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Framework for teaching Bharatanatyam through Digital Medium

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***Abstract*—Bharatanatyam is one of the most ancient Indian classical dance forms. There are students spread across the globe who learn this dance form at dance schools. Yet there exists no digital platform to help them systematically understand and independently practice the dance. This paper illustrates an effort to develop a digital Bharatanatyam interaction. A hierarchical architecture is extracted from the dance movements by analyzing its grammar. This is used in developing a framework to digitize the dance form. A mobile-based applet can then be implemented, as a teaching aid for this dance form, to the enthused in a game based approach. This would enhance the students' understanding and also assist them in a virtual guided practice.**

Keywords- Bharatanatyam; Nritta; hierarchical architecture; game-based learning; guided practice;

I. INTRODUCTION

Bharatanatyam is one of the oldest Indian classical dance forms. A popular interpretation of its name is *BHAva* (expression) + *RAgam* (music) + *TAlam* (rhythm) + *NATYAM* (dance) = *BHARATANATYAM.* Indian classical dance are broadly classified into

1. *Nritta*: *Ragam*+*Talam* (pure dance)
2. *Nritya*: *Nritta* + *Bhava* (drama)

The *Nritta* basis of *Bharatanatyam* possesses an inherent structured approach to develop compositions and present the art form. There have been few attempts to teach *Bharatanatyam* for distant learners by video tutoring and illustrating the postures by animated stick figures or pictures [1]. In this process the learner just imitates the art form as depicted by the picture but lack in the informative understanding of the techniques. The strong pattern in *Bharatanatyam* motivates us to discretize it for digital rendering. The current paper proposes a schematic codification of the patterns for developing a digital platform for interactive teaching and learning.

II. GRAMMAR OF *NRITTA*

Bharatanatyam Adavus (basic steps) revolves around either of the three basic positions as given in Fig. 1.

Adavus [2]are divided into 14 categories, according to their footwork. The hands usually follow the footwork. The head and the eyes coordinate with the hand. Each of those 14 categories has sub variations leading to around 120 such basic movements [3]. Stringing of *Adavus* form *Nritta* compositions. Melodic patterns, based on any particular *Talam* (rhythm), are visualized as dance sequences. Geometrical patterns are rendered in time based on *Talam* and space.

Figure 1. Basic positions of *Bharatanatyam*

III. CONVENTIONAL PEDAGOGY

All classical dances have specified technique and body kinetics governing them. Every student needs to learn the details of these techniques. Traditionally *Bharatanatyam* is learned through the *guru-sishya parampara* (teacher student interaction) where the body movements and patterns structured in it were explained by live demonstration. Learning the complete set of *Adavus* itself takes almost two years. Only after learning *Adavus* the student graduates to learn compositions like *Tillana, Alarippu, Jatiswaram,* etc [4].

Developing an application that would visualize the patterns in an interactive manner will definitely enhance the learning experience.

IV. A HIERARCHIAL MODEL OF *NRITTA*

Following a top down approach, any *Nritta* composition is discretized as combinations of *Adavus*. A movement in the *Adavus* is interpreted as changing body postures associated with specific transitions. Body postures are assembly of individual body parts

At each level of this model an associated rule is formulated based on the human body constraints and specific postures and movement that the grammar of *Bharatanatyam* allows.

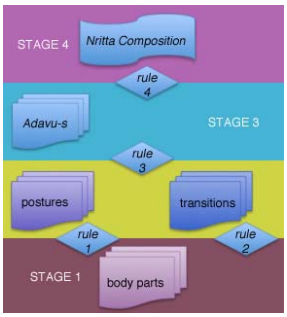

Figure 2. Hierarchical model and bottom up process Flow for computer implementation

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V. COMPUTER IMPLEMENTATION

The Indian dancer, like an Indian sculptor, does not lay much emphasis on the muscles of the human body but takes the joints and the fundamental bone structure as its basis [3]. Based on this the bottom up approach can be taken to assimilate a dance piece. The process flow for computer implementation is stage-wise described in Fig. 2.

A. Stage 1- Indexing the body parts

The body is divided into parts each having possible configurations that appear in dance. Corresponding orientations of each configuration are counted. Indexing of all possibilities is done as Part.Configuration.Orientation. This generates the library of body parts with all the possible configurations and orientation. Fig. 3 describes the schematics of division of body and illustrates an example of library elements for the head.

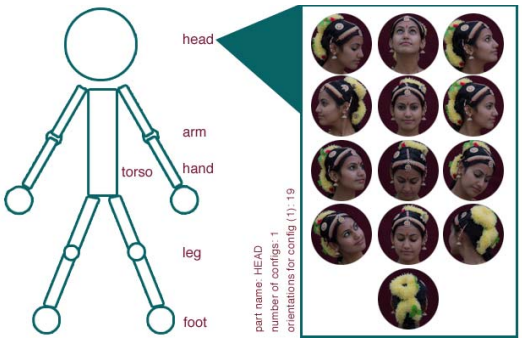

Figure 3. Body parts classification & library elements for head

B. Stage 2- Generating body postures

Elements are selected from each body part library and are assembled to define a body posture. Assemblies of kinesthetically valid and correct postures are governed by the first set of rules. Each posture is specified as an ordered list, defined by the index number of the individual parts. Fig. 3 illustrates the concept of assembly of individual body parts into a body posture. Thus at this stage a second library is generated that keeps the list of all possible body postures.

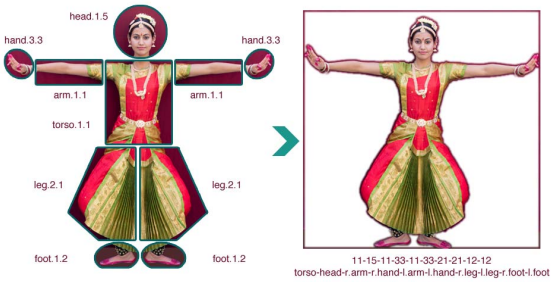

Figure 4. Body posture generated by assembly of body parts

C. Stage 3- Generating Adavus

Adavus is defined as sequence of the body postures with a specific transition associated with each body part. A list of the transitions is stored in a library and a rule set would govern how applying transition would transform each body parts.

Adavus form a library, whose elements are the ordered sequence of the pointers to postures and transitions. *Adavu*s are used for subsequent development of *Nritta* compositions. A visual storyboard of the movements in *Natta Adavu* is demonstrated in Fig. 5.

D. Stage 4 – Creating Compositions

Sequencing string of elements from the *Adavus* generates a composition. Each posture of the *Adavu* corresponds to one rhythmic time cycle. Hence given the total length of the sequence, choosing combination and permutations of the *Adavus* of appropriate time length generates a composition. The symmetric nature of each composition and the conventional end piece by the *Tirmaanam* derived from the grammar gives the governing rule to validate the generated composition.

VI. FUTURE MOBILE IMPLEMENTATION

The library generated by the body postures and the *Adavus* can be stored in a device. A game based on puzzle can be modeled to generate various body postures. The user can find which all *Adavus* has the posture that is formed by assembling puzzle based game. A fit-tetrix based game can generate composition and make a mobile-based *Bharatanatyam* choreography applet. This would be helpful in imparting guided practice and structured information about the techniques of *Bharatanatyam*.

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Figure 5. Generation of a *Nattadavu*