

Synchronization of Dance Motion Data Acquisition using Motion Capture



Joko Sutopo, Mohd Khanapi Abd Ghani, M.A.Burhanuddin

Abstract: *Dance is a body activity that unites body movements, art and certain meanings. Dance performances are sometimes only performed at certain times, so that it is not well known by the public, especially young people today, especially classical dance. They are more interested in presenting a more modern culture because of the development of the times and more advanced technology. The lack of public knowledge about current dance moves has encouraged researchers to conduct motion capture research for dance movements using the Kinect sensor. This paper proposes a technique called mechanical motion capture to capture the motion of objects, namely the dance movement Golek Menak which is one of the classical dances in Indonesia. The proposed Kinect motion capture technique requires special input devices such as cameras with the ability to capture motion up to 2000 frames per second. Kinect has the facility of RGB camera and depth sensor (depth sensor). Kinect's advantages over other tools that can capture and track the movements or actions of three-dimensional (3D) objects (humans and animals) accurately, without marking under certain lighting conditions by utilizing depth sensors. The results showed that the Kinect sensor was able to perform motion capture (MOCAP) techniques in dance movements accurately to produce the right body frame with the movement of dance props which subsequently developed the results in various fields, one of which was the development of motion characters for animation. The results of the synchronization of dance motion data and the capture of motion with motion capture then in this study were developed in the animation of dance movements.*

Keywords: *Dance, Gesture, Motion, Capture, Movements.*

I. INTRODUCTION

Dance performances are one of the internationally recognized cultural heritages. Dance performances are a form of cultural arts activities that reflect aspects of social, political, economic, religious, linguistic and public relations. Dance shows have meanings and meanings that can arouse a culture so dance is also a symbol of regional pride [1].

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So that dance continues to exist as a culture that needs to be maintained, dance needs to be developed in the learning process that is in accordance with the development of society and technology, so that dance as high culture and art is not extinct or forgotten by generations of society. Along with the development of information technology, dance in the process of maintaining its existence, developed learning technology with information technology ranging from video, animation, multimedia and internet social media.

One of the technological developments in learning is the motion capture (MOCAP) technique, which in this study is used to capture dance movements from dancers with Kinect sensors [2]. Kinect sensor is an input device for detecting the movements of actors or dancers [3]. Kinect has RGB camera facilities and a depth sensor (depth sensor). One of the advantages of Kinect compared to other devices is that it can capture and track the movements or actions of three-dimensional (3D) objects both human and animal accurately, without marking in certain lighting conditions by utilizing depth sensors.

In addition, the price of Kinect is quite affordable (low cost), resistant to interference (not disturbing) and can work even if the lighting is lacking. However, Kinect motion capture systems require distance calibration of the right object fishing [4], [5]. This paper is arranged in a sequence of studies, namely part 2 presents works related to the capture of dance movements and movements. Section 3 presents the proposed method and section 4 presents the results obtained and followed as well as discussion or discussion. Finally, section 5 concludes from the results of this work.

II. RELATED WORK

Dance performance [6] is a show of gesture activity as a work of art that has spiritual, health, cultural values and various values. Dance performances are now a means to convey moral messages, entertainment, advice, and announcements to the public. Dance performances have contributed to society both economically, spiritually and socio-politically. Dance as a cultural value that is not extinct needs to be maintained in the learning process, in accordance with the times and technology.

At present there is a technology of learning processes namely Motion Capture or MOCAP also called digital recording techniques in the movement of real objects usually human or animal can be illustrated in computer character animation [7] how it works MOCAP technique to perform extraction movements of objects in the real world into The computer uses a set of input devices,



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the next actor or visual motion input device with a set of models that have determined the pattern of movement according to the story.

The advantages of the MOCAP technique are that the images produced are more involved with faster production time, the cost of the production process is significantly reduced due to reduced time and more effective processes, movements that are produced naturally and accurately by the natural movements of the objects taken. The disadvantage of this technique is that MOCAP requires certain hardware and software, the application level and input devices become obstacles for small industries and require synchronization accuracy in motion when shooting motion pictures.

The application of motion capture (MOCAP) techniques by utilizing the Kinect sensor catch will produce the appropriate motion data from each dancer movement with the motion data format in the form of bio vision hierarchy (BVH). Kinect Sensor technology controls the game introduced by Microsoft in November 2010. Kinect continues to grow not only for games but also for robot applications, virtual reality, medical, and various identification patterns without the need for additional hardware.

The Kinect Sensor software was developed with technology from Microsoft Game Studios and camera technology from Prime Sense. In Kinect with camera technology can interpret certain movements or movements without using hand control (hands-free) by utilizing an infrared projector, RGB camera and microchip to track the movement of objects in the 3D field. The shape of the sensor Kinect as illustrated in Figure 1 below is a long box that has support with a shaft that can rotate and can be placed in various positions.

III. PROPOSED METHOD

This study was conducted by observations and interviews with experts dance puppet show *Menak* for basic movements of dance puppet show *Menak*. Point gestures of dance puppet show *Menak* twenty (20) points, include: head, neck, chest, hip, right hip, left hip, right knee, left knee, right ankle, left ankle, left shoulder, right shoulder, right shirt collar, shirt collar left, right elbow, left elbow, right wrist, left wrist, right ankle and right ankle. Arrest dance movements with a Kinect sensor will generate data in the form of dance movement biovision hierarchy (BVH) [11], [12].

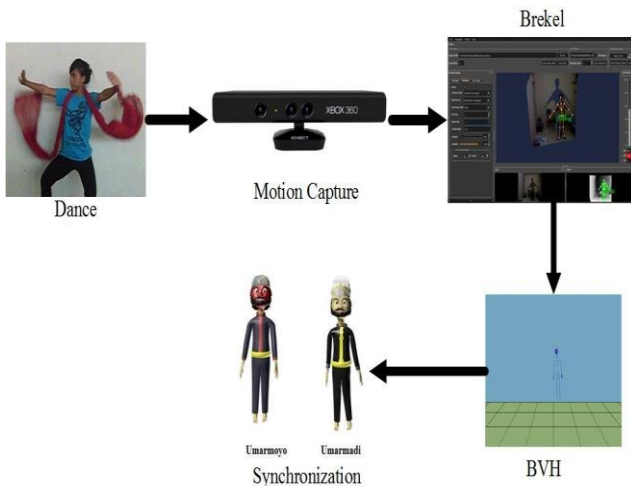


Fig. 1. Flowchart System

Where on the front makes the shape of the front of the character such as the length of the body, legs, hands, head,

and make the eyes and mouth, while the side makes a character posture consisting of the shape of the hands, feet, chest shape, and rear body shape. The results of the arrest of the actor (BVH) are then made an adjustment process to synchronize the motion to the animated character, starting from the body's reinforcement settings, the rhythm of motion, time and suitability of the motion [11], [12].

IV. RESULT AND DISCUSSION

A. Visualization Puppet Ballet of Golek Menak

Puppet shows are one of the performing arts and culture of Indonesian people are very famous. Puppet show presented not to use screens and figures his players in the form of dolls made of wood. However, people presently presenting puppet shows not only presented in the form of a doll but has developed in the form of ballet (art, drama, and dance). The characters in the ballet performances played by human or person (See Figure 2). So that in the show will perform several people or leaders who conduct a dialogue with dance movements. Menak dance movement puppet show includes a series of blows, Ulap-Ulap, Muryani fashion, Lampah Sekar, Minang-style martial arts, and warfare. Dance movements are the one that will be captured by the Kinect sensor.



Fig. 2. Gesture Dance

B. Motion Capture

Motion capture is a technique of making animated using motion capture actor or dancer puppet show Menak. In the motion capture process is required to perform capture motion equipment such as personal computers (PCs), Brekel version V.0.50 and sensor Kinect Microsoft Kinect X-Box 360 Kinect Brekel Software Version V.0.50 an interface or link between X-Box Kinect sensor 360 (input) with the actor as a processor from the motion capture actor.

In addition to the hardware and software needed actors who demonstrate movement also planned. In this case, the actor is a puppet show Menak, a real dancer. Movements in ballet Menak puppet show, one by one performed by an actor. The distance between the Kinect sensor with the actor about 1.5 meters. In this process also required operators of motion capture that people who operate and record all sorts of movements that will be and has been done by the actor. Operators will prepare for the motion capture equipment ranging from the installation of Microsoft Xbox Kinect with the adapter, mounting to the computer until recording motion captured using software Brekel.

Actor motion captured by the Kinect sensor will be processed using software Brekel to generate data movement position (BVH). In the motion capture process takes proper calibration settings as shown in Figure 3 depicts an actor who is performing the calibration to adjust the position of the motion capture process.

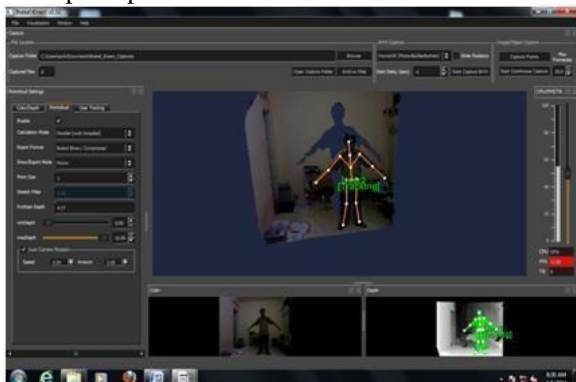


Fig. 3. Dance Motion Capture Process

C. Motion Capture

Motion data generated from Brekel software be Biovision Hierarchy (BVH) containing a skeleton structure with motion positions *x*, *y*, and *z*. The shape of the body skeleton motion capture result as in Figure 4 below.

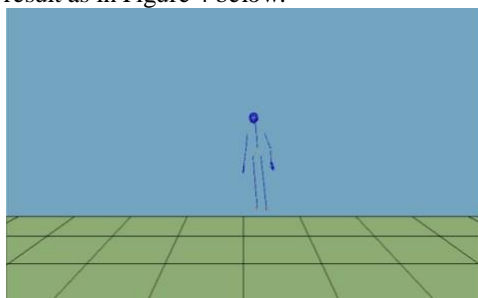


Fig. 4. Skeleton Body

The MOCAP data format consists of the skeleton which is a representation of the movement of the character as a whole, bone as the basic entity of the skeleton that are subject to transformation, Channel or Degree of Freedom (DOF) as a parameter for the transformation of the bone (translation, rotation, movement orientation) and frame as a collection of information channel / DOF for each bone in a pose [8].

Biovision Hierarchy (BVH) is used as the MOCAP data format generated by the Kinect because it has the support of compatible data formats to be imported and in-export on several 3D software [9]. BVH data format consists of two parts, namely the hierarchy of information on the structure of bone and parameter data information section of each channel. BVH used standards-based animation movement data structure of the human body as well as a supporter of MOCAP animation techniques and other support software under development [10].

D. Motion Capture Results

Motion capture results obtained from the arrest of the Kinect sensor in the form of motion data BVH motion dancer Marionette Puppet *Menak*, examples of modelling the gestures of the dancer's movement as shown in Figure 5, BVH motion data generating position data of motion.

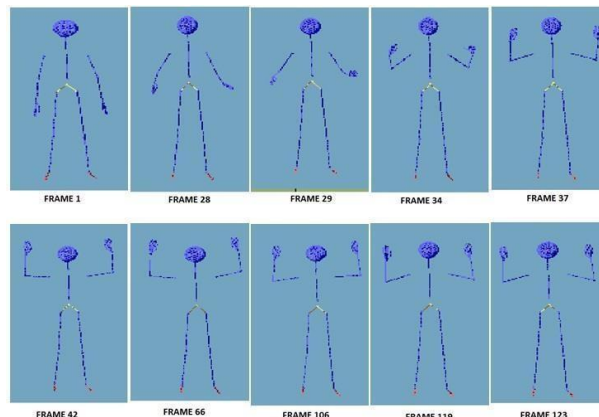


Fig. 5. Frame Body Motion Position

Motion capture motion data results *Menak* puppet dance is then performed with the synchronization process models using a 3D character animation application Blender 3D is a 3D character with the intention that can move like movements performed by dancers *Menak* puppet show. Synchronization results in the form of an animated puppet showed *Menak* with figures Umarmoyo Umarmadi and accompanied his movements as in Figure 6.

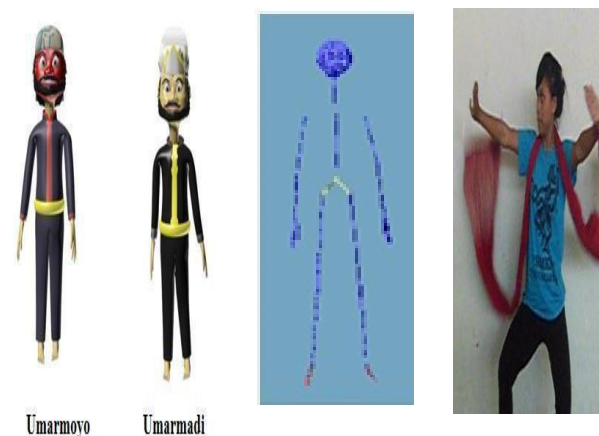


Fig. 6. Synchronize dance moves and animated characters

The results of catching movements by actors using motion capture will produce BVH files that will be synchronized with animated characters named Umarmoyo and Umarmadi who each perform the same or different movements. All recordings of motion capture using motion capture can be synchronized with the animated characters in Figure 5. The results of BVH synchronization to animated characters produce the same movements as those of the actor.

V. CONCLUSION

This paper has proposed a technique called mechanical motion capture to capture the motion of the object, namely dance puppet show of *Golek Menak*. The proposed technique has required special input devices such as cameras with motion capture capability up to 2000 frames per second, using the Kinect sensor. The Kinect sensor can capture motion puppet dance *Menak* with 20 points on the body position of the actor called the skeleton.

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The format of the motion data generated in the form Biovision Hierarchy (BVH) is a compatible format to be imported and in-export on some 3D software. The results of the synchronization of motion data resulting from the motion capture of dancers in this study, are further adjusted to the character of the characters in dance animation. So there needs to be an adjustment in the motion capture technical as well as BVH data with character.

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