ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 6, June 2015

Real Time Sign Language Interfacing System

Tejasvi Rajendra Gaikwad, Ratnaraj Kumar

M.E, Dept. of Computer Engineering, G. S. MOZE College of Engineering, Balewadi, Pune, Maharashtra, India

HOD, Dept. of Computer Engineering, G. S. MOZE College of Engineering, Balewadi, Pune, Maharashtra, India

ABSTRACT: Sign language is a language through which communication is possible without the means of acoustic sounds. Instead, sign language relies on sign patterns, i.e., body language, orientation and movements of the arm to facilitate understanding between people. It exploits unique features of the visual medium through spatial grammar. The spatial nature of sign languages makes it difficult to develop an interfacing system as a communication medium platform for sign language users

In our approach, the user just selects the sign video. Then, the system compares the input sign video with sign videos stored in the system database, the message which is in the video form is reflected in form of text at another (normal) user. And the reply from the normal user is in the form of text and that text message is converted back in the sign video at the sign language user side.

KEYWORDS: American Sign Language, interfacing system, visual tracking, feature extraction, Human-Computer Interaction (HCI).

I. INTRODUCTION

Due to loss of hearing many times people feel like being isolated and lonely, which result into tremendous loss, in both, their social and professional life. Meaning of a sign is not an easy i.e. straight forward task. Sign Language is the well structured code gesture; wherein every gesture has a pre defined meaning assigned to it [2]. Signing has always been used by humans for communication [1]. Even newborns use gestures to communicate, until their speech muscles are mature enough to articulate meaningful speech [8].One of the way for communication used by deaf people is Note writing , to communicate with someone who is seating nearby, but it becomes difficult in the situations like, having a talk while walking, standing at a distance, and when number of persons involved in the conversation is more than two i.e. group discussion. Another way of communication used is hiring a translator. But drawback of using such method is it becomes difficult finding a well experienced and educated translator for the sign language user every time and everywhere, but human computer interaction system for this can be installed anywhere possible [7].

In today's world we find the influence of computers in our lives has increased tremendously. As a result importance of Human-Computer Interaction (HCI) has increased significantly. There are many research fields which focus on making HCI faster, easier, and more natural. To achieve this, techniques like Human-to-Human Interaction are being introduced. One of the finest way of implementing Human-to-Human Interaction is the making use of hand gestures to express ideas [8].Observation says sign language is the only means of communication for deaf community people. With advancement of science and technology many techniques have been developed not only to minimize the problem of deaf people but also to implement it in different fields [3]. It is the language through which communication is possible without the means of acoustic sounds. Instead, sign language relies on sign patterns, i.e., body language, orientation and movements of the arm to facilitate understanding between people. It exploits unique features of the visual medium through spatial grammar.

As in oral language, sign language is not universal; it varies according to the country, or even according to the regions. Sign language in the Arab World has recently been recognized and documented [8]. Different categories of sign languages are there, Indian Sign Language, British Sign Language (BSL), Korean Sign Language (KSL), Arabic Sign Language, American Sign Language (ASL) etc [3, 4, 5].

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 6, June 2015

II. RELATED WORK

Various ways/approaches have been used by many researchers in various fields related to sign language recognition. Approaches like vision based approaches, data glove based approaches, soft computing approaches like Artificial Neural Network, Fuzzy logic, Genetic Algorithm and others like PCA, Canonical Analysis, K-Nearest Neighbor Algorithm [7], Support Vector Machine (SVM) [3] etc. Approaches can be broadly classified as - Hand segmentation approaches, Feature extraction approaches and Gesture recognition approaches.

Researchers Beifang Yi, Xusheng Wang, Frederick C. Harris, Jr, and Sergiu M. DascaluIn did some explorations in the areas of computer graphics, interface design, and human–computer interaction with emphasis on software development and implementation presented in sEditor [1]. Now a day, virtual human figures can be constructed. Can be called as human avatars, which can imitate human actions and even facial expressions. All the body joints and featured parts (such as eyebrows or mouth), represented as various parameters, are controlled in their motions, allowing the creation of virtual gestures [9].

The use of virtual human figures in sign language studies is one of the popular approach. However, Frishberg et al. provide framework concepts and Ong and Ranganath provide sign language gesture issues w.r.t modeling transitions between signs, modeling inflectional processes, and related concerns. Human avatars (i.e., virtual human bodies) may provide advantages over videos of native signers [1].

Since, the sign language phonemes, words, and sentences are fixed. Therefore, the users cannot create new sign language “words” or “phrases”. This issue is resolved by, sEditor which is an “open” platform for different sign languages with user interfaces for the creation and management of sign language [1].

III. PROPOSED ALGORITHM

In our approach, we are trying to implement a system which will help a sign language user to work efficiently giving his best at the work place by overcoming the biggest hurdle which he faces in his day today life. We realized that this is the serious problem which they face at their work place. Lack of communication becomes one of a pulling back thread in their professional growth. Which result in loss for their carrier and financial loss as well.

Bridging in the communication gap is our aim. So, to achieve it, we are trying to come up with the system using American Sign Language (ASL), where the sign language user can simply input the sign video. Then, the system compares the input sign video with the database stored, the message is reflected in form of text at the another (normal) user. And the reply from the normal user can be in the form of text which can be converted back to sign video at the sign language user side

It will be resulting as a Real Time Sign Language Interfacing System (kind of a chat system i.e. an interactive system). Between a sign language user (the one who cannot hear) and a normal user (one who can hear).

Mathematical Model for this system is as follows:

Dynamic Operation
Below are dynamic operations present in the system.

1. videoToTextConversation.
We have received the request from client to send Message in Video format with Video File (V).
The same file recivied on conversion server which will have dataset of videos.

data(V) = {V1 , V2 , V3,.....,Vn}

Then server will start processing of the incoming video file (v). Video file is splited into the images. Below is the formula to get total number images.

no_of_images (In) = PlayTime(V) * FPS.

Then server will try to featch each every images ... i.e I(V)i.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 6, June 2015

I(V) = { I(v)1, I(v)2 ,..... In}

This will start compression of the I(V) with image dataset with store video. Below is the sudo code for the compression.

```
for i = 0 to i = data(V).Size();
        D(vi) = GetImageDataSet(Vi);
        for j = 0 to j = I(vi).size()
                result = ComprePixel(D(vj) , I(vj));
                 if(result == true )
                        matchCount++;
if(matchCont== I(V).Size())
        VideoMatchFound();
        setExactFlag = true;
        break;
else
        if(matchCount = I(V).Size() / 0.80)
        check for highest matchCount , if not found then set HighMatchCount = D(v)j
if setExactFlag == true
        GetMessageForVideo(D(V)j);
else
        GetMessageForVide(D(V)HighMatchCount);
end;
```

2. GetMessageForVideo() Operation:

As conversion server has internal indexing structure for storage of the text and video mapping.

```
<entry key="V(i)">Text(mapforV(i))</entry>
```

Whole Indexing will load into memory and it will create the HashTable for the entires. The Text Message will retrive from the created HashTable.

3. TextToVideo() Operation :

As Conversion server has HashTable (HT) which is nothing but key value pair mapping of the Video file to text message. Now in this case we will get message in the form of text i.e M(text).

sudeo for the conversation..

```
HT = loadregistery("mapping.properties");
Entry<Key,Value> ES = HT.GetEntrySet();
foreach  entry in ES
        if(entry.value == M(text))
                return entry.key;
        return null;
```

Once you got the VideoFile Name V , It will start searching the into the internal dataset , once file is found it will send response to the client with filename.

```
V = OperationResponse();
```

Till now client will only get the FileName. To Get the Actuall byte[] data need to go to the VideoServer. which will shown in browser.

```
byte [] = VideoServer(V);
```

4. MultiLanguageConversation() Operation :

In these operation we need to translate the set of inbox messages

M = {M1 , M2 , M3 .. , Mn}

which is internally store into the English Language.

In these module we have used Google Translate API Version V2. to convert M into RegioalLanguage(M).

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 6, June 2015

sudeo Code for the converstion.

```
Lan = GetLanguagePreference();
code = GetLanguageCode();
for i = 0 to M.size()
        RL(M (i)) = TranslateApi(M(i) , TargetLanguage("en") , code);
end;
return collection(RL(M(i));
```

5. TextToSpeechConversation() Operation :

In this operation we need to translate text inbox ,

$$M = \{M1 , M2 , M3 \ldots Mn\}$$

into and audio.

These conversions will element base not set base. Means each Mi will convert indivisually.

Sudeo code for the conversation

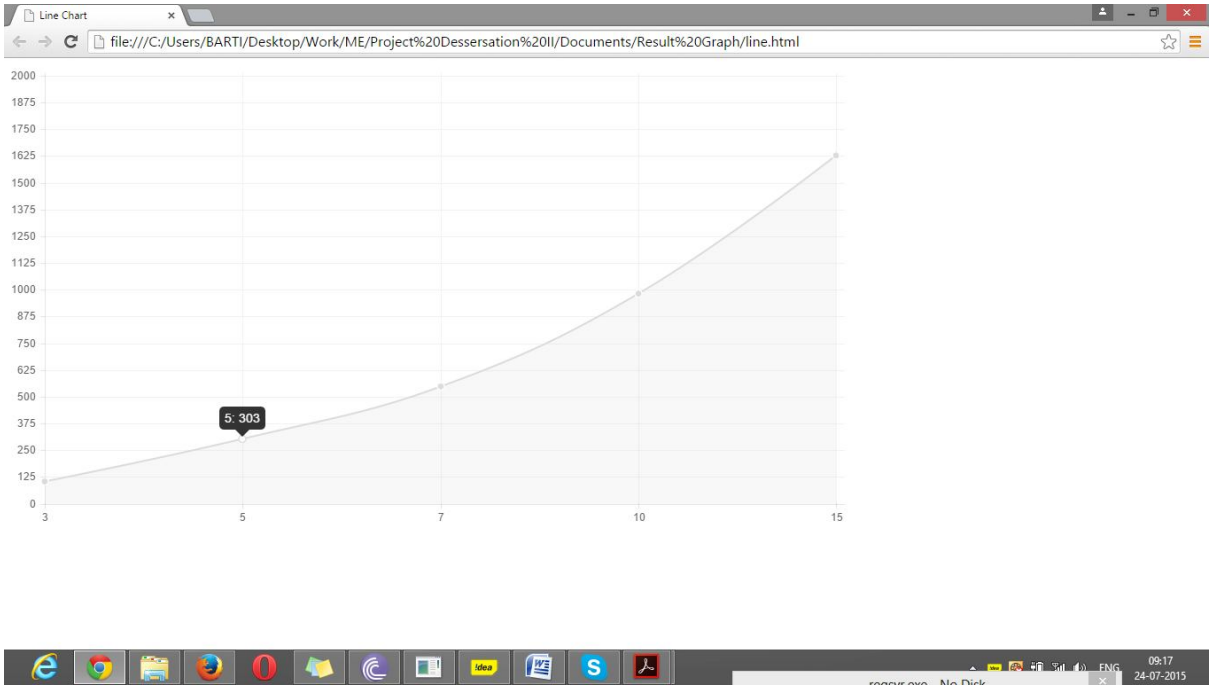
```
AudioFile (AF) = GoogleTextToseepchBot(Text , Language.Code);
WebBrower.GetPlayer().Play(AF);
```

This will play audio file with default player, in language mention in preference.

IV. RESULTS

Shows the graph where in :

x-axsis is number of files in dataset.
y-axsis is time required to send message.



V. CONCLUSION AND FUTURE WORK

The major benefit of the system is, it is a cost effective approach. Since, we are have come up with the system by utilizing the easily available resources such as making use of inbuilt cameras available in the laptop, instead of purchasing a new one.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 6, June 2015

So if in case, the system will be used in future no additional hardware and software requirement should become a hurdle of implementing it anywhere. And one can easily afford using it.
It will not only benefit the deaf and dumb people of India but also could be used in various applications in the technology field.

- Teaching aid e.g. It can be used as a teaching and learning tool for sign language.
- Can be enhanced making it more capable of live capturing of the signs.
- Can be deployed on cloud.
- Can be used in all offices for boss employee comunication.
- Can be used as television control.
- Can be used for music synthesis
- Can be used for robot control
- Can be used for surgeon's computerized aid
- Can be used for video surveillance
- Can be used in forensic research
- Can be used for hand-gestures interfaces for smart phones
- Can be used for home automation & medical monitoring, like Gesture Pendant

REFERENCES

[1] sEditor: A Prototype for a Sign Language Interfacing System Beifang Yi, Xusheng Wang, Frederick C. Harris, Jr, and Sergiu M. Dascalu.
[2] Development of an American Sign Language Game for Deaf Children Valerie Henderson, Seungyon Lee, Helene Brashear,Harley Hamilton1, Thad Starner, Steven Hamilton.
[3] Development of a New Arabic Sign Language Recognition Using K-Nearest Neighbor Algorithm 1 Prof.reyadh Naoum, 2 Dr.Hussein H. Owaied, 3 Shaimaa Joudeh 1Dean of Faculty of Information Technologies - Middle East University 2Associated prof - Faculty of Information Technologies - Middle East University.
[4] Real-time gesture recognition using deterministic boosting Raymond Lockton and Andrew W. Fitzgibbon Department of Engineering Science University of Oxford.
[5] Sign Language Recognition, Generation and Modelling with application in Deaf Communication. Dr. Eleni Efthimiou, Research Director, ILSP/ATHENA R.C.
[6] A Sign Language Recognition System Using Hidden Markov Model and Context Sensitive Search Rung-Huei Liang Ming Ouhyoung Communication and Multimedia Lab., Dep. of Computer Science and Information Engineering, National Taiwan University, Taipei, R.O.C.
[7] The Development And Evaluation Of A Speech To Sign Translation System To Assist Transactions M. Lincoln1, S.J. Cox1, M. Nakisa
[8] Arabic Sign Language Alphabets Translator Nashwa El-Bendary1, Hossam M. Zawbaa2, Mahmoud S. Daoud2, Aboul Ella Hassanien2, and Kazumi Nakamatsu3.
[9] Sign Language Recognition and Translation with Kinect Xiujuan Chai, Guang Li, Yushun Lin, Zhihao Xu, Yili Tang, Xilin Chen Key Lab of Intelligent Information Processing of Chinese Academy of Sciences (CAS), Institute of Computing Technology, CAS Beijing, Chinaxiujuan.chai, guang.li, yushun.lin, zhihao.xu, yili.tang, xilin.chenvipl.ict.ac.cn Ming.
[10] Handling Movement Epenthesis and Hand Segmentation Ambiguities in Continuous Sign Language Recognition Using Nested Dynamic Programming Ruiduo Yang, Sudeep Sarkar, Senior Member, IEEE, and Barbara Loeding.

BIOGRAPHY

Tejasvi. R. Gaikwad, graduated as Bachelor of Engineering in Information Technology, from Cummins College of Engineering for Women, Pune in the year 2010. Worked as a Lecturer in computer department of S. B. Patil College of Engineering from 2011-2013. Now persuing M.E in Computer Engineering from G. S. MOZE College of Engineering, Pune.