Title: A Survey on Dance Gesture Recognition

Mr. Kriti Verma

kriti.verma2006@gmail.com

Abstract:

Gesture recognition implies the recognizable proof of various articulations of human body parts to express the thought, contemplations and feeling. It is a multi-disciplinary examination region. The application zones of motion acknowledgment have been spreading quickly in our genuine exercises including move signal acknowledgment. Move motion acknowledgment implies the acknowledgment of significant expression from the distinctive move postures. Today, examine on move motion acknowledgment gets more consideration all through the world. The computerized acknowledgment of move signals has numerous applications. The thought process behind this overview is to introduce a far reaching study on robotized move motion acknowledgment with accentuation on static hand signal acknowledgment. Rather than entire body development, we consider human hands since human hands are the most adaptable part of the body and can exchange the most significance. A rundown of exploration issues and open difficulties is likewise highlighted.

1. INTRODUCTION

Gestures are capable and characteristic methods for non-verbal correspondences in which obvious body activities are utilized to convey vital messages. Gesture acknowledgment implies the distinguishing proof of significant articulations of human movement; including acknowledgment of fingers, arms, hands, head and body expressions [1].

To study signal acknowledgment, it is crucial to comprehend the applications, definitions and nature of the motions. Gesture acknowledgment is a multi-disciplinary examination region. The application zones of signals spread from our day by day life exercises to Artificial Intelligence through Electronics Engineering [2], Medical Science, Education, and Robotics [3] furthermore for amusement [4] reason.

We formally characterize the motion and hand signal as takes after.

Definition1: Gesture: It is characterized as a picture expression that convey a message.

Definition2: Hand motion: It is characterized as a hand picture expression which pass on importance amid common discussion.

Hand motions are the most vital sorts of motions since human hands are the most adaptable parts of the body and can exchange generally importance. Society particular hand signals can pass on various implications in various society.

In the later past, a few audits on motion acknowledgment [1], skeleton signal acknowledgment [5], vision-based motion acknowledgment [6], and vision-based movement catch [7] have been distributed

in writing. In any case, our overview varies from them in the accompanying ways.

1. Like [1],[5], we likewise give a scientific categorization of signal order procedures and also, we talk about vision-based motion acknowledgment. Additionally, we incorporate examination of different glove-based and vision-based methods.

2. Unlike the greater part of them, we highlight a rundown of issues and research challenges in this live research area.

The primary parts of this overview is to give data about presence take a shot at robotized signal acknowledgment in move space and to bring up the issues and to give thoughts to future degree in this area. Mechanized acknowledgment of move signals can help in making all inclusive correspondence environment for a move show, free of the dialect utilized as a part of the related melody [8]. In this way, such acknowledgment framework helps a viewer to comprehend the significance of move successions regardless of the dialect of the foundation melody. Likewise, it incorporates applications, for example, move self-appraisal and e-learning of moves [9], [10]. Next, we examine six noteworthy uses of signal acknowledgment.

1.1. Computer vision

Gesture recognition in PC vision helps enhancing the Human Computer Interaction (HCI) as, say, giving backing to youthful youngsters or physically tested individuals to interface all the more adequately with PC. Creating of different gesture based communications like American sign language[11], Arabic sign language(ArSL) [12], Japanese communication through signing (JSL) [13], [14], Korean sign language(KSL) [15], [16], Brazilian sign language[17] gives new life for listening to weakened and physically tested individuals. Framework created for hand motion acknowledgment in PC vision can without much of a stretch perceive the motions and utilize them for controlling the electronic gadgets.

1.2. Electronics Interface

The interest for touch and touch-less innovations are another real extension for signal acknowledgment research. The remote control gadget, multi-touch gadget, touch cushion, iPhone, info gadgets like wired gloves, profundity mindful cameras, stereo cameras all are straightforwardly or in a roundabout way included with signal acknowledgment research.

1.3. Artificial Intelligence

Gesture acknowledgment generally engaged with the investigation of usefulness of person. It expects to accumulate and speak to human signals and utilize them to pass on significance. Acknowledgment of communications via gestures and lie identification are different conceivable outcomes of motion acknowledgment.

1.4. Neurology

The fundamental errand of neurology is to create and bolster human knowledge. Understanding human feeling and conduct is the most vital examination range in present day world. Gestures are by and large handled in the left sub-par frontal gyrus (Broca's range) and the back center transient gyrus zone. These ranges of the cerebrum bolster the blending of signal and significance and it adjusts in human advancement. It works for both co-discourse and stunned motions [18].

1.5. Medical Science

Observing the patient's enthusiastic state and push is another significant utilization of motion acknowledgment. Hand motion acknowledgment frameworks can help specialists in surgical environment to control advanced pictures amid medicinal treatment.

1.6. Social Significance

Today, gesture acknowledgment likewise has an imperative part in our everyday life from authority attempts to amusement exercises. A vital commitment of gesture acknowledgment is e-learning. It makes simple to convey in video conferencing. Signal can fill in as a scaffold in the middle of human and PC i.e., human-PC connection (HCI) which makes it more easy to use and more adaptable. Demeanors of human body are generally arranged into three sorts of signals [1]: (a) Hand motions, (b) Head and face motions and (c) Body motions.

Rest of this paper is sorted out as takes after Section 2 gives a nonspecific perspective of move signal acknowledgment which is the prime center of this work. Section 3 gives scientific categorization of signals and in Section 4 covers the work survey on move motion acknowledgment area took after by study on glove-based and additionally vision-based methodologies. Area 5 gives the future course of the study. At last, section 6 closes the rundown of this overview paper.

2. DANCE GESTURE RECOGNITION

Research on move gesture acknowledgment has been getting an expanding consideration every day. Robotized move gesture acknowledgment is an exceptional undertaking of general gesture acknowledgment. Move gesture acknowledgment implies the acknowledgment of important expression from various move postures. It communicates the significance of move dramatization and make all inclusive correspondence environment. It can likewise help for self-appraisal and e-learning of moves [8].

Next, we give few noteworthy definitions to give an establishment on move signal acknowledgment.

Definition 3: Gesture Feature: Gesture highlight fi of a motion sort gi is characterized as a normal for gi.

Definition 4: Gesture Feature Vector: It is characterized as a subset of elements fi 's to speak to a signal sort.

Definition 5: Gesture Class: It is characterized as a gathering of comparable signal pictures.

Definition 6: Gesture Recognition: It is a procedure of perceiving a sort of signal

The method for move signal acknowledgment can be isolated into four noteworthy stages; viz., (a) picture obtaining (b) preprocessing, which can be further separated into two noteworthy errands, i.e., (i) division and (ii) limit location, (c) highlight extraction and (d) grouping and acknowledgment

We now portray each of these stages, in a nutshell.

2.1. Picture Acquisition

The catching of picture is for the most part performed by a spotless situation with uniform foundation utilizing single camera. In the event that we utilize two cameras with roughly orthogonal course then we can without much of a stretch lessen the ambiguities contrasted with single perspective methodology. Kinect sensor camera [19] or profundity sensor camera [9] are utilized for catching 3-D pictures. The pictures can be specifically skeletonized furthermore the position of the skeleton can be evaluated by utilizing both these cameras.

2.2. Preprocessing

The primary undertaking of this stage is to prepare the pictures those are caught in the past stage without losing their remarkable elements. The pictures are prepared by editing, resizing, separating, changing (utilizing say Gaussian channel or Gabor Wavelet channel) and extricating the article from the foundation.

The accompanying steps are for the most part included for preprocessing the pictures.

2.2.1 Segmentation

Division is the procedure by which questions of various shapes can be extricated from the foundation. The division calculations are subject to various sorts of elements, skin shading based [20], surface based [21], saliency object based. Mixture Saliency calculation [8] is an exceptionally well known division calculation which is utilized on pictures with complex foundation to highlight the article from foundation and to discover the remarkable element of the pictures. Utilizing this calculation the remarkable locales can be separated from the foundation points of interest effortlessly.

2.2.2 Boundary Detection

The picture division dependably not gives legitimate result (limit). In this way, to detect the limit edges, numerous morphological operations are utilized. The general morphological operations of picture handling are disintegration, widening, diminishing, separating and gap filling operations. For instance, skin shading based division calculation contains numerous inconsistencies [10]. Utilizing opening operations (disintegration went before (widening operation), it is conceivable to uproot these abnormalities. The chain code era calculation is utilized for distinguishing the unbounded edges. Resultant limit of surface based division contains topological blunder like opening. To top off these openings diverse filling operations, Sobel edge identification and numerous others methods are utilized [22].

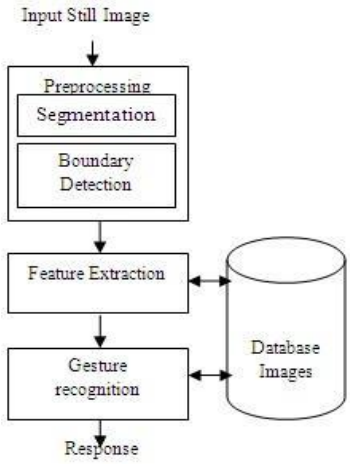

Fig 1. Generic view of Dance Gesture Recognition System

2.3. Feature Extraction

In the wake of preprocessing, the following stride of acknowledgment is highlight determination. It is a procedure by which we can change the information into an arrangement of elements. The determination of feature(s) is/are not a simple undertaking, it is critical to pick legitimate feature(s) vector to arrange the pictures. Introduction histogram [10], [23], cross breed saliency procedures [8], Steer channel [10] are some current element extraction methods used to concentrate sorts of components such as (e.g., zone, real pivot length, minor hub length, centroid and unusualness) of mudra pictures can be removed. A noteworthy issue is to discover an ideal and pertinent component vector that can characterize the pictures in any mind boggling foundation with high acknowledgment exactness.

2.4. Classification and Recognition

This is the last period of gesture acknowledgment. The fundamental employment of this stage is to comprehend the pictures. To comprehend the pictures, it needs to cross two stages: picture arrangement and picture acknowledgment. Picture characterization implies which

class it fits in with. For instance it is human hand i.e., discover the position of certain item. Picture acknowledgment implies which signal it is, i.e., perceive the example. The grouping and acknowledgment might be of managed or unsupervised. To group any pictures, the signal dataset are isolated into preparing set and testing set [8]. A noteworthy bit of the dataset are use as preparing set and the persisting set are utilized to characterize or test the information [19]. The distinctive arrangement techniques[24] for move signals are simulated neural system (ANN), choice tree (DT), bolster vector machine (SVM)[25], fluffy classifier, fluffy set hypothesis based procedures [25], shrouded markov model [26], back proliferation neural system [27], molecule separating and chart hypothesis based [1], fluffy L-participation [23] and KNN(K-closest neighbor) calculation.

3. GESTURES TAXONOMY

Gestures are extensively ordered into two sorts: static motions and element motions (Table I). Aside from this expansive grouping, a few different characterizations are given by different creators. Some of these characterizations are delineated in Fig. 2 and portrayed in the remaining part of this area. Signals have differently been ordered by various individuals [28], [29] in various timeframe.

Gestures	Meaning	Example
Static gestures	Static gestures are those where the user assumes certain pose or configuration.	Stop 
Dynamic gestures	Dynamic gestures are those gesture where the three phases prestroke, stroke and post stroke are considered	Goodbye 

Table1. Basic types of gesture [1]

3.1. Efron's Classification

Efron is thought to be the pioneer of grouping signals. His grouping depends on the semantic parts of the motion conduct and expression [28]. By, signals can be of two sorts: "objective" motions which are stunned and 'sensible desultory' which depicts alongside discourse. Target motions are more distant sorted into three sorts of signals i.e., deictic, physiographic and typical motions. Coherent verbose motions are sub characterized into Batons signals and Ideographic motions.

3.2. Kendon Classification

In the year 1988, Kendon grouped the signals in light of the assortment of prerequisite and discourse dependency[28]. These signals are arranged into five sorts as i) Gesticulation motions which are utilized as a part of general discussion with articulation, ii) Speech-surrounded motions are the part of the sentence itself. iii) Emblems are perceived without discourse, iv) Pantomime, these are utilized to portray the story without discourse and v) Signs motions are for the most part utilized as a part of gesture based communications. These sorts of motions have their own particular semantic

structures, syntactic examples, vocabulary and morphological examples.

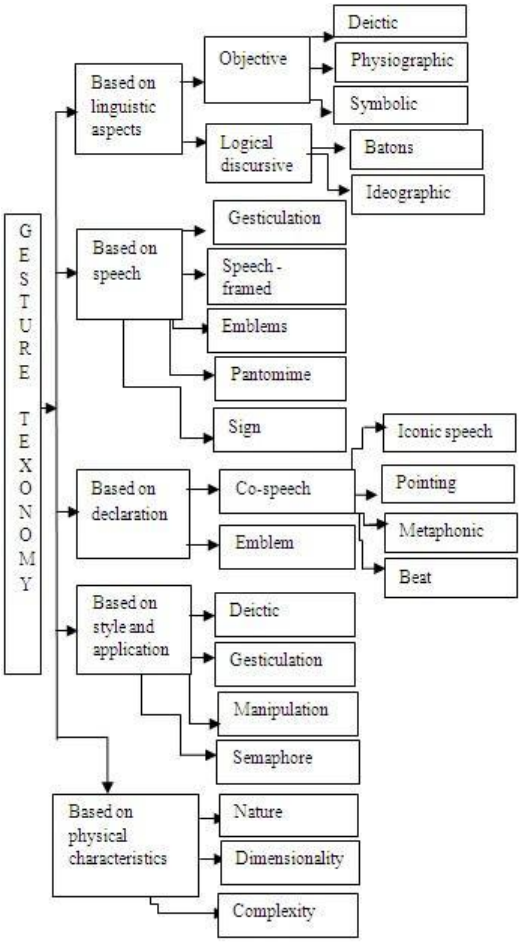

Fig 2. Gesture Taxonomy

3.3. David McNeil Classification

By McNeil, motions are characterized into Co-discourse motions and Emblems signals [29].

3.3.1 Co-discourse motions

Co-discourse motions are the sort of signals which are utilized alongside word. These sorts of signals are arranged into the accompanying sorts:

3.3.1.1. Notable

These motions are utilized alongside discourse. At whatever point we express some physical matter we utilize our hands to clarify it all the more unmistakably. For instance, in the event that we depict about some genuine thing such as how enormous or little it is, then we paint our hand alongside the word. Notable signals are not the same as whatever is left of motions as in it is utilized to portray genuine and existing matter.

3.3.1.2. Indicating:

The directing signals allude toward the way individuals demonstrate the pointing so as to learn. One can show a spot or maybe a thing moving starting with one place then onto the next utilizing this signal. For instance, on the off chance that we point somebody over the room, then, actually we make point our finger in the suitable bearing.

3.3.1.3. Figurative

This kind of signals can express a thought generally. For instance, when we are portraying something complex, additionally we wave our hand noticeable all around. These sorts of signals likewise include feeling and flavor when something being said. At some point it is pretty much sensational. Making our hand into heart shape and setting in our mid-section to demonstrate the fondness to a friend or family member.

3.3.1.4. Beat motions

Beat motions are identified with cadenced beating of hand expressions. At some point they might be portrayed by a solitary beat or might proceed with the entire term the length of clarifying some specific point. These signals can differ contingent upon circumstance. [29]

3.3.2. Symbols motions

Symbol motions demonstrate those are free of discourse, it is a particular kind of signal with particular implying

that are purposefully utilized and inadvertently caught on. These signals are utilized as a substitute of words which are like gesture based communication. For instance we can perceive diverse letter set and numbers by utilizing our hand expressions.

3.4. David Karam's classification

Karams arrangement of signals depend on representation of gesture, application area and data yield technology[28]. These signals are of four sorts: Deictic, Semaphores, Gesticulation and Manipulation

3.4.1. Deictic

Deictic motions allude to indicating character or spatial area of an item.

3.4.2. Semaphore

This sort of motions can be communicated by means of body part or different items and electronic gadgets, for example, a mouse.

3.4.3. Signal

Signals motions are co-discourse multimodal motion, comprising of hand development, this sort of motions are not pre-arranged.

3.4.4. Control

This sort of signals is additionally alluded to as physical motions. This class of signals offers significance to the connection between hand development and the item being controlled.

3.5. Ruiz classification for 3D -motion gestures

These characterizations of signals are utilized as a part of 3D-movement motions that are connected on cell phone (advanced mobile phone). The signals are arranged in light of physical attributes [28]. The physical characters are dynamic drive, dimensionality and intricacy. These signals are ordered as body part, handedness, hand shape and the scope of movement. The four sorts of dimensionality for the signals are utilized as i) Single-pivot which are utilized around the single hub. ii) Double-pivot signals are utilized on plane i.e., on 2D surface zone. iii) Tri-hub motions are utilized as a part of 3D space and works either on translational movement or rotational movement and iv) Six-pivot motions, are likewise utilized as a part of 3D space yet distinction is the it chips away at both sorts of movement, translational and in addition rotational movement. The Complexity of these sorts of signal might be of straightforward or complex, contingent upon the circumstance.

4. LITERATURE REVIEW

Research on move gesture is still on in quick stage, however inside of this brief period it has gotten a decent force. Presumably, Efron [30] is the pioneer who took a shot at motion examination in brain research. The execution of hand signals are separated into three stages: arrangement, stroke and withdrawal. He demonstrated motions as a principle hinder for human movement in the early piece of 1940. Later, Kendon proceeded with Erfon's work [31] and changed over how signal identified with words in dialect. He likewise demonstrated the main portion of human motions and acknowledgment. From that point forward, motion examination in move field has appeared.

The momentum research on move field can be sorted as (i) Bharatnatyam [10], where acknowledgment in light of two level choice making framework and works with single hand motion, (ii) Odissi [25], where the motion of entire body utilizing dynamic sensor. Their work is conveyed with just eleven co-ordinates out of twenty distinct joints of skeleton,(iii)Bali Traditional Dance [9], which deals with probabilistic punctuation based classifier, (iv) Ballet Dance [22] where various stage framework is proposed to perceive the diverse move

stance, (v) Kazakh Traditional Dance [26] is fundamentally worried with the head motions and numerous others. A joint group [10] likewise has been discovered taken a shot at signal acknowledgment of Bharatnatyam hastas. Bharatnatyam is the most seasoned move type of Indian traditional move. This gathering intends to create one model to perceive the 28 asamyukta hastas of Bharatnatyam in two dimensional structure. They work for making self-learning offices for artists and to advance e-learning of Bharatnatyam over the world. In [9], accentuation has been given on Bali customary move. Their mean to assemble a strong recognizer in view of etymological spurred technique. The creator utilize the Alergia calculation with Symbolic Aggregation Approximation (SAX) discretization strategy and discovered 92%accuracy. The work in light of critical joint components like left/right foot and left/right elbow of Bali conventional move. The creators of [25] mutually propose signal acknowledgment calculation for Indian established move style utilizing sensor. They made one gadget which produces the skeleton of human body from which twenty distinctive intersection 3-dimensional directions are acquired. They utilize a one of a kind framework and concentrate the elements to recognize outrage, dread, satisfaction, misery and unwinding. They figure the separation between various parts of the upper human body and produce speed, increasing speed alongside the edge between various points. On the premise of that they remove twenty three elements. The execution of their technique is just about 86.8%. In [8], the creators perceive the mudra succession utilizing picture handling and example acknowledgment systems and apply the outcome to the distinctive articulations of established move. The acknowledgment of mudra succession can hence make dialect free general correspondence environment for the move dramatization. Their framework comprises of two noteworthy parts: preparing and testing. They utilize cross breed saliency procedure in picture to highlight the item from foundation and to discover the striking components of twofold hand mudra picture. They utilize hypercomplex representations for static mudra representation and k-closest neighbor calculation for characterization. The elements of the distinctive mudra are removed and the estimations of these components are contrasted and the element values for every mudra in the database. They apply the k closest neighbor calculation for arrangement amid testing. Yield of this system is enthusiastic depiction for the perceived mudra pictures. According to the writing survey, the move motion acknowledgment approach has been isolated into two methodologies:

(i) Glove-based approach and

(ii) Vision-based methodology. We talk about each of these methodologies next.

4.1. Glove-based Approach

In this methodology [2], sensor gadgets and hand gloves are utilized as a part of the picture obtaining stage. It gives the co-ordinate purposes of skeleton and introduction. In this methodology, client can straightforwardly associate with PC. Nonetheless, two noteworthy restrictions of this methodology are: entirely sweeping and wasteful for working in virtual reality. The related chips away at move signal acknowledgment in glove-based methodology is condensed in Table 2. In glove-based methodology, division calculation is not required. The sensor use in picture obtaining gives skeletanized picture consequently.

4.2. Vision-based Approach

In this methodology [6], the pictures are caught by camera. It is an exceptionally straightforward methodology manages the basic picture attributes like shading, composition and power values. An impediment of this methodology is that it is not ready to give the proper result in a few circumstances such as mind boggling preparing systems which have been utilized to

handle foundation, lighting variety, vague shading mix.

5. FUTURE RESEARCH DIRECTION

In view of this writing overview, we have recognized the accompanying examination issues and difficulties.

1) Developing quicker division strategies for article in an intricate foundation is still a testing assignment.

2) Image of a specific stance might have wide varieties because of position and point of perspective of the camera. In this manner, adding to a hand motion acknowledgment framework fit for taking care of various sorts of changes is a critical examination issue.

3) Dance stances might differ from artist to artist, so exact identification of signals in vicinity of these varieties is a testing assignment.

4) There are no appropriate order procedures accessible in writing, which can recognize all the pertinent gatherings of hand motions and additionally the subset of firmly coordinated motions inside of a subgroup.

6. CONCLUSION

Gestures express human affection, feelings, commitment and describe stories of religious sacred writings and are basic parts of the festival of life. In this review paper, the diagram of gestures acknowledgment with unique accentuation available and move gestures are talked about. This paper likewise gives an extensive study on vision based and glove based signal acknowledgment, motion scientific categorization. At long last, this overview paper finishes up with existing methodologies and strategies to execute and scope for future work.

REFERENCES

[1] Mitra, S. and Acharya, T. 2007. Gesture recognition: A survey. IEEE Transactions on Systems, Man, and Cybernetics, Part C: Applications and Reviews, 37(3):311–324.

[2] Sturman, D.J. and Zeltzer, D. 1994.A survey of glove-based input. Computer Graphics and Applications, IEEE, 14(1):30–39.

[3] Fong, T., Nourbakhsh, I. and Dautenhahn,K. 2003. A survey of socially interactive robots. Robotics and autonomous systems, 42(3):143–166.

[4] Freeman, W.T., Tanaka, K., Ohta,J. And Kyuma, K. 1996. Computer vision for computer games. In Automatic Face and Gesture Recognition, Proceedings of the Second International Conference on, pages 100–105. IEEE.

[5] Pradeep kumar, B.P., Santhosh, S.Y., Manjuatha, M. B. 2014. Survey on skeleton gesture recognition provided by kinect. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 3.

[6] Moeslund, T.B. and Granum, E. 2001. A survey of computer vision-based human motion capture. Computer Vision and Image understanding, 81(3):231–268.

[7] Wu, Y. and Huang, T. S. 1999.Vision-based gesture recognition: A review. In Gesture-Based Communication in Human-Computer Interaction, volume 1739, pages 103–115. Springer Berlin Heidelberg.

[8] Mozarkar, S. and Warnekar, C.S. 2013 Recognizing Bharatnatyam Mudra using Principles of Gesture Recognition. International Journal of Computer Science and Network, 2(2):46–52.

[9] Heryadi, Y., Fanany, M.I. and Arymurthy, A. M. 2012. Grammar of dance gesture from bali traditional

dance. International Journal of Computer Science Issues (IJCSI), 9(6).

[10] Hariharan, D., Acharya, T., and Mitra,S. 2011. Recognizing hand gestures of a dancer. In Pattern recognition and machine intelligence, pages 186–192. Springer.

[11] Starner, T and Pentland, A. 1997. Real-time American sign language recognition from video using hidden markov models. In Motion-Based Recognition, pages 227–243. Springer, 1997.

[12] Maraqa, M. and Abu-Zaite,R. 2008. Recognition of arabic sign language (arsl) using recurrent neural networks. In Applications of Digital Information and Web Technologies, 2008. ICADIWT 2008. First International Conference on the, pages 478–481.IEEE.

[13] Murakami, K. and Taguchi, H. 1991. Gesture recognition using recurrent neural networks. In Proceedings of the SIGCHI conference on Human factors in computing systems, pages 237–242. ACM.

[14] Starner, T, Weaver, J. and Pentland, A. 1998. Real-time american sign language recognition using desk and wearable computer based video. Pattern Analysis and Machine Intelligence, IEEE Transactions on, 20(12):1371–1375,.

[15] Kim, J., Jang, w. and Bien, Z. 1996. A dynamic gesture recognition system for the korean sign language (ksl). Systems, Man, and Cybernetics, Part B: Cybernetics, IEEE Transactions on, 26(2):354–359.

[16] Cho. M.G 2006 A new gesture recognition algorithm and segmentation method of korean scripts for gesture-allowed ink editor. Information Sciences, 176(9):1290–1303.

[17] Bedregal, B. C., C. R. Costa, A. and Dimuro, G. P. 2006 Fuzzy rule-based hand gesture recognition. In Artificial Intelligence in Theory and Practice, pages 285–294, Springer.

[18] Campbell, R., LANDIS, T., and REGARD, M. 1986 Face recognition and lipreading a neurological dissociation.Brain, 109(3):509–521.

[19] Saha, S, Ghosh, S. Konar, A. and Janarthanan, R. 2013. Identification of odissi dance video using kinect sensor. In Advances in Computing, Communications and Informatics (ICACCI), 2013 International Conference on, pages 1837–1842. IEEE.

[20] Phung, S.L., Bouzerdoum, A. and Chai Sr, D.2005. Skin segmentation using color pixel classification: analysis and comparison. Pattern Analysis and Machine Intelligence, IEEE Transactions on, 27(1):148–154.

[21] Belongie, S., Carson, C., Greenspan, H. and Malik, J. 1998 Color-and texture-based image segmentation using em and its application to content-based image retrieval. In Computer Vision, Sixth International Conference on, pages 675–682, University of California, IEEE.

[22] Saha, S., Banerjee, A. Basu, S., Konar, A. and Atulya, K. N. 2013. Fuzzy image matching for posture recognition in ballet dance. In Fuzzy Systems (FUZZ), 2013 .IEEE International Conference on, pages 1–8.