SIGN LANGUAGE RECOGNITION

PROJECT SYNOPSIS

OF MAJOR PROJECT

BACHELOR OF TECHNOLOGY

COMPUTER SCIENCE AND ENGINEERING

SUBMITTED BY

KHUSHBOO JHA
PRIYANKA ANAND
RIYA GUPTA

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KIET Group of Institutions, Delhi-NCR, Ghaziabad (UP)

Department of Computer Science and Engineering

KIET Group of Institutions, Delhi-NCR, Ghaziabad (UP)

Department of Computer Science and Engineering

Project Synopsis

1. **Name of Student**: Khushboo Jha, Priyanka Anand, Riya Gupta

2. **University R.No.:**2000290100083,2000290100107,2000290100119

3. **Class Roll No.:**15,39,51

4. **Branch:** CSE

5. **Batch:**2024

6. **Proposed Topic:** Sign language recognition

7. **Submitted by:** Khushboo Jha, Priyanka Anand, Riya Gupta

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Introduction

The goal of this project was to build a neural network able to classify which letter of the American Sign Language (ASL) alphabet is being signed, given an image of a signing hand.
This project is a first step towards building a possible sign language translator, which can take communications in sign language and translate them into written.

Conversing with people having a hearing disability is a major challenge. Hence there is a need for systems that recognize the different signs and conveys the information to normal people. A system for sign language recognition that classifies finger spelling can solve this problem.
Various machine learning algorithms are used and their accuracies are recorded.

Most research implementations for this task have used depth maps generated by depth camera and high-resolution images. The objective of this project was to see if neural networks are able to classify signed ASL letters using simple images of hands taken with a personal device such as a laptop webcam. This is in alignment with the motivation as this would make a future implementation of a real time ASL-to-oral/written language translator practical in an everyday situation

Rationale

Hand gesture is one of the methods used in sign language for non-verbal communication. It is most commonly used by deaf & dumb people who have hearing or speech problems to communicate among themselves or with normal people.

Pattern recognition and Gesture recognition are the developing fields of research. Being a significant part in nonverbal communication hand gestures are playing key role in our daily life. Hand Gesture recognition system provides us an innovative, natural, user friendly way of communication with the computer which is more familiar to the human beings.

By considering in mind the similarities of human hand shape with four fingers and one thumb, the software aims to present a real time system for recognition of hand gesture on basis of detection of some shape-based features like orientation, Centre of mass centroid, fingers status, thumb in positions of raised or folded fingers of hand.

Objectives

- Communication is always having a great impact in every domain and how it is considered the meaning of the thoughts and expressions that attract the researchers to bridge this gap for every living being.

- The objective of this project is to identify the symbolic expression through images so that the communication gap between a normal and hearing-impaired person can be easily bridged.

- To develop an automatic sign language recognition system with the help of image processing and computer vision techniques.

- The objective for this work is to provide a real time interface so that signers can easily and quickly communicate with non-signers.

- To efficiently and accurately recognize signed words, from Sign Language, using a minimal number of training examples

Literature Review

Abstract:

Sign language facilitates communication both within the community and between the deaf and the hearing. Sign language recognition can be used to ease the learning of sign language, or even to circumvent it altogether.

Sign Language (SL) recognition is getting more and more attention of the researchers due to its widespread applicability in many fields. This paper is based on the survey of the current research trends in the field of SL recognition to highlight the current status of different research aspects of the area. Paper also critically analyzed the current research to identify the problem areas and challenges faced by the researchers.

INTRODUCTION:

Sign Language is important, but learning languages is difficult. For this reason, computers and various input devices have been applied to create the field of automatic sign language recognition (SLR). Over the last several years, the scene of the hand gesture recognition field has changed due to the emergence of several depth-based devices. This paper will focus on reviewing the literature concerning the use of the American Sign Language (ASL), alphabet is being signed, given an image of a signing hand. ASL (American Sign Language) is a natural language that serves as the predominant sign language of Deaf communication in the United States of America and most of Anglophone Canada. ASL is a complete and organized visual language that is expressed by both manual and nonmanual features.

The chosen methods and their results will be compared in order to find the most successful approaches. A wide selection of research about the hand gestures in different languages has been done in relation to sign language recognition is available.

This paper will contain information about various algorithms and techniques used in word formation by hand gestures recognition.

USE OF MACHINE LEARNING:

The use of machine learning helps overcome several difficulties. Various algorithms have been tried and tested. Classification machine learning algorithms like SVM, k-NN are used for supervised learning, which learning, which involves labelling the dataset before feeding it into the algorithm for training. For this project, various classification algorithms have been studied and used like SVM, RNN, k-NN, and CNN.

RESULTS:

Broadly, the literature deals with feature extraction, and gesture classification. A variety of both variables have been used in the literature. As mentioned previously, the data set generally consisted of some fingerspelling gestures, and the testing was done using some form of cross validation. By considering the real time scenario, the software aims to present a real time system for recognition of hand gesture on basis of detection of some shape-based features like orientation. Centre of mass centroid, finger status, thumb in positions of raised or folded fingers of hand.

Feasibility Study

The sign language recognition system feasible for muted persons because of them can be communicated in deaf via this system. The system can capture hand gestures and navigate the words as in text format it will use for muted persons to see these words and understand the sentences.

Need of sign language?

- Being proficient in ASL allows you to communicate with a wide range of hearing, hard of hearing, and deaf individuals— including students in mainstream and deaf school or university programs and deaf or hard of hearing residents and business people in your community.
- Helpful for people with **autism spectrum disorder**

- Helps the deaf and the dumb to communicate with the others as well as amongst themselves

- Helps in the process of social inclusion of those that suffer from hearing impairment
- Provides a chance to the deaf children to educate themselves

- Enhances the level of confidence among the disabled
- Easier and effective communication reduces chances of conflict between people
- Sign language interpreters and educators are greatly required in public places such as police stations, courts, hospitals to remove language barriers between the deaf and the normal people and prevent any chance of exploitation.
- It is believed that 90 per cent of the deaf children is born to parents who can listen properly. Therefore, such parents need to learn the sign language to communicate with their child

Methodology/ Planning of work

The primary source of data for this project was the compiled dataset of American Sign Language (ASL) called the ASL Alphabet.

Tools of data collection / analysis

- Uses dynamic dataset fort training. dynamic is a real-time live capture of the gestures. This involves the use of the camera for capturing movements.

- Programming an AI to Recognize Sign Language with TensorFlow and Keras

- **Backend language:** Django

- With Django, you will get authentication, URL routing, template engine, object-relational mapper (ORM), and database schema migrations all in one pack.

- **Frontend language:** HTML, CSS, JavaScript, react

Facilities required for proposed work

➢ **Software requirements:**

a) **Operating System:**

- Windows

b) **SDK:**

- Python (3.7.4) IDE (Jupyter), cv2 (OpenCV) (version 3.4.2)

- TensorFlow, Eros, NumPy (version 1.16.5), Keras (version 2.3.1), TensorFlow (as keras uses TensorFlow in backend and for image preprocessing) (version 2.0.0)

➢ **Hardware Requirements**

The Hardware Interfaces Required are:

- **Camera:** Good quality,3MP

- **Ram:** Minimum 8GB or higher

- **GPU:** 4GB dedicated

- **Processor:** Intel Pentium 4 or higher

Expected outcomes

Our project aims to capture sign language performed by signers on a real-time basis and interpret the language to produce textual output for the illiterate.

For this, a camera-based approach willbe made use of, owing to the ease of portability and movement that the camera-based method offers over other techniques

References [IEEE format]

https://www.researchgate.net/publication/314522980_Sign-Lingo_-Feasibility_of_a_Serious_Game_for_Involving_Parents_in_the_Language_Development_of_Their_Deaf_or_Hearing_Impaired_Child -
[Ivor van der Schalk and Marco Spruit
Department of Information and Computing Sciences, Utrecht University, Utrecht, The Netherlands, January 2017]

https://ijisrt.com/assets/upload/files/IJISRT21APR505.pdf-
[Ayushi N. Patani, Varun S. Gawande, Jash V. Gujarathi, Vedant K. Puranik, Tushar A .Rane
Department of Information Technology Society for Computer Technology and Research's
Pune Institute of Computer Technology Affiliated to Savitribai Phule Pune University
(formerly known as Pune University) , April 2021]

https://ieeexplore.ieee.org/document/9681062
[Qazi Mohammad Areeb; Maryam; Mohammad Nadeem; Roobaea Alroobaea; Faisal Anwer , January 2022]

https://ieeexplore.ieee.org/document/9835908
[Vishal Munnaluri; Vishal Pandey; Parminder Singh , July 2022]

https://ieeexplore.ieee.org/document/7507939
[Anup Kumar; Karun Thankachan; Mevin M. Dominic , July 2016]