

E- Learning through Single Hand and Two Hand Sign Language

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Abstract—E-learning is commonly referred to the intentional use of networked information and communications technology for teaching and learning. It can raise standards, and widen participation in lifelong learning. E-learn is useful method that has contributed in facilitating education for deaf mute people. Deaf mute people are able to get benefit from this technology by increasing their skills and improving their knowledge. They can use the mobility feature to learn anywhere and at any time. Most of the deaf students easily learn and develop skill and knowledge in e-learning method. Now a day's e-learning tools are mostly used in learning method. E-learning includes computer and electronically supported learning and teaching methods. In this paper we study single hand sign language with voice and without voice and two hand sign language with voice and without voice, and finally we find out and suggest which type of sign language is best for learning to deaf and dumb peoples.

Keywords—E-learning, single hand sign language, two hand sign language, deaf and dumb students

1 Introduction

E-learning represents a wide range of methods for the electronic delivery of information in order to provide education or online training. There are many terms used to describe learning that is delivered online, via the internet, ranging from Distance Education, to computerized electronic learning, online learning, internet learning and many others. We define eLearning as courses that are specifically delivered via the internet. World Health Organization reports says (2017), 360 million people worldwide have disabling hearing loss, and 32 million of these are children. Hearing loss may result from genetic causes, complications at birth, certain infectious diseases, chronic ear infections, the use of particular drugs, exposure to excessive noise, and

ageing.60% of childhood hearing loss is due to preventable causes.1.1 billion young people (aged between 12–35 years) are at risk of hearing loss due to exposure to noise in recreational settings. In India five types of disabilities on which data has been collected, disability in seeing at 48.5% emerges as the top category. Others in sequence are: In movement (27.9%), Mental (10.3%), In speech (7.5%), and In hearing (5.8%).

According to the tamilnadu (India) census data 27273 peoples are hearing impaired. So we give more efforts to the Deaf mute to equal opportunities in education. E-learning is the excellent ways to increase the percentage of educated Deaf mute people by optimizing new technology. Today, many new systems were designed to assist Deaf mute people access the web for learning and training. Fig- 1 shows about e-learning system. It has learning and knowledge management process

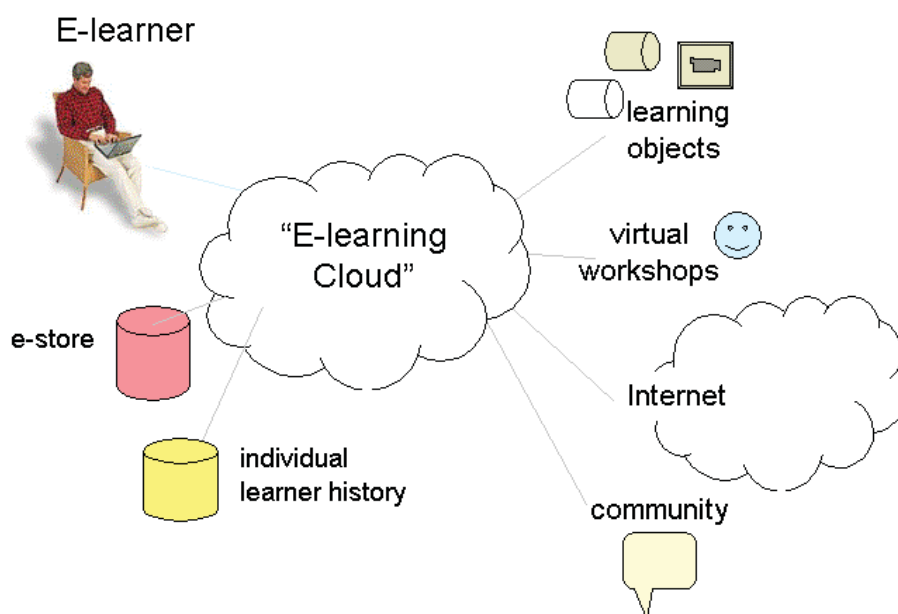


Fig. 1. e-learning system

The above figure has e-learning cloud with all learning data's. Learners, e- store, individuals, objects, internet, community are the components. The following list contains 6 important components of a successful Online Learning Environment: Duration and addition of your own resources, Supplement text-heavy environments with other types of resources, Encourage and Model Participation, Gradual Release of Responsibility, Summarizing, and Assessment.

The Advantages of e-Learning training includes: Flexibility, Mobile, No Travel, Lower cost, Technological Possibilities, Global The disadvantages of eLearning Training includes: Lack of Control, Learning Approach, Isolated, Technology Issues , Computer Competency.

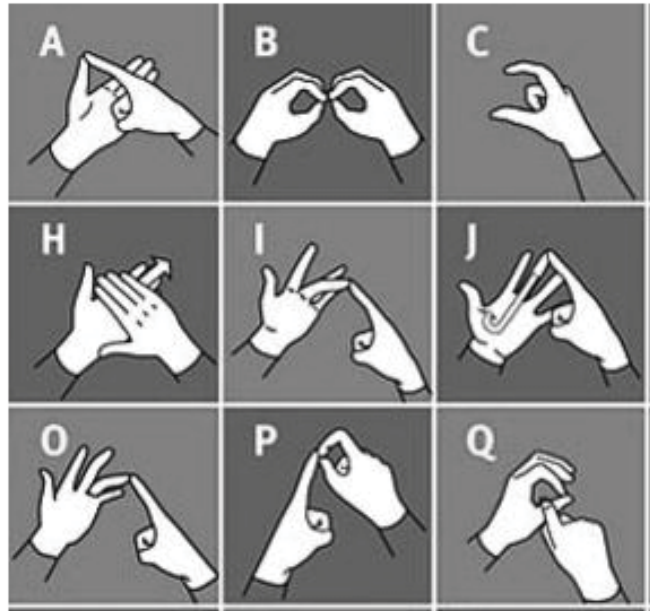


Fig. 2. Two hand sign language

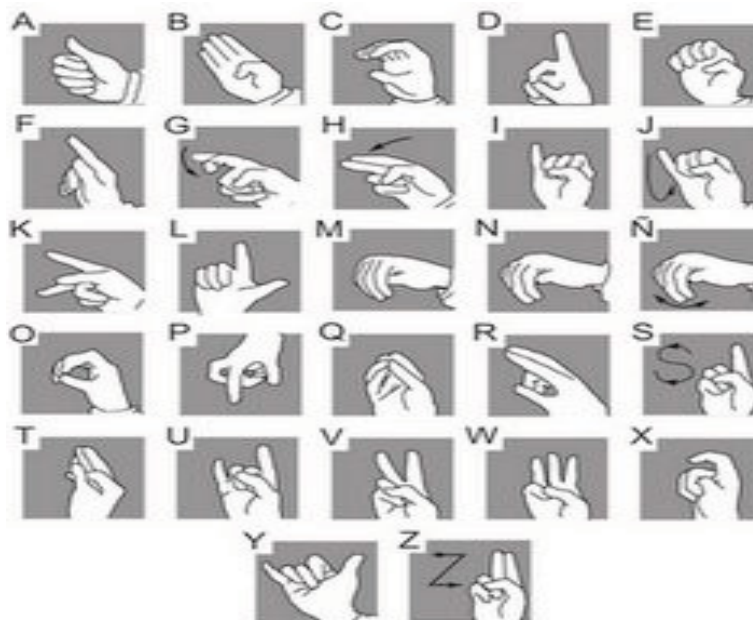


Fig. 3. Single hand sign language

2 Literature review and related work

Learning System offers Greek Sign Language videos in correspondence to every text in the learning environment. That system is designed notably for deaf mute adults for the purpose of their lifelong educational training. In the Learning System, the special needs of Deaf mute learners are satisfied,[1]

To present a learning management system which offers German Sign Language videos in correspondence to every text in the learning environment? The system is designed notably for deaf mute adults who want to maintain and improve their mathematical and reading/writing skills [2]

The use of sign language furthers the reading competence of deaf people and enhances their acceptance and understanding of learning content presented to them. Providing sign language videos will help the users improve their reading skills and enable them to learn more independently.[3]

To develop an effective technology to support Deaf mute Students so as to learn various topics via computer. The major core of the mentioned technology could be represented by two branches: The first is to offer empty templates to the first user “The teacher introducing e-learning modules for his own interest topics for the Deaf mute candidates”. The second task of our system is to translate all the submitted material as well as the output material from the normal text into its corresponding lips of sign language and finger spelling (single and double hand). To evaluate the experimental modules of tutorial e-lessons. [4]

We build word models for American Sign Language (ASL) that transfer between different signers and different aspects. Transfer learning is possible because we represent blocks of video with novel intermediate discriminative features based on splits of the data. By constructing the same splits in avatar and human data and clustering appropriately, our features are both discriminative and semantically similar: across signers similar features imply similar words [5]

A study on potential technology solutions for enhancing the communication process for deaf people on e-learning is the platforms through translation of hand Sign Language (SL). Considering SL in its global scope as a spatial-visual language not limited to gestures or hand/forearm movement, but also to other non-dexterity markers such as facial expressions, it is necessary to ascertain whether the existing technology solutions can be effective options for the SL integration on e-learning platforms. [6]

Sign language is the only tool of communication for the person who is not able to speak and hear anything. Sign language is a boon for the physically challenged people to express their thoughts and emotion. In this paper, a novel scheme of sign language recognition has been proposed for identifying the alphabets in sign language. [7]

The goal of enabling access for the Deaf to the current mobile phone network by compressing and transmitting sign language video gives rise to challenging research questions. Encoding and transmission of real-time video over mobile phones is a power-intensive task that can quickly drain the battery, rendering the phone useless. Properties of conversational sign language can help save power and bits: namely, lower frame rates are possible when one person is not signing due to turn-taking, and

the grammar of sign language is found primarily in the face. Thus the focus can be on the important parts of the video, saving resources without degrading intelligibility. [8]

To analyzes the Viterbi algorithm and its application to Sign Language Recognition. The Viterbi algorithm is used as a maximum a posteriori approach to solving the decoding problem of Hidden Markov Models (HMM). the attributes of the HMM with an example. The theoretical time complexity of the algorithm is compared to the results of experiments on a Python implementation. The more general field of Gesture Recognition is briefly mentioned as foundation for the type of system necessary to facilitate Sign Language Recognition.[9]

Hand gestures are powerful means of communication among humans and sign language is the most natural and expressive way of communication for dump and deaf people. In this work, real-time hand gesture system is proposed. Experimental setup of the system uses fixed position low-cost web camera with 10 mega pixel resolution mounted on the top of monitor of computer which captures snapshot using Red Green Blue [RGB] color space from fixed distance.[10]

The author finds out the detection of reduplication in digital videos of American Sign Language (ASL). In ASL, reduplication is used for a variety of linguistic purposes, including overt marking of plurality on nouns, aspectual inflection on verbs, and nominalization of verbal forms. Reduplication involves the repetition, often partial, of the articulation of a sign. In this paper, the apriori algorithm for mining frequent patterns in data streams is adapted for finding reduplication in videos of ASL. [11]

Visual interpretation of sign language gesture can be useful in accomplishing natural human robot interaction. This paper describes a sign language gesture based recognition, interpreting and imitation learning system using Indian Sign Language for performing Human Robot Interaction in real time.[12]

2.1 One Hand Sign Language (Letter - C)



Fig. 4. One hand Sign language video

2.2 Two Hand Sign Language (Letter - M)



Fig. 5. Two Hand Sign Language Video

3 Methodology

Here we use four types of sign languages methods and find out which method is suitable for e-learning,

1. One hand sign language(with voice)
2. One hand sign language(no voice)
3. Two hand sign language(with voice)
4. Two hand sign language(no voice)

4 Finding

We take sign language 7 videos (one hand and two hands) in programming in java language, and analyze it. Deaf peoples using e learn method that can use java language videos. Then we are classify it for which type of sign language method is most useful one in e learn to deaf peoples.

The java programming sign language videos contains introduction of c, application of java, constant, variable, data types, operators, If statement, for loop, while loop, constructor, inheritance, thread, exception handling, packages, and applets. These topics are covered in sign language videos (one and two hand, with voice and no voice).

It should be shown to 50 deaf and mute peoples and classify it.

OH_WITH VOICE	-	One Hand with Voice
OH_NO VOICE	-	One Hand and No Voice
TH_WITH VOICE	-	Two Hands with Voice
TH_NOVOICE	-	Two Hand and No Voice

Table 1. Statistics Report of 50 Students

Topics	OH_WITH VOICE	OH_NO VOICE	TH_WITH VOICE	TH_NO VOICE
Introduction	4	7	28	11
String	5	5	31	09
Constructor	8	3	29	10
Inheritance	5	5	31	09
Packages	2	4	27	17
Thread	4	3	29	14
applet	8	5	28	19

4.1 Algorithm Implementation

Here we implement algorithm for time and space complexity for storage of videos.

Time Complexity. Time complexity of an algorithm signifies the total time required by the program to run to completion. The time complexity of algorithms is mostly expressed using the **big O notation**. Time Complexity is most commonly estimated by counting the number of elementary functions performed by the algorithm. And since the algorithm's performance may vary with different types of input data, hence for an algorithm we usually use the worst-case Time complexity of an algorithm because that is the maximum time taken for any input size.

Table 2. Time Complexity comparison of Sorting Algorithms

Algorithm	Time Complexity		
	<i>Best</i>	<i>Average</i>	<i>Worst</i>
Quick sort	$O(n \log(n))$	$O(n \log(n))$	$O(n^2)$
Merge sort	$O(n \log(n))$	$O(n \log(n))$	$O(n \log(n))$
Heap sort	$O(n \log(n))$	$O(n \log(n))$	$O(n \log(n))$
Bucket Sort	$O(n+k)$	$O(n+k)$	$O(n^2)$
Radix Sort	$O(nk)$	$O(nk)$	$O(nk)$

Space Complexity. It's the amount of memory space required by the algorithm, during the course of its execution. Space complexity must be taken seriously for multi-user systems and in situations where limited memory is available. An algorithm generally requires space for following components:

- Instruction Space: It's the space required to store the executable version of the program.
- This space is fixed, but varies depending upon the number of lines of code in the program.
- Data Space: It's the space required to store all the constants and variables value.
- Environment Space : Its the space required to store the environment information needed to resume the suspended function.

Table 3. Space Complexity comparison of Sorting Algorithms

Algorithm	Worst Case Auxiliary Space Complexity
Quick sort	$O(n)$
Merge sort	$O(n)$
Heap sort	$O(1)$
Bucket Sort	$O(n k)$
Radix Sort	$O(n+k)$

5 Chart

The following chart is the four types of sign language in e-learning.

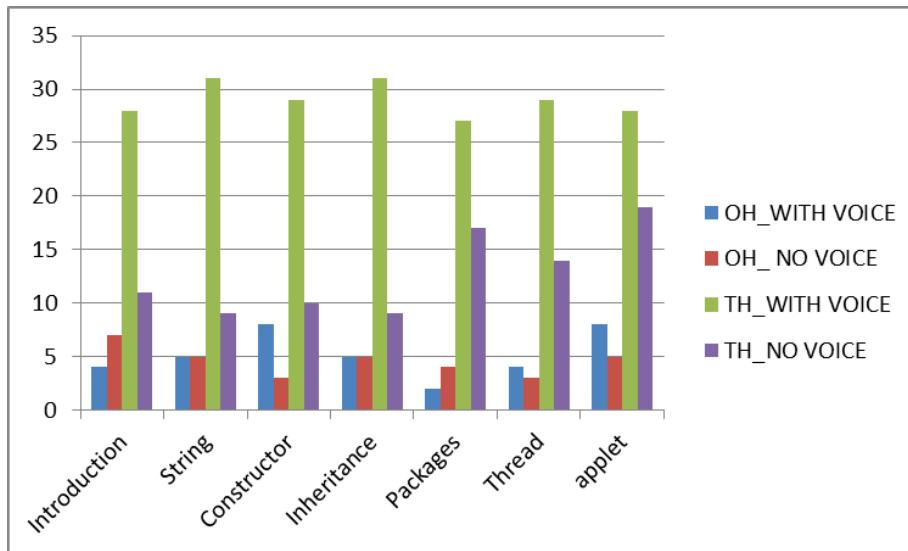


Fig. 6. chart for sign language in e-learning

6 Conclusion

In this paper we study about deaf mute students how use e-learning system using single hand sign languages and duoble hand sign llanguage in learning java subject . We have classify 50 deaf mute students that how they understand e-learning using sign language content videos. Here out of 50 students most of the peoples like and understnd THWV-double hand with voice method of teaching and learning. These data's are implementing in 5 sorting algorithms namely Quicksort, Merge sort, Heap sort, Bucket Sort, and Radix Sort for calculating time and space complexities. Finally

we conclude that Bucket sorting algorithm is best for this time and space complexity. The author strongly recommends that THWV method is suitable for e-learning especially for deaf mute students. Finally all these videos and text materials are stored in cloud, so deaf mute students can access java programming sign language videos anywhere at any time.

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8 References

- [1] A.S.Drigas, D.Kouremenos , S. Kouremenos and J. Vrettaros, . An e-Learning System for the Deaf people, ITHET 6th Annual International Conference, July 7 - 9, 2005, Juan Dolio, Dominican Republic, 7803-9141-1/05/\$20.00 © 2005 IEEE July 7 – 9, 2005, Juan Dolio,
- [2] Katja Straetz , Andreas Kaibel , Vivian Raithel, An e-Learning Environment for Deaf Adults, Marcus Specht Klaudia Grote.
- [3] A.S.DRIGAS, D.KOUREMENOS, An e-Learning Management System for the Deaf people Department of Applied Technologies NCSR “DEMOKRITOS”.
- [4] Dr.Karim e-Learning Modules of Tutorial Lessons for The Deaf Students : Development & Evaluation “View Points of Experts in Consideration” Associate Professor Computer Science Dept. Al-Isra private University.
- [5] Ali Farhadi, David Forsyth , Transfer Learning in Sign language University of Illinois at Urbana Champaign
- [6] Paulo Martinsa,b, Henrique Rodriguesb , Leonel Morgadoa,d a INESC TEC, Rua Doutor Roberto Frias 378, 4200-465 Porto, Portugal.
- [7] Pratibha Pandey, Vinay Jain, An Efficient Algorithm for Sign Language Recognition, Department of Electronics Engineering Shri Shankracharya Group of Institutions Bhilai, C.G.
- [8] Neva Cherniavsky Activity Analysis of Sign Language Video for Mobile Telecommunication, University of Washington.
- [9] Elana Margaret Perkoff, The Viterbi Algorithm and Sign Language Recognition
- [10] Jayashree R. Pansare , Shravan H. Gawande, Real-Time Static Hand Gesture Recognition for American Sign Language (ASL) in Complex Background, Department of Computer Engineering, M. E. Society’s College of Engineering, Pune, India
- [11] Zoya Gavrilov, Stan Sclaroff, Detecting Reduplication in Videos of American Sign Language, Carol Neidle, Sven Dickinson University of Toronto.
- [12] Shekhar Singh, Recognizing and Interpreting Sign Language Gesture for Human Robot Interaction, International Journal of Computer Applications (0975 – 8887) Volume 52–No.11, August 2012 Assistant Professor CSE, Department PIET, Samalkha, Panipat, India.

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