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Text to Animation for Sign Language of Urdu and Sindhi

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Abstract - Sign language is a nonverbal gesture-based language used by deaf and dumb people to communicate. The use of hand gestures to form symbols that correspond letters and words are the main mode of communication for the people who are unable to speak. Learning such unique language is a huge problem and very difficult as no verbal information is used, only hand gestures are required in a particular form and shape. In this research work the aim was to use multimedia learning principles to teach and facilitate a normal person to learn and be able to communicate with the deaf and dump persons. The system uses a Test tot animation approach, where the normal person types in a text which will then display a corresponding animation of the hand gestures translating the text into sign language. The 3D animation was done with virtual avatar and a android app was developed to integrate the animation of sign gestures with user controlled text app. The learning section of the app includes various tutorials and infographics on sign language in three different languages, including alphabets, (Sindhi alphabets, Urdu alphabets, English alphabets), Numbers, Fruits names, Body parts names and basic communication sentences with their relevant 3D gesture animation. The final application is a great aid for communication and tool for learning sign language.

Keywords: PSL, Animation, Dumb, Deaf, Disabled, English, Urdu, Sindhi,

INTRODUCTION

There are many ways of communication, but speaking is the biggest wealth. Unfortunately, few very special people in this world do not have this ability to talk or understand and are unable communicate with common people. Such type of people are known as disabled people. To overcome this gap there is need of a language or mode of communication which may be adapted by such type of people to understand each other easily, which is known as Sign Language (Khan, N.S. et al, 2015).

Sign language is way of communication with your face expression and body language, figure shapes or gesture. It also helps children to communicate easily instead of speaking. Sign language is the best language for children to teach. There are 143 sign languages existing and used by people around the world. According to WHO (World Health Organization) there are 72 Million people are existing in this world they are deaf, or they haven't ability to hear (Deaf People Human rights report URL: http://www.wfdeaforg). According to Pakistan association of deaf over 0.2 Million people are deaf in Pakistan (Deaf Statistics, 2013).

Information technology is going to change this world. There are many hardware and software tools developed which can help in different ways for deaf & dumb people to communicate with normal people such as using gesture recognition, artificial intelligence and pattern matching techniques.

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Different sign languages have been developed according to country and region, such as Chines Sign Language, Australian Sign Language, American Sign Language, French Sign Language, and British Sign Language etc. Pakistan Sign Language (PSL) is developed by deaf and dumb community which consist of individual syntax and vocabulary (Khan, N.S. et. al, 2014). PSL works on linguistics rules just like Urdu language spoken. Problem is that in our country Pakistan there is lake of communication centers or schools for deaf and dumb person. Only main cities (Karachi, Hyderabad, Larkana) etc. having schools for deaf and dumb people but other cities are not working for it. The purpose of this research is to make android application system using sign language and Maya application using animation.

This system will take input in the form of text or voice and system will match pattern that is composed of sign language and displayed the suitable sign as output. It will allow dumb and deaf people to communicate with normal people using text message or voice recognition. Gesture is physical measure just like finger, arm, head, or body movement for showing meaning full message.

The main objective of this research is:

- To create a system that automatically recognize sign and hand gesture language in alphabetic format and educational platform for dumb and deaf.
- It would be quite useful in the educational process of hearing impaired/mute students and further into readable text for communication with normal people.
- To teach and analyze the Sindhi and Urdu Sign-Language Gesture.
- To develop an android App that would allow us to communicate with deaf and dumb people.
- To convert the written text into 3D animation of Gestures expressing words in Sindhi and Urdu language.

LITERATURE REVIEW

According to the statistics of deaf community of Pakistan 0.24 million people have not capability to hear and speak and 55% are belongs to age between 5 to 29 (Statistics D., 2015). There are many research groups and communities are actively working on gesture and sign language for dumb and deaf in Pakistan (Sulman, D. N. and Zuberi S., 2000) (Haseeb, B., and Ilyas, A., 2012). Bushra et al discussed that the big issue in Pakistan is that there is lake of special deaf teacher and standard sign language.

Alvi M., et al, developed a gesture recognition system known as Boltay Haath (Alvi M. A. L. et al, 2012) . In this system he received sign as input and matched with gesture and applied on English and Urdu alphabet accuracy was 70% - 80%. Mr. Boltay Haath was also known as developer of PSL recognition system (Alvi M. A. L. et al, 2012) (Hassan, B. et. al, 2015). While, Sumaira et al. developed a system that recognized the sign using fuzzy classifier and it was executed by deaf. They used the angle between fingertips based on PSL Urdu alphabet with coloured data and accuracy was 95% (Kausar, S. et. Al, 2008).

Although Ahmed et al. introduced an inverse system. In that system sound was converted into sign or gesture from PSL. Whereas Built-in API's were used at the accuracy of 78% (Kausar, S. et. Al, 2008) (Bhatti, et al., 2013). Though Sami et al also worked on Urdu alphabet sign language recognition correlation technique was used to search the nearest input images from dataset (Sami, M. et. al, 2014) (Bhatti, et al., 2018). Another work regarding machine translation done by Grieve-Smith in this work natural language NL text was converted into sign language in three-dimensional animation sequence (Grieve Smith, 2001). According to recent research year 2018 Dewani et al. developed an e-Learning web-based system for hearing impaired people. Aim was to teach deaf and dumb people through e-learning web-based system using Pakistan sign language. In this English was translated into PSL gesture (Dewani, A. et. al, 2018). (Bhatti, et al., 2016)

METHODOLOGY

The proposed methodology is divided into following steps. It's very simple to use, based on android application and platform independent for deaf and dumb people for Pakistan using PSL English, Urdu and Sindhi language. It will allow communication between normal people and hearing-impaired people. It will also be helpful for children, teachers and adults.

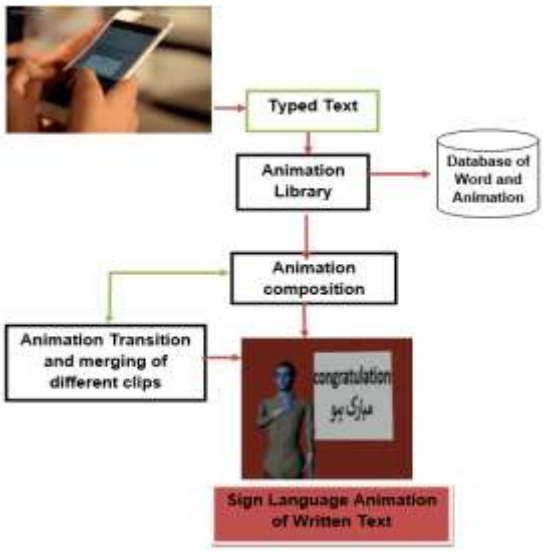

Figure 1: methodology and system design

Figure 1: shows the over all system architecture how system works. First, normal people will type the text message to disable person. let suppose he type congratulation then send to disable person. Message will be matched with database if it is available in system, then system will generate the message in animation format it will compose the message with sign language animation as well as gesture. At the other hand, this animated message will be displayed to the disable person.

A. About Sign Language

Sign languages consist of different gesture. Gesture means to create specific phrase, word or letter. There are two type of Gesture. The first one is manual gesture which means movement, location or hand shape. Other one is non-manual gesture which means body movements such as face expression, head movement, shoulder rotation and pronouncing (Al-Qodri M. et. al, 2012, and Hall, M. L. et. al, 2015).

English Alphabets:

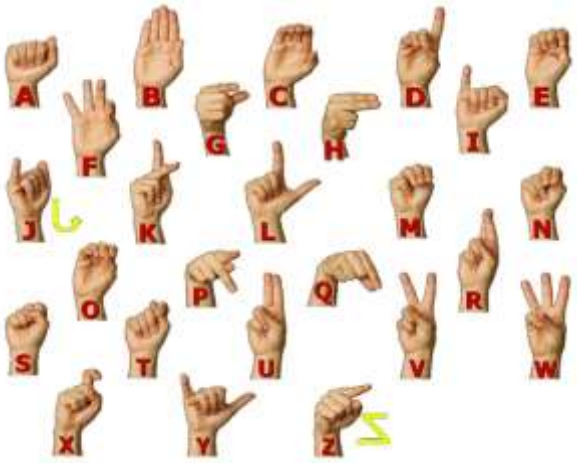

Figure 2: Sign language for English alphabet

In figure 2, there are 26 letters of English alphabet are demonstrating difference between letters using sign language gesture how deaf people will differentiate and understand English alphabet hand gesture (Karbasi M. et. al, 2016 and Karbasi M. et. al, 2013).

Urdu alphabets:

Urdu alphabets are also included in this research showing the sign for each letter in Figure 3 and all 39 alphabets that students can learn. Urdu language is our national language and have important in our society as well as in the world.

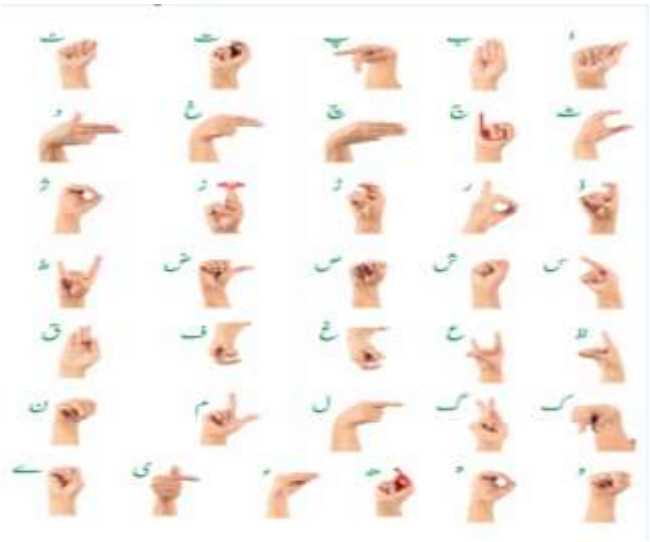

Figure 3:PSL for Urdu alphabets

Sindhi Alphabets

This research has also worked on Sindhi alphabets. Because in our province Sindh majority of people are spoken Sindhi language.

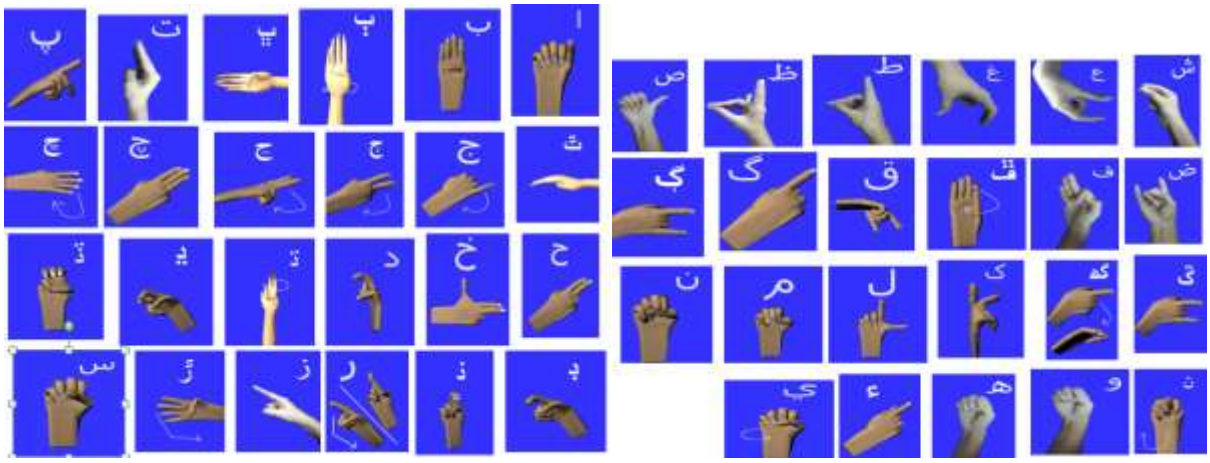

Figure 4: PSL for Sindhi Alphabets

In Figure 4 Sindhi alphabets are shown which consist of 52 character. First hands model is drawn on Maya application after that rig was created through the bones and made animation on these hands for moving them. Using Sign language gesture was created for deaf and dumb peoples that they can understand Sindhi language easily in society and in community.

B. Designing the Alphabets

In this phase we have designed the animation of each alphabet of English, Urdu and Sindhi, along this Numbers and sentences are also included, so that every student can know the gesturing of sign language or have the knowledge about hand language or body language to communicate with deaf and dumb peoples. This is Maya 3D environment which allow us to create 3D animation. Its showing animation.

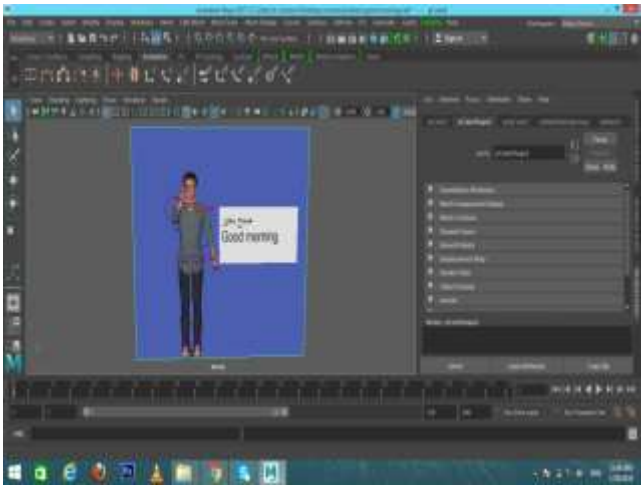

Figure 5: Character Model with words

In Figure 5: animation of good morning with sign gesture is showing to communicate with dumb and deaf people.

C. Hand Modeling

Modelling of objects was done in Autodesk Maya using Polygon modelling tools. We created a simple polygon box and then added few segments, then extruded the box in form of fingers to form the basic shape of hand (Bhatti, Z. et al, 2018 and Brohi, A. et. al, 2018). The rigging of hand with joints and controllers was done inside Maya to control the hand geometry for animation as discussed (Bhatti, Z. et. al, 2012 and Bhatti, Z. et. al, 2015).

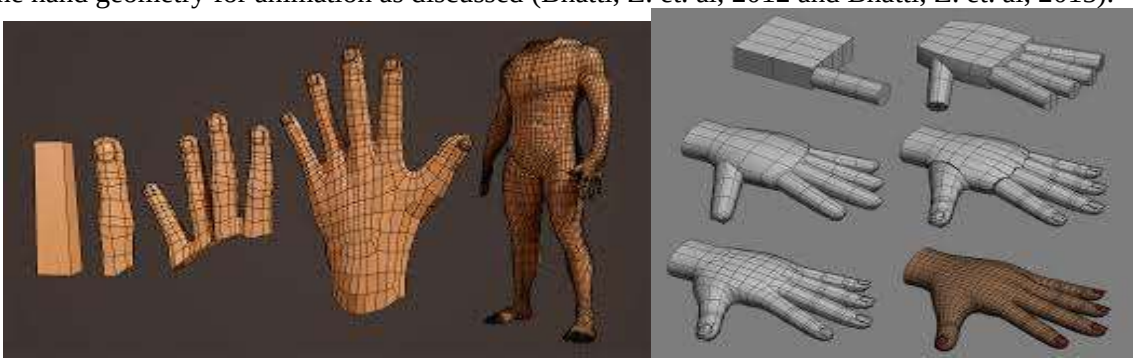

Figure 6: Steps to model hand

In Figure 6: steps for hand modeling is showing which is created using Maya tools with rig.

RESULTS AND DISCUSSION

The central idea of this research is that (Here we have used a character which is defining the way how to communicate with deaf and dumb peoples through gesturing. Which include the alphabets, (Sindhi alphabets, Urdu alphabets, English alphabets), Numbers and sentences. The tools that are used in research that are Maya Application tool, Adobe Photoshop, Android Application using Java language.

Figure 7: ESU User Interface

In figure 7: user interface is showing for this android app named as ESU (English, Sindhi and Urdu). Its simple and easy to use any one can use this system even children.

Figure 8: Alphabets and sentences

In figure 8: alphabets, numbers and sentences menus are shown where user can select any language, number and built-in sentences for quick communication.

Figure 9: Animation as example

In figure 9: Example of animation of sign for congratulation is shown. Along this Urdu and English text is also shown. This system generated message for dumb and deaf which is sent by normal people as typing text.

CONCLUSION AND FUTURE WORK

This research is based Android application which included the alphabets, (Sindhi alphabets, Urdu alphabets, and English), Numbers words and sentences. Using sign language and animation. This app is specially designed for dumb and deaf people who can not speak or listen. Through this app these people can speak with each other and also speak with normal people. It is also helpful for children which are physical impaired they can learn and educate through this. The tools that were used for this research is Maya Application, Adobe Photoshop, Android Application, Android application with Java and PSL Pakistan Sign language.

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