3D Text Segmentation and Recognition using Leap Motion Sensor

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***Abstract* - In this, we present a method of Human-Computer-Interaction (HCI) through 3D air-writing. Previous system worked on pen-paper based system. Leap motion sensor using 3D texts drawn by fingers can be provocative for existing text recognition framework. The 3D gestures are recorded in air they produce often non-uniform text style and jitter-effect while writing. Air writing, characters, words, and lines are usually connected by continuous stroke that makes it is complex to recognize. In this, we will present 3D text segmentation and recognition using leap motion sensor. In this system we have used Feature Point Extraction Algorithm and Cosine Similarity Algorithm, Ecludien algorithm for measuring the distance. It can be differentiated from it's neighbouring points. Feature with similar co-ordinate in both text will be compared. Cosine similarity algorithm is used to measure cosine of angle between the two non zero vectors. It recognize characters and words and 3D sequences of segmented words. For this we are creating a dataset. 3D text segmentation and recognition it reduce pen-paper based system.**

***Keywords*: Text segmentation, Feature point Extraction, Cosine Similarity algorithm, Ecludian Distance Measure Algorithm leap motion sensor, Air writing.**

1. INTRODUCTION

Nowadays there are several devices that produce faster and efficient interaction of humans with computers. with the advancement in technology of Sensor and control device. Sensor technology vision gives low cost new ways of research in Human-Computer-Interaction (HCI).It gives a robustness and high accuracy to devices. This type of application develop from some commercial sensor. It is not more expensive, it provides easy way to interact with the different computer system. This sensor provides 3 Dimensional points which is useful for representing various movements. The sensor motion is being successfully used by various researchers to develop applications like 3D games, word segmentation, hand-writing recognition, smart-room environment, human computer interface, upper limb rehabilitation, palm rehabilitation, security. It reduces pen paper based technology. Using leap motion camera, we are writing text on air and that will record in 3D. After that segmentation of words can be carried out and this will stores into the database. For this, we are using feature point extraction and cosine similarity algorithm for recognizing 3D text. We are presenting comparative analysis of these two models using a large dataset.

1.2 Problem Statement

Previous system worked on pen-paper based system. The 3D gestures are recorded in air they produce often non-uniform text style and jitter-effect while writing. Air writing, characters, words, and lines are usually connected by continuous stroke that makes it difficult to recognize. In this, we will present 3D text segmentation and recognition using leap motion sensor.

2 Literature Survey:

Study of Text Segmentation and Recognition using Leap Motion Sensor

Pradeep Kumar, Rajkumar Saini, Partha Pratim Roy and Debi Prosad Dogra[1] This system describes that words, lines, characters and air writing are connected continuously without any gap between them .using leap motion device the text is sensed and it is different from traditional online and offline system. User writes on air using finger is a new way of handwriting in 3D space.In this system they have used Bidirectional Long Short Term Memory-Neural networks(BLSTM-NN) model and Hidden Markov Model(HMM) model for recognizing such type of text. Using these two models accuracy has been obtained is 78.2% .using BLSTM-NN model recognition result in both side. and using HMM model result is carried out in one side.

3D Text Segmentation and Recognition using Leap Motion.

Pradeep Kumar1, Rajkumar Saini1, Partha Pratim Roy1, Debi Prosad Dogra2 [2], The words consists of only one stroke .hence gaps between contiguous text are absent. In this system, the way of interaction is done without pen and paper. In 2D system, start and end positions are fixed. In 3D System, there is no specific start and end positions. In 3D co-ordinate system, they do not get distinct start positions for same word written by different writers. User write text on air is facilitated using fingertip within leap motion device. They have used HMM model. They have used dynamic and simple features when words or texts are not correctly recognized by HMM model. Accuracy has been obtained is 80.3%. Using leap motion sensor they have proposed 3D handwritten text segmentation and recognition methodology.

Segmentation and Recognition of Text Written in 3D using Leap Motion Interface

Chelsi Agarwal, Debi Prosad Dogra, Rajkumar Saini, Partha Pratim Roy[3], 3D gestures are recorded in air hence they produce jitter effect and non-uniform text style. The pause of stroke-flow between word is missing due to constraint of writing in air. For segmented

words which are written in air they have used simple but effective heuristic. Start and end position of successive text lines heuristically finding the large gap information of separation of text lines. for recognizing text and words they have used Hidden Markov Model (HMM) .Accuracy has been recorded is 77.6%.

A study about Honey Bee Dance and Serious game for kids using Hand Gesture
Ok-Hue cho and Sung-Tae Lee[4], hand gestures is a form of non-vocal communication and speechless communication in which visual bodily communicate in particular messages. hand motion is a good interaction way for kids using computer. In this paper, they have developed the game for kids using leap motion sensor based on honey bee dance. The dances are perform by labor that have returned to the honeycomb. Kids brain development is good due to movement of hand. They have proposed this system for the purpose of Entertainment. The new development direction of serious games they have proposed in this.

3. ARCHITECTURE DESIGN

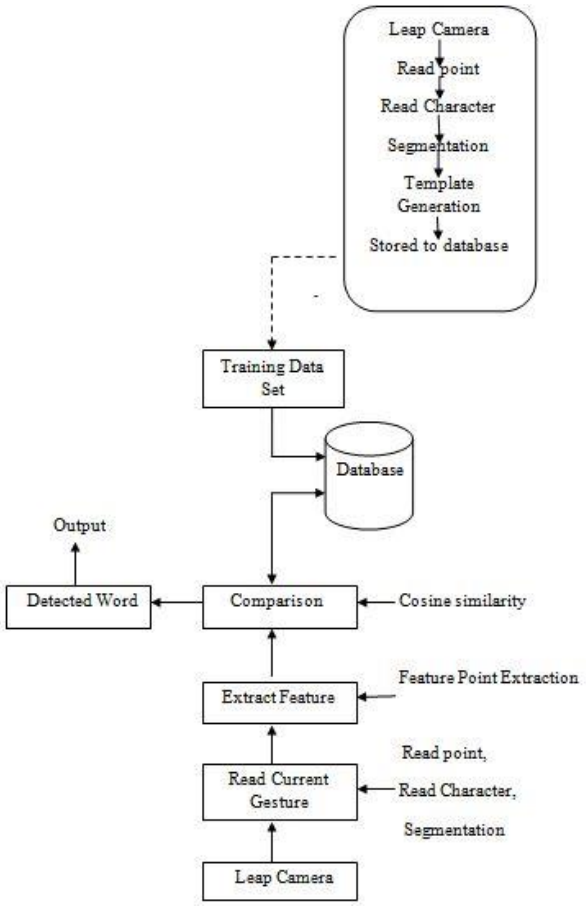


Fig.1: system architecture

Firstly Leap camera will interface this camera provide us leap API after that API gives 6 points then start calculating the features, while we writing 'A' character on that movement, we will get x, y, z characters .From this characters we will get array. This array we will store into the database. After storing different character we will comparing those characters. After that, we will get output. From maximum match we will get final output.

4. RELEVANT MATHEMATICS ASSOCIATED WITH THE PAPER

System Description:
Input: Creating Training Data Set
Output: Detection of word and character
Mathematical Formulation:
Let DB be the stored guesture
N be the total guesture points.
Now D' be the current guesture.
Now compare with all

```
for(i=0 to n;)
{
diff=diff (DBi,D')
}
Check(min)
```

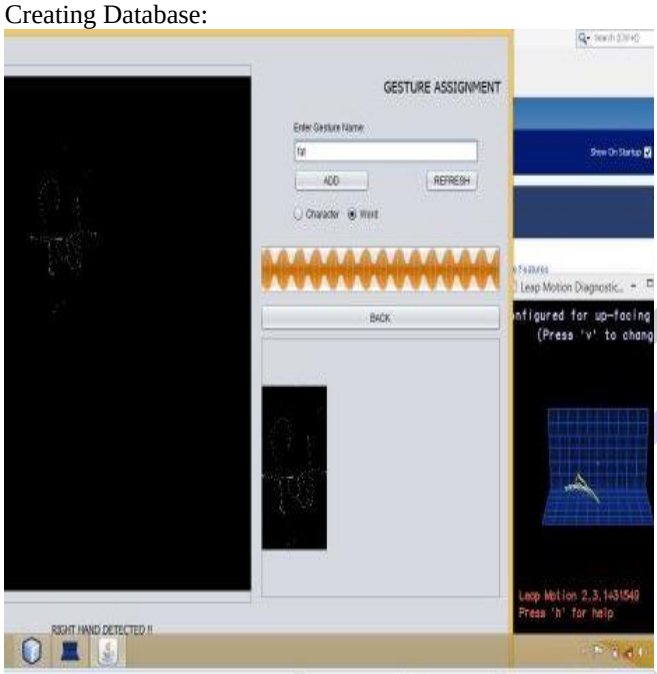
Display best match
diff(DBi,D')

$$D= \sum_{i=0}^{n} (DBi - Di)^2$$

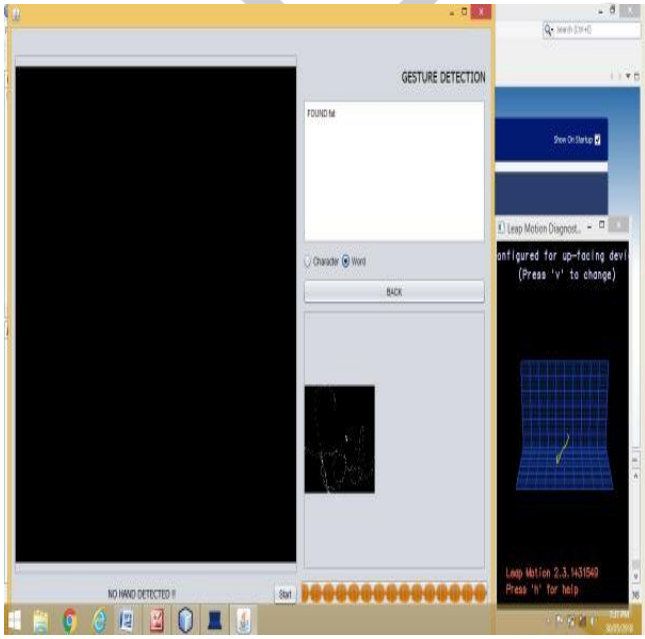
Where,n=total points in the array
return D.

5. Result Analysis

Creating Database:



Detection of word:



6. APPLICATIONS

1. Scool System
2. Signature Recognition
3. Banking.

7. CONCLUSIONS

In this, we are using feature point extraction,cosine similarity and Ecludien algorithm for measuring distance in between minimum and maximum points. So with the help of this we are increasing accuracy upto 84% for character and upto 81% for detecting a word.

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