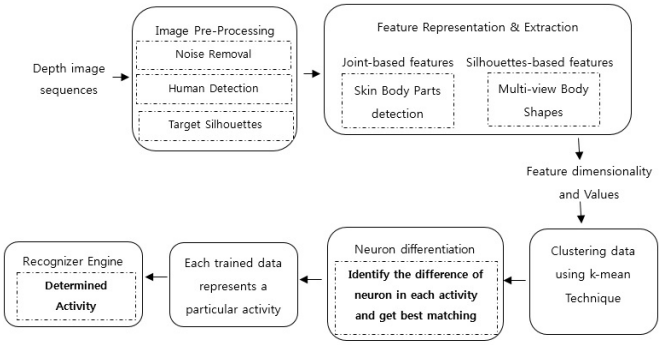


Figure 6.Block diagram of the joints plus body features representation-based human activity recognition framework [14]

This paper shows the feature extraction using a method to recognize human activities with the use of sequence of multiple depth images. At the very first step it performs. preprocessing of input sequence in order to get the depth silhouettes by finding the human body measurements. Which could be either height and width which further provided to evaluate the depth intensities[14].

Feature extraction is performed after preprocessing which is divided into two Segments:

- Skin body parts detection Feature
- Multi view body Shape Feature[14]

CONCLUSION

SR No.	Proposed By	Dataset Used	Method	Result
1	Monalisa pal, Sriparna saha, Amit konar [2]	Normal person And Use Skeleton 3D image	SVM Classification Algorithm is used, Feature vector is applied to calculate Features like angle or distance between joints.	94.29%
2	G. Akilandasowmya, P. sathiya, Dr. P. anadha Kumar[3]	Normal Person	K-NN classification algorithm applied for feature extraction.	93.33%
3	Megha D Bengaluru [4]	Normal Person And Use RGBD Image	SVM classification is also applied for feature extraction.	89%
4	Bojan Dikovski, Gjorgji Madjarov, Dejan Gjorgjevikj[13]	Normal Person And Use Skeleton 3D image	Mathematical formula applied for calculating Feature	Not Computed
5	Ahmad Jalal, Yeonho Kim, Shahayar Kamal, Adnan Faooq, Daijin Kim[14]	Normal Person And Use Depth Image	K-means Technique	92.43%

Table 2: Conclusion

Monalisa pal utilized SVM classifier and highlight vector is connected to compute include in their paper and the precision is 94.29%.G. Ankilandasowmya utilized K-NN classifier calculation for highlight extraction this technique gives 93.33% exactness. Megha D. Bengalur likewise utilize SVM classifier for concentrate the Element and give 89% precision. Bojan

Dikovski utilize diverse distinctive numerical equation for ascertaining the component this creator is not figured the outcome. Ahmad Jalal utilize K-implies method for perceive every day human activities. It give 92.43% precision.

But above all of them ,Human activity recognition performed though SVM classification gives the most efficient result .

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