# A Study on the method of creates a realty 3D sign language gesture

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## Abstract

*The developments of digital and multimedia have been increasing the demand of humans desiring the acquisition of real and intuitive information and diversified expressions and the use of animation characters are continually increasing in mass media. With the development of graphic techniques, these expressions of animation characters have become enabled of real and smooth representations. Although, in general, even fine movements of the hair of characters can be expressed using diverse data input devices, the studies on the multimedia technologies for disabled persons are quite insufficient.*

*In this paper, Directness it extracts the data which it move sign language and It propose the method which creates a realty 3D sign language gesture.*

## 1. Introduction

Sign language is a systematic communication mean for the people with hearing impairment who can express almost everything with hands. Even though people are more interested in the sign language it is still uncomfortable since it takes training for a certain period, much time and effort to learn the sign language.

Facial expression and complexion are also very important during the communication with sign language. For example, if a word "smile" is expressed with a smile means "smiling with a beaming face". If it is expressed without any facial expression it is considered as "ridicule". Also, if it is expressed with big smile and it means "big laugh" [1]. Therefore, facial expression and complexion also need to be expressed along with hand motion in order to have maximum effect of real sign language by human. It is necessary to improve the facial component and body movement to express realistic sign language.

In this paper, Directness it extracts the data which it move sign language and It propose the method which creates a realty 3D sign language gesture.

## 2. Technology

### 2.1. Composition of Sign Language

Sign language is a primary communication method used by aurally disabled persons for their social lives and it is a sort of language expression made by aurally disabled persons and is continually being regenerated. Sign language is not a voice system which is expressed by normal persons through utterance but a visual motion system and it is not a simple reproduction of vocal language by gestures but a complete language that has unique expression styles, idiomatic expressions like idioms in English and grammatical structures[2].

The method to composed the signs of sign language may vary between researchers but this article introduced the method of Kim, Seung-Guk(1983) to compose the signs of sign language.[3]

(1) Demonstrative: this refers to nouns, person pronouns, demonstrative pronouns and nouns that refer to time.
e.g.) below, fist, nose, head, red, past
(2)Imitative: imitation of the motions meant by words.
e. g.)See, kick, say, seal, wing, tears
(3) Hieroglyph: Indication by hands of fingers of the forms of the subjects meant by words or the distinguishing properties of them.
e.g.) Mountain, face, triangle, bear, palace
(4) Shaping and pointing: Shaping the form of a subject and pointing to it.
e.g.) slope, corner
(5) Shaping and motion: shaping the form of a subject or a part of it and making the motion of the subject.
e.g.) dragonfly, butterfly, elephant

(6)Assembly of meanings: assembling 2 or more morphemes to make a sign of a word with a different meaning.
e.g.) Sunday, valuable, rose
(7) Transfer: signs used to represent synonyms and analogs of existing signs meaning certain things.
e.g.) teacher, instructor, educator, master, preceptor, mentor

### 2.2. Motion capture

Motion capture refers to the processes of storing motions of objects in numerical data and then transferring the motion data to virtual objects made by computers. Special markers are attached to joints of actors and the positions and rotation data of the markers are perceived by special devices at real times to make 'motion data set' or'(motion curve)'. There are optical types, magnetic types and mechanical types for whole body and in addition, there are data gloves to capture the movements of fingers, face capture to capture facial expressions(recently, this is possible by normal cam coders) and lip sync for vocal signals[4].

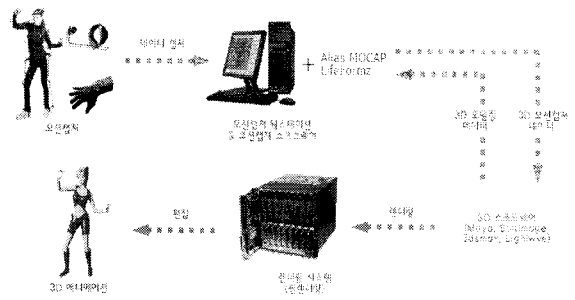


**Figure 1. Processes motion capture**

Figure 1. shows the processes to create reality 3D sign language gesture DB from motion capture systems. As shown in the figure, optical devices were used to perceive the capture of systemic movements and data gloves were used to perceive finger movements.

## 3. Design

### 3.1. Definition of hand gesture

Hand gesture is defined to control 10 primitive sign language gesture. To control sign language gesture, we use posture attribute and direction attribute of hand gesture. Different posture means different sign language gesture. Figure 2 shows defined postures for sign language gesture control. These postures are defined by modifying posture of Korean Sign Language(KSL). Direction of each gesture announces which direction the avatar moves. "walk" and "side walk" use same posture for the similarity of meaning except direction. "Change view" is used to control camera viewpoint of the system. Camera viewpoint is changed to upper view, side view or avatar eye view according to the movement direction for this posture. In figure 3, basic direction elements show defined 7 basic direction elements[5].

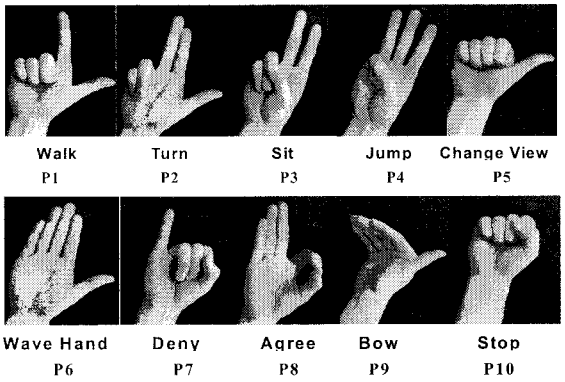



**Figure 2. : Basic Posture**

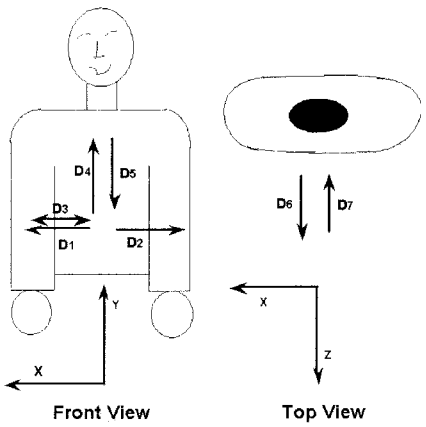



**Figure 3. : Basic Direction**

### 3.2. Gesture animation

Sign language motion expresses the body movement according to the position, direction and degree of bend of each joint. In this thesis, body was divided into head, body, arm and hand for upper body. They are defined with marks in the Figure 3 and Figure 4.

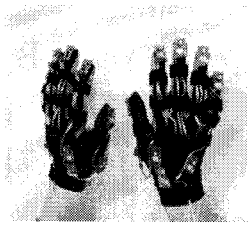


**Figure 3. hand gestuer**

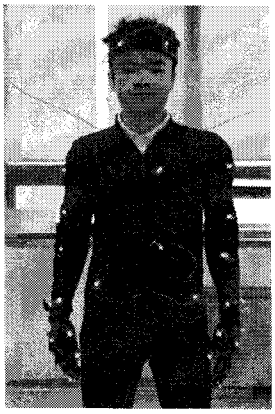
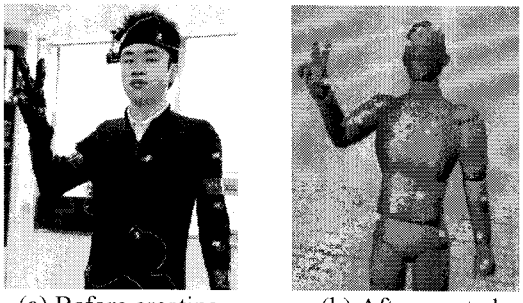


**Figure 4. The upper half the body gesture**

Sign language usually expressed in front of the chest clearly in large gesture and small gesture as necessary based on both shoulders. In case finger letters are used, always right hand should be used and the positions, shapes and directions of the hand should be expressed clearly so that letters would not be overlapped. The neutral position of both hands for the initiation of sign language is the median area connecting the head and the chest and the radius of hand motions is from the head to the abdomen vertically and around the width of the shoulder horizontally. As sign language is a visual language, communications are made through each other's hand motions, facial expressions and movements of entire body. Considering these characteristics, markers should be attached to both hand, fingers and upper half of the body to create motion data in order to capture sign language gesture.



(a) Before creating (b) After created

**Figure 5. Sign motion capture**

### 3.3. facial animation

Facial expression is very important component in order to transfer clear content when using sign language. Facial expression animation is extracted with sign language motion by using X-tive marker. This allows expressing representative emotion (joy, anger, sadness, surprise, disgust, fear) from a given ones and corresponding facial expression can be extracted accordingly.

Picture 6 is an example of the X-tive marker with facial expression.

**Figure 6. Example of Facial marker**

### 3.4. X-tive System

Whole system is designed to operate the start and end point in the same coordinates by using X-tive system. This is to connect the start and end point more smoothly in the sentence expression. X-tive is consists of Camera, BaseStation, Server, Active Marker, and LED Base Controller. X-tive is suitable for creating sign language motion which is small since it uses Active marker with unique values, less modification and effective in using the space. Picture 7 shows the system configuration.

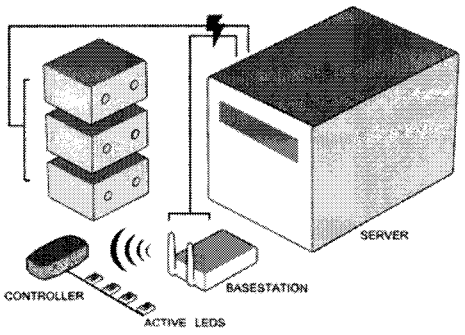



**Figure 7. X-tive System**

The system designed in this paper is comprised like the following Table 1.

**Table 1. Component**

| Specs | X-Tive | VICON | Eagle |
|---|---|---|---|
| Marker | active | passive | passsive |
| Camera | 6 | 6 | 6 |
| Resolution | 3600x3600 | 2352x1728 | 2352x1728 |
| Frame | 480 fps | 166 fps | 200 fps |

## 4. Materialization

In this paper actual sign language is made into database according to words by simulating 3D sign language. Facial expression and sign language are separated and edit the data to incorporate into one complete data. Edited data simulates realistic 3D sign language by mapping with modeling data. Picture 8 shows the procedure of creating realistic 3D sign language motion.

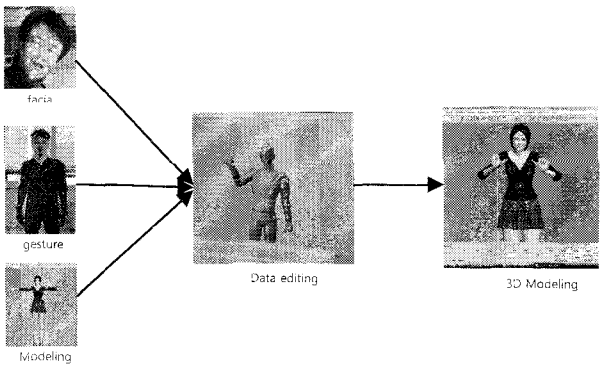



**Figure 8. Processes creating Sign Language gesture**

Sign language is composed of chapter 1~22 based on the frequently used daily expressions. Each chapter has its subjects and consists of approximately 520 words excluding repetitive words. It is easy to search for the words since each word is defined and it is possible to make a sentence using words randomly

## 5. Conclusions

In this paper, Directness it extracts the data which it move sign language and It researched the method which creates a realty 3D sign language gesture. A 3D sign language database was embodied in order to enable normal persons to learn sign language more easily and to enable disabled persons to communicate smoothly using sign language freely. The 3D sign language data created approximately 520 sign language words based on the basis sign languages and analogs of the words and the words with same sound and different meanings were excluded. But Korean language comprises diversified expressions and numerous terms so practically an enormous number of cases will occur if all words comprising Korean language are to be constructed. This should be accomplished by selecting accurate data for many thousands words through repeated tests and revising them to construct data thus requires further studies.

Also, in order for the 3D sign language DB to be perfectly embodied, the processes to complement the information on delicate a sentence expressions that were excluded in the course of designing. The 3D sign language DB is an epochal database for the learning of sign language by normal persons and disabled persons from which quite large effects can be expected.

If, in future, sign language dictionary services suitable to ubiquitous environments and screen displays of sign language at real times using 3D animation characters would become possible expanding the linguistic meanings, it is expectable that the systems could also be applied for normal persons.

## 6. References

[1] Cheonsik Son, "Usual expression of korea sign language" 1st Korea Sign Language Research Seminar – Seminar thinking of people with sign language, VOL.1, pp.21-41, 2000

[2] K. H. Quek, "Toward a Vision-Based Hand Gesture Interface", in Proc. of the VRST94 Conf., pp. 17-31, 1994

[3] Kim, Seung-Guk "A study psychological linguistics of korea sign language", master thesis, 1983

[4] Her, Jea-Young, "A Stduy on the sign language generating system using motion capture" masters thesis, August 2004.

[5] ChanSu Lee and ChanJong Park "The Control of Avatar Motion Using Hand Gesture" in Proc. of ACM VRST 98 Conf.