MODY UNIVERSITY OF SCIENCE AND TECHNOLOGY

Lakshmangarh,Rajasthan

GRADE A+ ACCREDITED BY NAAC (3.43 ON THE SCALE OF 4)

Sign Language to Text Conversion

UNDER THE GUIDANCE

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INTRODUCTION

Sign language is one of the oldest and most natural forms of language for communication, but since most people do not know sign language and interpreters are very difficult to come by, we have come up with a real time method using neural networks for fingerspelling based on American sign language. In our method, the hand is first passed through a filter and after the filter is applied the hand is passed through a classifier which predicts the class of the hand gestures. Our method aims to provide 95.7 % accuracy for the 26 letters of the alphabet.

Problem Statement

Communication barriers exist between the hearing-impaired and non-sign language users, limiting accessibility in various social and professional settings. Existing methods of communication, such as interpreters and text-based applications, are either costly or inconvenient.

Solution

This project proposes an AI-powered system that recognizes sign language gestures and converts them into text in real-time. By leveraging computer vision and deep learning, the system can interpret gestures accurately, making communication more accessible and inclusive.

METHODOLOGY

- **Data Collection:** The system relies on a dataset of sign language gestures.
- **Preprocessing:** Image frames are processed using computer vision techniques, such as background removal and normalization.
- **Feature Extraction:** Key features from hand gestures are extracted using convolutional neural networks (CNNs).
- **Model Training:** A deep learning model (such as CNN) is trained to recognize gestures.
- **Real-Time Prediction:** The trained model is integrated with a live webcam feed to recognize and convert gestures into text.
- **Output Display:** The recognized text is displayed on a user-friendly interface.

PROPOSED STANDARDS

- **Dataset Quality:** The dataset should contain diverse hand gestures to ensure model accuracy.
- **Model Accuracy:** The recognition model should achieve a high accuracy rate to minimize misinterpretations.
- **Real-Time Processing:** The system should operate with minimal latency for real-time usability.
- **User Interface (UI):** A simple and intuitive UI should be developed for easy interaction.
- **Scalability:** The system should be extendable to different sign languages and environments.

PROJECT DESIGN

Objective:

- To develop a real-time Sign Language to Text Conversion system using neural networks that can recognize American Sign Language (ASL) fingerspelling and convert it into text.

System Architecture:

- Input: Live hand gesture images.
- Preprocessing: Image filtering, background removal, resizing, and normalization.
- Model: A Convolutional Neural Network (CNN) trained on ASL gestures.
- Prediction: The model classifies hand gestures into the corresponding alphabet.
- Output: Display of the recognized letter in a text format.

Technology Stack:

- Programming Language: Python
- Libraries: OpenCV, TensorFlow, NumPy, Hunspell
- Dataset: ASL fingerspelling dataset
- User Interface: Python-based GUI

MAINTAINABILITY

Code Structure:

- Modular Approach: Separate scripts for data preprocessing, training, testing, and application.
- Well-Commented Code: Each function and module is documented for easy understanding.
- Scalability: New signs or words can be added by retraining the model with more data.

Model Maintainability:

- Retrainability : New data can be fed to improve accuracy.
- Lightweight Deployment: Can be optimized for real-time use on edge devices.
- Error Handling: Checks for incorrect inputs and missing data.

REALISTIC CONSTRAINTS

Hardware Constraints:

- Training requires high computational power (GPU/TPU recommended).
- Real-time detection might face latency issues on low-end devices.

Data Constraints:

- Large dataset required for better generalization.
- Different hand sizes, lighting conditions, and camera angles can affect accuracy.

Software Constraints:

- Model size should be optimized to run on low-power devices.
- Needs a proper GUI for non-technical users.

Ethical & Accessibility Constraints:

- Should be inclusive for diverse user groups.
- Might not cover all sign language variations (currently supports only ASL).

TECHNOLOGY USED

- **Python -** The programming language used to develop the project.
- **TensorFlow -** A machine learning framework used for training and running deep learning models, likely for sign language recognition.
- **OpenCV -** A computer vision library used for image processing, detecting hand gestures, and extracting relevant features from the input images.
- **Matplotlib -** A visualization library used to plot graphs, display images, or track training progress.
- **PIL (Pillow) -** A library for opening, manipulating, and processing images in various formats.
- **Hunspell -** A spell-checking library used for suggesting correct words if any errors occur during text conversion.

GANTT CHART

Sign Language to Text Conversion

PROCESS	PHASE 1		PHASE 2		PHASE 3	
	Jan	Feb	Feb	March	March	April
Planning						
Requirement Analysis						
Design Process						
Deployment & Testing						
Report Writing						

THANK YOU