

Emotion Recognition By Dance Movement – A Survey

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Abstract-Emotion plays an important role in our daily lives. Recognize emotions such as happy, sad, fear, surprise etc from facial expressions is an easy task for human. But it is a complex task for computers. Many researches have done to recognize emotions from user's facial expression by computers. In that, a challenging thing today is recognize emotions from body pose. In this paper, we review the methods of emotion recognition by body pose. body pose means, it may be dance movement or person – person communication. In this paper, first we review some methods of emotion recognition from dance movements. Secondly, we propose our future method of recognize emotions from the Indian classical dance bharathanatyam navarasas i.e. nine emotions. We will use the techniques of orientation filtering, max pooling and template filtering for recognizing navarasas of bharathanatyam dance.

Keywords- kinect sensor, log gabor filter, max pooling, template filter

I. INTRODUCTION

Emotion is a fundamental component of being human. Joy, hate, anger and pride among the plethora of other emotions, motivate action and add meaning and richness to virtually all human experience. Emotions play an important role. Obviously, in case of human computer interaction, it plays a vital role. Already Many researches was conducted and is being conducted to classify emotions fro facial expression and speech. Now researchers have turned to the challenging field of recognize emotions by body pose and motion. There are many are explored by many researchers. In our future research, we propose the recognition of nine emotions of bharathanatyam dance by pose from a computational perspective. We will construct a biologically hierarchy of neural detectors to differentiate the nine emotions of bharathanatyam dance. In our work, we will attempt

to make automatic classification of full body expressions to recognize the navarasas. It is essential to understand the impact of emotions in the aspect of body pose expressions while interacting with computer and other humans. The research will explore the use of navarasa emotion recognition technology from a user's perspective. It will empirically test assumptions about bharathanatyam navarasas which underlie the use of such technology. It will test the impact of navarasa emotion recognition on measures of usability and user satisfaction. This paper the beginners to get the ideas of recognize emotions from dance movement.

II. LITERATURE SURVEY

1. **Sriparna et al** have explored their ideas to classify emotions from Indian classical dance basic movements by detecting skeleton of the performer while dancing. To extract skeleton based feature, they used kinect sensor.

Kinect sensor

It detects the 3d image representation of an object. It tracks the skeleton of the person standing in front within a finite amount of distance using a set of visible IR cameras. For the recognition purpose they used SVM (Support Vector Machine). SVM is a classifier to recognize emotions. It is a powerful algorithm for producing very accurate classifiers and less over fitting, robust to noise. they worked on only five gestures. They are anger, fear, happiness, sadness and relaxation. Features were extracted from only hands, head and body. They did not account of feet movement. In their work, there was no constraint on different lighting conditions. Recognition rate is as high as 86.8% using SVM. This method is not only applicable for Indian dance forms but also can

be used for other international dance types. They used Euclidean distance as a feature. Euclidean distance was calculated among the head, shoulder, hands, elbows and spine for different emotions. Euclidean distance is calculated by

$$\text{Dist} = \sqrt{\frac{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}{3}}$$

Dist is the euclidean distance between two points. Then they proposed an algorithm to recognize emotions from dance movement by calculating the Euclidean distance. Finally they concluded that this is the first approach that body gesture is recognized for Indian classical dance style through their proposed algorithm.

2. **A.K.Nussiphelcov et al** have explained their work to recognize gesture from Kazakh traditional dance. They used kinect sensor to obtain human skeleton. They used hidden markov model to detect dance gestures.

Hidden Markov Model

Hidden Markov Model is a statistical markov model in which the system being modeled is assumed to be a markov process with unobserved (hidden) states. It's goal is to recover a data sequence that is not immediately observable. In their work they additionally used headwear tracking. The recognition rate is 90.82% is a very good accuracy. Finally, they concluded that they used many techniques to recognize gestures from Kazakh dance such as structured baysian network and expectation maximization algorithm with k-means clustering to calculate conditional linear guassians for classifying poses (used in human pose estimation). One main thing was they extended kinect skeleton by adding headwear as a new skeleton joint.

3. **Athira.sugathan et al** have done a good work to recognize emotions from bharathanatyam dance basic steps by the attributed relational graph of the 2D dance pose in images. They considered orientation, length of branches, strength and vector position as features for classification. They concentrated only on poses and shorthand signs of basic dance steps. They

built skeletonization and attributed relational graph. They used thinning and pruning method in skeletonization process.

A. Thinning algorithm

The purpose of thinning algorithm is to convert binary shapes obtained from edge detection to 1-pixel wide lines. It deletes pixels inside the shape to shrink it without shortening it or breaking it apart.

B. Pruning algorithm

It is a technique to reduce the size of decision trees. It reduces the complexity of the final classifier and improves predictive accuracy by the reduction of over fitting.

C. Smoothened skeleton

This process has done to improve the smoothness and to reduce the amount of unwanted data. For this they used a set of spline curves. It appropriates the unnecessary branches of the original skeleton. Such a continuous representation allows to compute the graph more easily and accurately.

D. Attributed graph

Skeleton can be represented as graph with end points and junction points as vertices and branches as edges. An attributed relational graph has built and used as a structural object for classifying by means of graph matching. It has a set of nodes which are union of end points and junction points and set of edges which are represented by skeleton branches. In this work, the weights like angle, feature vector, length of the branches, strength were taken as a feature for extraction.

III. PROPOSED FUTURE WORK

In our future work, we are going to recognize bharathanatyam navarasas. The navarasa means nine emotions. The nine emotions are

1. Shiringaram(Love)
2. Adbhutam(Wonder)
3. Raudram(Anger)
4. Bhayanakam(Fear)
5. Bibhatsam(disgust)
6. Hasyam(Laughter)
7. Karunyam(Kind Heartedness)
8. Santam(Peace)
9. Viram(courage)

For this work, we will construct a biologically plausible hierarchy of neural detector to recognize navarasas (nine emotions) of bharathanatyam dance pose. Figure 1 depicts the bharathanatyam navarasas (nine moods) or (nine emotions).

Figure 2 explains our future model to recognize navarasas of bharathanatyam dance.

component is a Gaussian distance function according to the angle in polar coordinates.

B. Max pooling

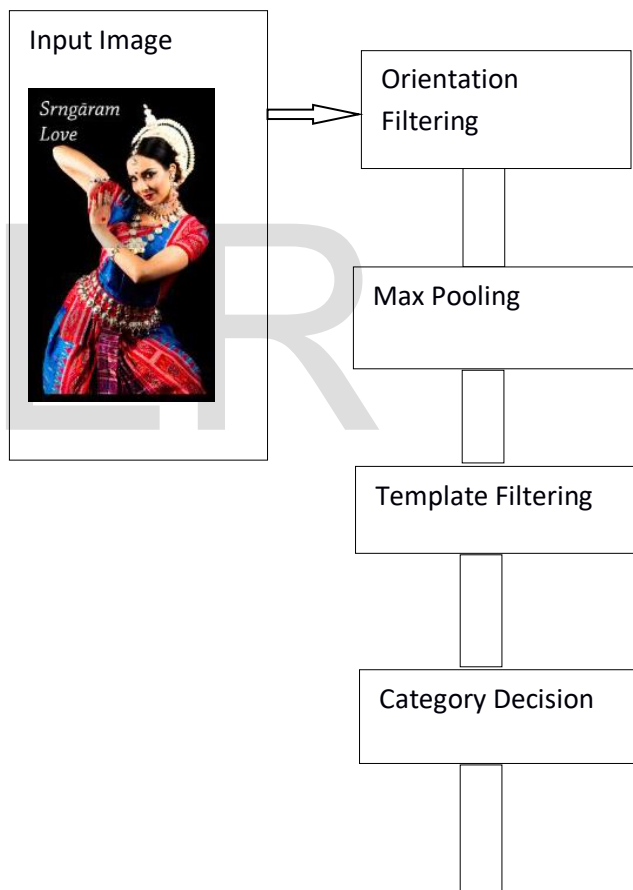
Max pooling computes the maximum of each component instead of its average. It has recently gained popularity due to its better performance when paired with sparse coding and simple linear classifiers and its statistical properties which make it well suited to sparse representations.



Figure 1: Bharathanatyam Navarasas (Nine Emotion)

A.Orientation Filter

We use log-gabor filter for image filtering. The log-gabor filter has seen great popularity in image processing. Because of this, it is useful to consider the 2-dimensional extension of the log-gabor filter. With this added dimension the filter is not only designed for a particular frequency, but also is designed for a particular orientation. The orientation



- Shringaram(Love)**
- Adbhutam(Wonder)
- Raudram(Anger)
- Bhayanakam(Fear)
- Bibhatsam(disgust)
- Hasyam(Laughter)
- Karunyam(Kind Heartedness)
- Santam(Peace)
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IV. CONCLUSION

In our future model, we use log-gabor filter to extract local orientation from input images in the first level. The reason why we use log-gabor filter is in pattern recognition, the input image must be transformed into a feature representation that is easier for a classification algorithm to separate classes. Features formed from the response of log-gabor filter may form a good set of features. Because it can locally represent frequency information. The filter has been successfully used in face expression classification. In the second level, it consists of neurons with layer receptive fields, which pool the filter responses. Pooling is done by max operator. Max pooling increases the position invariance and robustness to sensor noise. The third level consists of feature detectors. In our model, these are learned through PCA. PCA is a useful statistical technique for face recognition and image compression. Its key advantage are its low noise sensitivity, the decreased requirements for capacity and memory and increased efficiency given the processes taking place in a smaller dimensions. At the top level, an emotional category that is Bharathanatyam navarasas have to be determined. Since the categories are represented by body pose (Bharathanatyam dance pose). To recognize navarasa emotions, we use SVM classifier. SVM is a powerful algorithm for producing very accurate classifiers and less over fitting, robust to noise.

Figure 2: Future Model To Recognize Navarasas Of Bharathanatyam Dance.

C. Template Matching

Template matching is a technique in digital processing for finding small parts of image which match a template image. It can be used in manufacturing as a part of quality control, a way to navigate a mobile robot, or as a way to detect edges in images. Template matching techniques are flexible and relatively straightforward to use, which makes them one of the most popular methods of object localization. If the image has strong features, a feature-based approach may be considered. For templates without features, or for when the bulk of the template image constitutes the matching image, a template based approach may be effective.

D. Principal Component Analysis

(PCA) also known as the eigen face approach is one of the popular method for facial expression recognition. The major goal of PCA is to reduce the dimensionality for effective face indexing and retrieval. Also, PCA uses linear projection, which maximizes the projected sample scattering. We use this technique in our proposed future work.

E. Category Decision

The output of previous level in our model is converted to an emotion category with a support vector machine(SVM) classifier.

Support Vector Machine

SVM uses linear models to improve nonlinear class boundaries. It transforms the input space using a nonlinear mapping into a new space. Then a linear model constructed in the new space can represent a nonlinear decision boundary in the original space.

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