IJITCE

ISSN 2347- 3657

International Journal of Information Technology & Computer Engineering

Email : ijitce.editor@gmail.com or editor@ijitce.com

International Journal of Information Technology & Computer Engineering

ISSN NO: 2347 – 3657
Volume 9, Issue 2, 2021

HAAR Classification for Evaluation of Dance Performance - Bharatanatyam

GoskiSathish1,KunduruSaidiRaddy2
1,2AssistantProfessor,DepartmentofIT
1,2MallaReddyEngineeringCollege,Hyderabad,Telangana,India

Abstract
Automated evaluation of dance performances against a gold standard is implemented in this project and a scorecard is provided to the performer in the form of a graph with improvement suggestions. Joint detection is used by the system to acquire the motion of the performer. The dancer's frontal view is captured by a camera. To separate the video into individual frames, it is input into the system. As the HAAR classification system detects eight essential joints of the body in each frame, the position changes of these joints are used to calculate the joint velocity. A dancer's performance is evaluated in contrast to a gold standard using a scoring algorithm. Upper- and lower-body movements are scored independently. As a result of the upper and lower body scores, a final score is given that incorporates both scores. In addition to providing a score, the algorithm also attempts to pinpoint areas where the dancer can improve. This system attempts to automate the complete evaluation process of a dancer during examinations in order to reduce the amount of time and effort required by humans.
Keywords: Joint Detection, Object Detection, Contour, Nritta, Haar, and Joint Detection.

1.**Introduction**

In India, Bharatanatyam is one of the country's most ancient dance genres. An important aspect of this art form is the use of body postures and foot patterns and beats. There are two types of movement: abstract and expressive. Body movements alone are referred to as "abstract," whereas face gestures are referred to as "expressive." Nritta, Nrithya, and Natya are the three divisions of Bharatanatyam. In Nritta, the focus is solely on body movement and posture, which is why it's referred to as pure dance. Natya is a ballet dancer, but Nrithya incorporates body motions and facial expressions. Bharatanatyam's Nritta (non-expressional) dance form is the focus of this method.

A lot of emphasis is placed on classical dance, particularly Bharatanatyam in India. The central board of Bharatanatyam conducts examinations in various states every year to evaluate dancers on a variety of criteria. Hundreds of thousands of people around the United States take these tests. Despite the importance of this, there is a lack of a well-structured mechanism in place to implement it. There is a severe lack of competent judges who serve as examiners. There is a reduction in the number of judges allocated to each student. Ideally, there should be two or more judges for each student, but due to a lack of judges, most exam centers have just one judge present. The evaluation of a dance performance cannot be automated by any existing system. A system to standardize the evaluation of a dancer is required.Video and image processing techniques will be used to create an automated dancer evaluation system. A video of the performance and a number are fed into the system.

explain what kind of dance is being shown in the video. Several well-known dance routines will serve as the standard against which all subsequent performances will be measured. Extracting a frame from the video once it has been uploaded is the next step. Haar Classifiers [4][5][8] are used to classify the dancer's joints, which have been trained for the relevant body parts. The feet and hands can also be

identified via skin detection. Skeleton tracking is accomplished using a combination of these two approaches. In order to determine the direction of joint movement and the accompanying joint velocity, these coordinates must first be determined. As a result, the precision of each movement may be calculated mathematically. Upper body, lower body, and hand gesture ratings are delivered following skeletal tracking. The student's score vs the typical dancer's score for each frame is then shown. As a result, a dancer can utilize this tool to gauge his or her own progress over time.

2. PreviousWork

We've learned a few things from earlier research on various tools and strategies. There is a difference between using Microsoft Kinect and this technology, which seeks to get outcomes without it. Figure 1[9] shows the Kinect-based skeletal tracking technique. Skeleton tracking was accomplished using the Kinect studio and the OpenNI module. Each frame's joints are shown in these modules. An amateur dancer's aligned position and velocity vector are compared to the comparable signals of a professional dancer in order to score a certain choreography.. A dancer's performance is judged on the basis of their joint locations and joint speeds. Haar Cascade Detection was utilized for face and upper body detection in [2]. In addition, they used foreground segmentation and morphological techniques such as dilation and erosion to reduce the noise. Stick Skeleton Models representing seven body parts and eight points were the result of their work. The hardware required to use Microsoft Kinect is quite pricey. For $143 you get a sensor, and the adapter costs around $49. A standard video source cannot be used to feed Kinect studio. Because of this, it is necessary to get the hardware that generates.xef files. To track skeletons and process video and images, OpenCV [10] is employed. Because of this, a conventional camera can be used to capture the performances on film. As a result of these modifications, we have saved a significant amount of money. A dancer's upper and lower body are scored separately instead of as one unit, so they may see where they might improve as an amateur dancer.

3. Design

Assumptions

•It is believed that the dancer will be performing in front of a plain background when the recording is taking place. • The room is expected to be well-lit while recording. • The recording procedure begins as soon as the music is played. Thus, the length of the video for each choreography is the same for both amateurs and professionals.

During the whole recording procedure, the camera is fixed in a specific location.

• During the whole performance, the dancer is presumed to be in the camera's field of view.

Dependencies

Skeleton detection is dependent on the system's components.

Fig.1. Components oftheSystem

A camera with a resolution of 8MP or higher is utilized to record the dancer's performances that will be

examined.

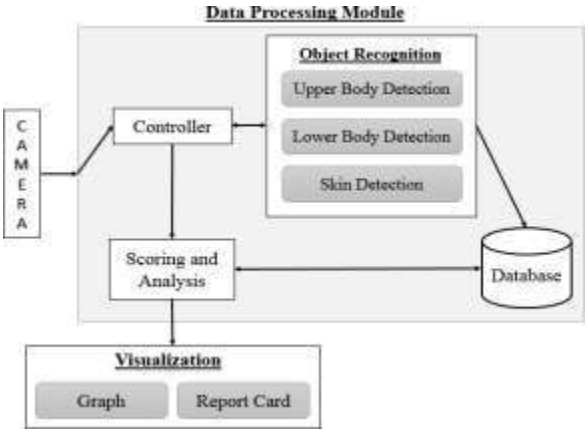
It is the Data Analyzer's job to process and analyze all of the footage that is entered into the system. A skeleton detection algorithm is used to each frame of the movie once it is converted into relevant frames. It is possible to identify the dancer's joints and posture. The typical dancer's data is then compared to this data. In addition to the report card and graph, the scoring module provides a score for each frame.

ISSN NO: 2347 – 3657
Volume 9, Issue 2, 2021

Database: This system employed SQLite Database to store the coordinates of the joints it detected. Therefore, a camera with a resolution of at least 8MP is recommended.

If you want to get crisper pictures, the dancer needs to be within 10 feet of the camera at all times.

This tool has now been taught five different dance routines. Consequently, only these can be



tested for each student.

4. Implementation

Fig.2.ArchitectureoftheTool

A phone camera with a resolution of 8MP or above can be used to record the dancer's performance. To ensure that the dancer is constantly in the camera's field of view, the camera should be placed 2 feet farther away from the dancer than half of the dancer's height. The dancer's shoulders are roughly at the level of the camera. One frame is collected for every 100 milliseconds of video being analyzed when it is delivered into the system. Each

The detecting module receives the frame and processes it accordingly. The upper and lower body detection is handled by this module. The face, neck, and shoulders are all part of the upper body. Hip and knee joints make up the lower body. The joints are labeled with an arrow pointing to the upper left corner of the image as the point of origin.

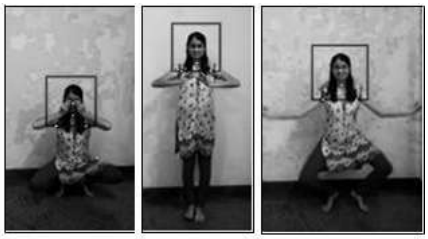


Fig.3.Upper BodyDetectionfortheStandingandSittingPostures

UpperBodyDetection

First, the face's contours are discerned. The joint for the face is marked at the center of the smallest shape that may be detected. The neck joint is then marked by adding 4% of this length to the bottom of the face, as seen in the illustration. The upper body's shape is clearly defined by the fact that the face's

ISSN NO: 2347 – 3657
Volume 9, Issue 2, 2021

shape falls within it. The shoulder joints are then delineated at a distance of one fifth of the width of the smallest contour found.

LowerBody Detection

There is only one contour that can be used to identify the lower body in this photograph, and it's the smallest one. The hip joints are marked on the top line of the contour detected at a distance of one-third of the borders.. Halfway along the lower body contour, the knee joints are marked. The Y coordinate of the face joint marked earlier is taken into account when drawing the knee joints.

As a rule, a dancer's knees are marked at one-third their width from either side if their Y coordinate is less than 35 percent of the frame's height.

This pose is called Aramandi if the Y coordinate of the facial joint is less than 45 percent and more than 65 percent, and the knees are indicated at a distance of one fifth the width from either side.

Fig.4.Lower BodyDetectionfortheStandingandSittingPostures

In case of the Y coordinate being above 45%, the dancer is assumed to be sitting and theknees aremarked on thesides ofthecontourdetected.

This way the 8 joints used to calculate the joint velocity are detected in every frameextracted.

SkinDetection

The skin detecting method is used to determine hand positions. In order to accomplish this, a straightforward RGB combination is employed. There are five main classifications of postures. If a joint or posture isn't identified in a given frame, the data from the previous frame are used instead.

ScoringandVisualization

The technique for calculating scores takes into account the joints' movement in three dimensions: direction, velocity, and posture. The final report displays the average scores for the joints of the upper and lower bodies, as well as the postures. Inaccuracies of 10%, 15%, and 20% each receive a score of 10, 5, or 3 points, respectively. A score of zero is awarded for any inaccuracies greater than 20%. In order to receive marks, an individual's posture must be similar to that of the standard video. Otherwise, a score of zero is provided. The final score is calculated by averaging the three previous ones. A graph depicting the scores assigned to each frame is shown at the conclusion of the study by the tool. Another benefit of this graph is that it provides a visual comparison between a user and choreographer's performances. There is a report card, a graph, and a list of things that could be done better.

5. EXPERIMENTAL RESULTSDataset

This system was trained using 955 positive photos and 1500 negative ones. All five movies of the dancer's choreography were analyzed for favorable imagery, which would be termed the "golden standard." Google's HAAR training website [6] provided the negative photos for this project. There were five choreographies performed by two separate dancers that were utilized to test the system. The authors themselves shot and edited each of the videos that were examined.

Tests were carried out on two distinct dancers' movies after producing Haar XML files for the detection of joints. A trained Bharatanatyam dancer and a beginner were both present. Because it was a binary

International Journal of Information Technology & Computer Engineering
ISSN NO: 2347 – 3657
Volume 9, Issue 2, 2021

scoring method, unlike upper- and lower-body detection, posture detection had the greatest impact on the final result. Each frame's three scores were given equal weight in the calculation process. All of the frames were given equal weight in the decision-making process. The tool's accuracy was tested by comparing the choreographer's footage to the original. In the end, we got an 8.6 out of 10, which means we were 86% accurate. Table 2 shows the average scores of two videos for two distinct levels of dancers.

TABLE1ACCURACYOFBODYPARTDETECTION

Modules	Accuracy(%)
FaceDetection	80
Upper BodyDetection	60
Lower BodyDetection	60
PostureDetection	50

A dancer is deemed to be on par with a professional if they receive an overall score of 8 or higher. A score of less than 4 indicates that the dancer is an inexperienced performer. In analyzing a dancer's progress over time, the frame's individual ratings might provide insight into their strengths and weaknesses. It's a great opportunity for the dancer to work on their own technique

Fig.5Comparisonof frameresultinginlowscore

Fig.6.Comparisonofframeresultinginhighscore

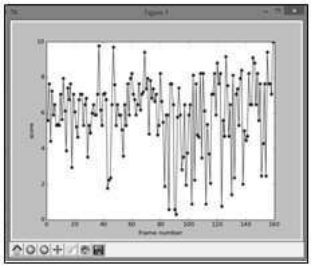


Fig. 7. Graph displayed at the end of the analysisTABLE2 SCORES

TestCase	Expected Score(/10)	Actual Score(/10)
ComparisonofaDancerwith herself	10	8.6

Evaluationofagoodd anceragainsta professional	>5	6
Evaluationofa below averagedanceragainstap rofessional	<=5	2.7

6.**Conclusion**

Bharatanatyam is regarded as one of India's most important forms of art. It's a career that a huge number of people are considering pursuing. In light of the significance of this, the examinations for students in this discipline must be meticulously planned. Find more qualified panelists to address this issue. Another option has been put forth.could be to use devices like Kinect which tracks your skeleton movements as you dance.Butboththesesolutionscouldpotentiallybeunaffordable.Thisapplicationtriestoprovide a cheaper solution to this problem. The only cost incurred would be in buying thecameraand the typical videos for the different dances.

7.**Future Work**

There are a few things that can be done to increase the system's accuracy and strengthen the evaluation process.

•A more powerful processor and a greater number of positive and negative images can be used to train for object detection on a bigger scale.

•The detection of facial expressions is the ultimate improvement that might entirely replace the current evaluation system. Facial expressions can be identified with some degree of accuracy with adequate training and rule-making.

•The following are some optional extras that could be included in the tool: comparing the same dancer's earlier performances. Providing more specific suggestions about how to fix the situation.

•Learn to examine additional choreographies with the help of the tool.

References

[1] Prithwijit Guha, Dr. Amitabha Mukerjee, and Abhishek Kar, "Skeletal Tracking Using Microsoft Kinect," Dimitrios Alexiadis, Petros Daras Institute for Information and Telecommunication Systems, Thessaloniki, Greece.

[2]. "Evaluating a Dancer's Performance using Kinect-based Skeleton Tracking," by Philip Kelly, Noel E. O'Connor, Tamy Boubekeur, and Maher Ben Moussa

[3]. As an IEEE Senior Member, Dimitrios Alexandropoulos is an expert in signal processing approaches for the automatic evaluation of dance performances based on motion capture data.

It is possible to use Haar Cascades for face detection with OpenCV 3.2.0-dev. [4].

[Online].In the opencv documentation, you may find a tutorial on face detection: http://docs.opencv.org. In April of this year

OpenCV HAAR classifier training, by C. Robin [5]. It can be found at http://coding-robin.de/train-your-own-opencv haar classifier.html. Visited on 3rd of March, 2016

Google Code Archive: p/tutorials-haartraining/ https://code.google.com

Access date: March, 2016.

Computer Vision and Pattern Recognition 2001 accepted paper by Paul Viola and Michael Jones: 'Rapid object detection utilizing an enhanced cascade of simple features'

In [8]. R. Padilla, C FF Costa Filho, and MGF Costa,

Science and Technology International Journal International Journal of Computer and Electrical Engineering, Automation and Robotics

ISSN NO: 2347 – 3657
Volume 9, Issue 2, 2021

Vol. 6, No. 4, 2012, Control and Information Engineering
At the Information Technologies Institute Centre for Research and Technology - Hellas in Greece, [9] Georgios Th. Papadopoulos and Petros Axenopoulos presented their work on 'Real-time Skeleton-tracking-based Human Action Recognition using Kinect Data'.
"Image Processing and Object Detection," Nidhi, International Journal of Applied Research (2015).