A PROJECT SYNOPSIS

on

Real-Time Indian Sign Language Recognition

Submitted By

1) **Meehir Mhatre (42)**
2) **Swastik Poojari (61)**
3) **Palak Sharma (64)**

Under the Guidance of

Prof. Guide Name

Department of Information Technology

Saraswati Education Society's

SARASWATI COLLEGE OF ENGINEERING

Kharghar,Navi Mumbai

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Tel. : 022-27743706 to 11 * Fax : 022-27743712 * Website: www.sce.edu.in

CERTIFICATE

This is to certify that the requirements for the synopsis entitled " Real-Time Indian Sign Language Recognition "

Have been successfully completed by the following students:

Roll numbers	Name
42	Meehir Mhatre
61	Swastik Poojari
64	Palak Sharma

In partial fulfillment of Sem –VI,**Bachelor of Engineering of Mumbai University in Information Technology** of Saraswati college of Engineering,Kharghar during the academic year 2020-21.

Internal Guide **External Examiner**

Prof.

Project coordinator **Head of Department**

Prof. Ragini Sharma Prof. Diksha G Kumar

Principal

Dr. Manjusha Deshmukh

DECLARATION

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included; I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Meehir Mhatre Swastik Poojari Palak Sharma

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1) **Meehir Mhatre(42)**
2) **Swastik Poojari (61)**
3) **Palak Sharma (64)**

Real-Time Indian Sign Language Recognition

ABSTRACT

Sign languages are a visual representation of thoughts through hand gestures, facial expressions, and body movements. Sign Languages also have several variants, such as American Sign Language (ASL), Argentinian Sign Language (LSA), British Sign Language (BSL) and ISL.

The hearing and speech impaired people prefer sign language, which is mostly used in their region.

Though there exist many sign languages, the normal people do not know about sign languages. Hence communicating with deaf and dumb people becomes more complex.

We consider the problem of real time Indian Sign Language (ISL) finger-spelling recognition. The system takes in a hand gesture as input and returns the corresponding recognized character as output in real time on the phone's screen.

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1. INTRODUCTION

Sign languages are developed primarily to aid deaf and dumb people. They use a concurrent and specific combination of hand movements, hand shapes and orientation in order to convey particular information. One such set of languages is the Indian Sign Language (ISL) system which is predominantly used in south Asian countries. Certain aspect that distinguishes ISL from other sign languages is that ISL is devoid of any temporal inflections in its finger spelling chart and also the usage of both the hands.

With the advent of artificially intelligent algorithms coupled with the availability of big data and large computational resources has led to a huge growth in the field of healthcare, robotics, autonomous self-driving vehicles, Human Computer Interaction (HCI) etc.

Many people in India are speech and/or hearing impaired, and they thus use hand gestures to communicate with other people. However, apart from a handful number of people, not everyone is aware of this sign language and they may require an interpreter which can be inconvenient and expensive. This project aims to narrow this communication gap by developing software which can predict the ISL alphanumeric hand gestures in real time.

2. LITERATURE SURVEY

Sr. No	Year,Journal	Title	Methodology	Advantages	Result
1)	2019, IEEE	Real-Time Recognition of Indian Sign Language	Fuzzy c-means clustering	Capable of recognising 40 words of ISL in real-time	75 %
2)	2020, IEEE	Sign Language to Speech Translation	CNN	Classify both one-handed and two-handed signs.	75%
3)	2019, IEEE	Real-Time Translation of Indian Sign Language using LSTM	Recurrent neural networks (RNNs)	The designed glove uses low-cost hardware, making it affordable for the users.	98%
4)	2021, IEEE	Artificial Neural Network based Indian Sign Language Recognition using hand crafted features	Artificial Neural Network	Images here are captured using digital camera, but can be in future replaced by mobile camera.	98%
5)	2020, IEEE	Gesture Recognition Using Deep Learning	Deep Learning	The application recognize in real time and in varying backgrounds	99%
6)	2019, IEEE	Real Time Conversion of Sign Language using Deep Learning for Programming Basics	Deep Learning	System detects one-handed and two-handed gestures	61.58%
7)	2019, IEEE	Indian Sign Language converter using Convolutional Neural Networks	CNN	Classifying 26 letters of the Indian Sign Language into their equivalent alphabet letters by capturing a real time image	87.69%
8)	2020,IEEE	SIGN LANGUAGE RECOGNITION USING TEMPLATE MATCHING TECHNIQUE	Deep Learning	Detects ASL and ISL.	75%

3. PROBLEM STATEMENT

Communication is one of the basic requirements for survival in society. Reports indicate that 11100 or 1% of children are born with hearing impairments. It means that about 60 children are born deaf everyday in India. Deaf people communicate among themselves using sign language but normal people find it difficult to understand their language. In addition to this, the lack of datasets along with variance in sign language with locality has resulted in restrained efforts in ISL gesture detection. ISL is also subject to variance in the locality and the existence of multiple signs for the same character.

4. PROPOSED SYSTEM

• The goal of this project is to build an application able to classify Indian Sign Language, given an image/video. This project is the first step towards building an ISL translator, which is not yet launched in the market and can communicate in sign language and translate them into written and speech format.

• The goal is further motivated by the isolation that is felt within the deaf community.

• To make this computerized we considered Different types of features and studied them thoroughly and made an App.

4.1 Algorithm

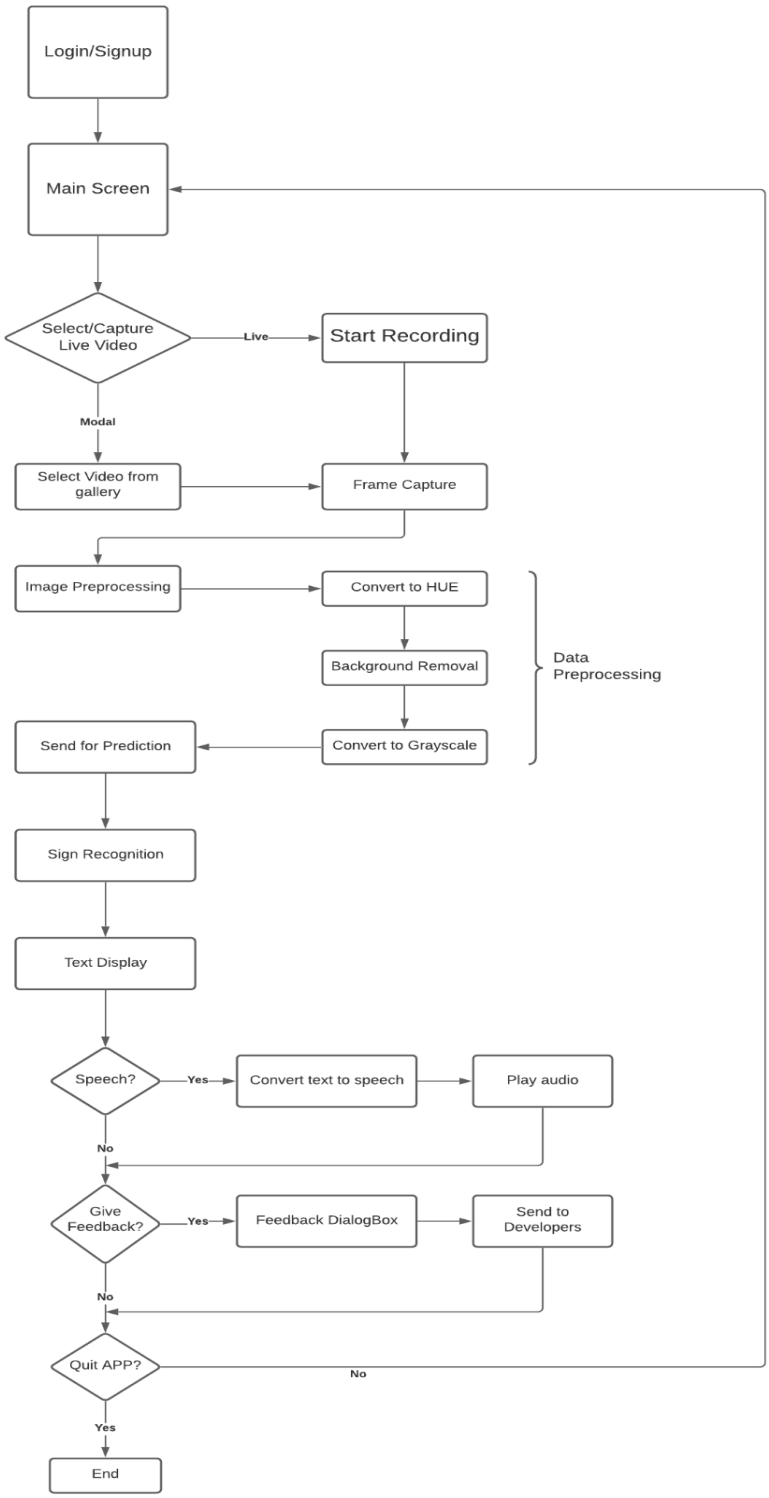
1. The primary module being the input where the image of gestures are taken from the user.

2. Then image pre-processing that removes noise and sharpens the contrast of the image for better results.

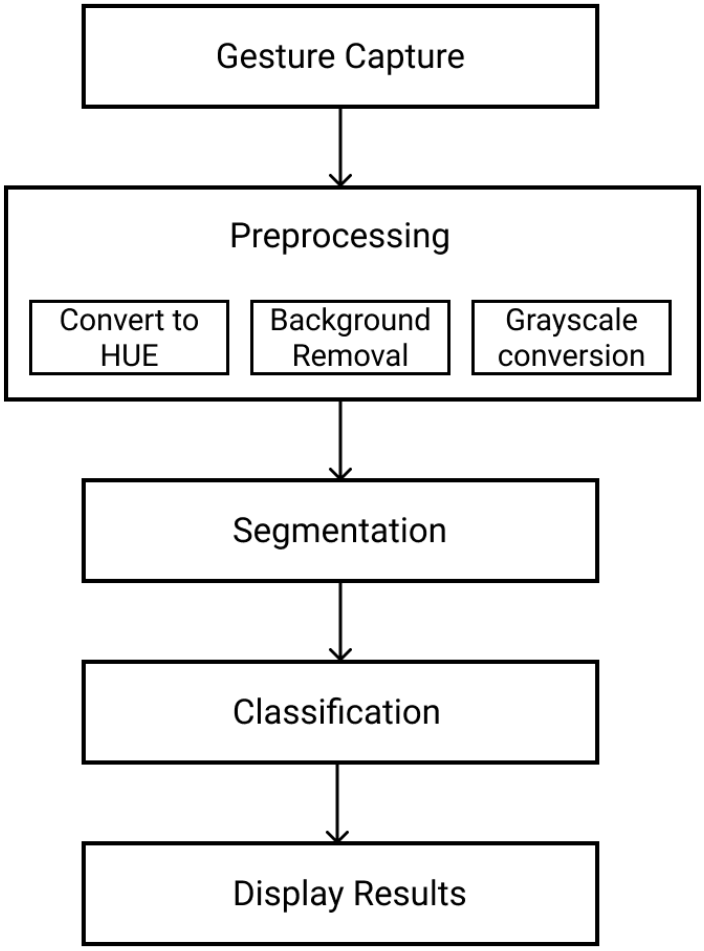
3. That is then passed to the VGG16 model that analyses the input image with the model which is created by performing VGG16 on the training dataset and labels the input image accordingly.

4. The last module is the output where the labelled images from the previous module is used to recognise the signs and show on the screen .

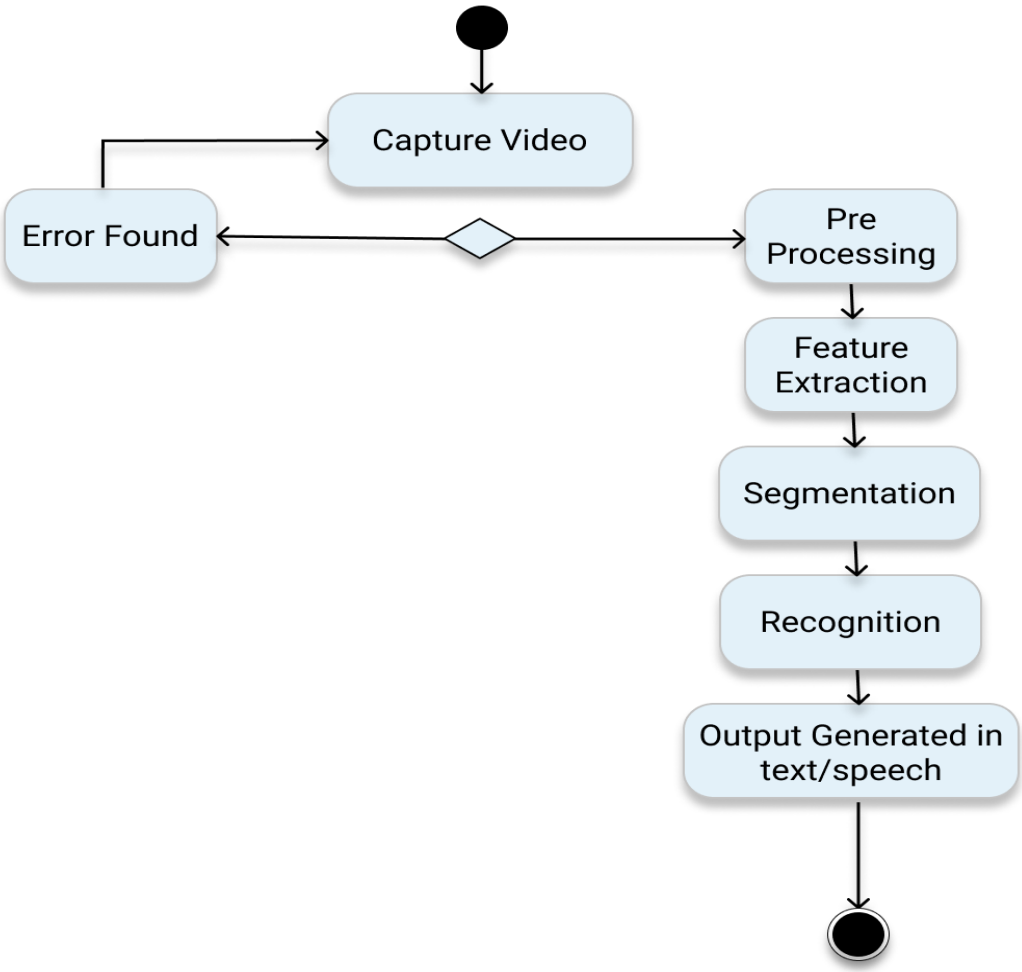
4.2 Flowchart



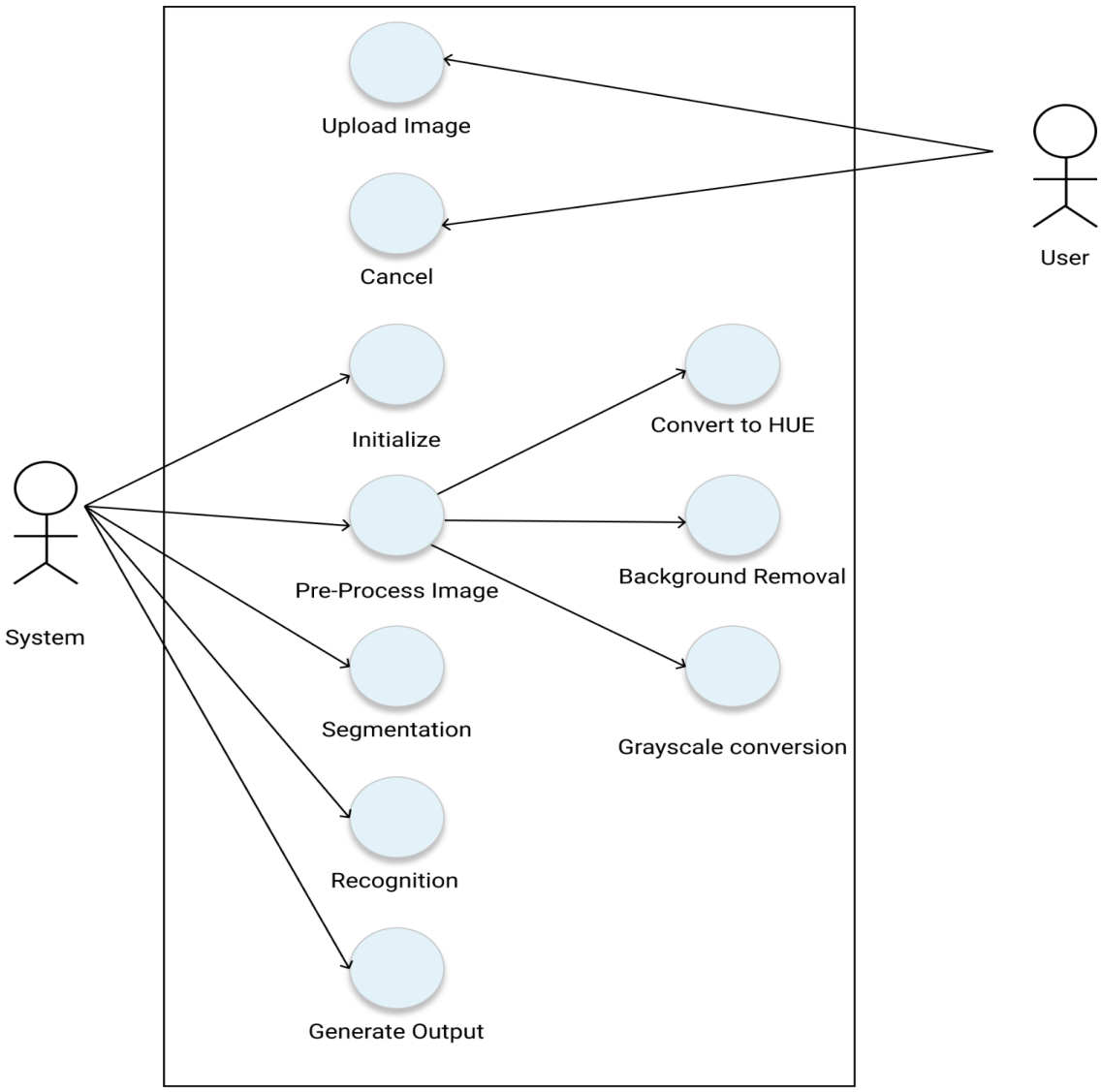
4.3 Block Diagram



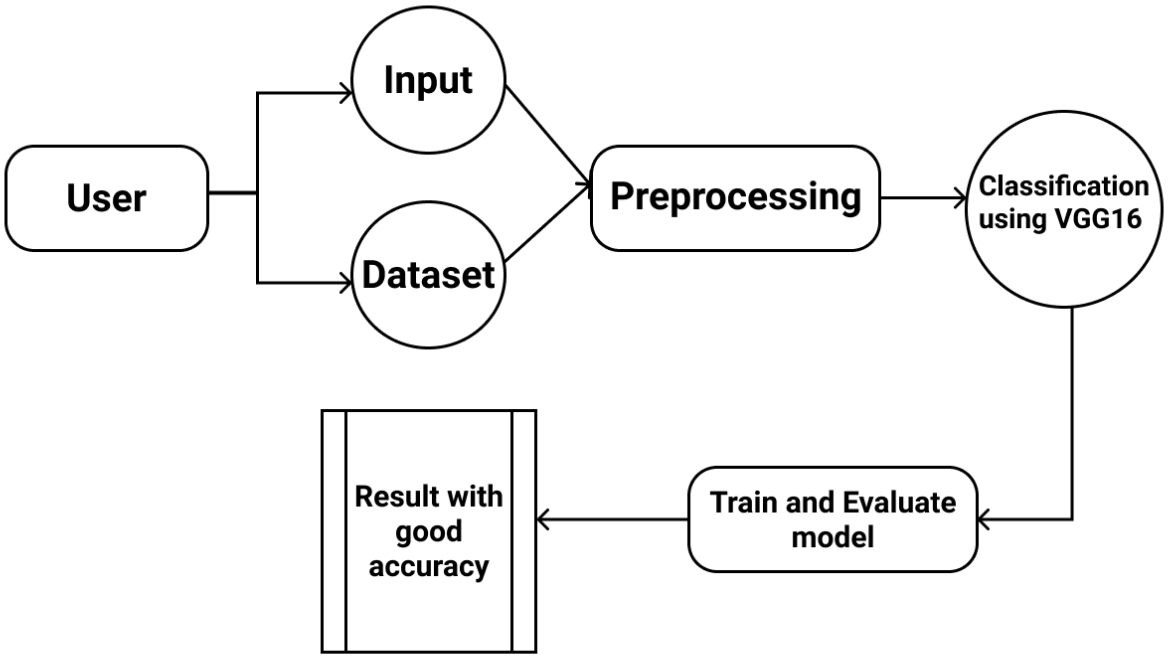
4.4 Activity Diagram



4.5 Use Case Diagram



4.6 DFD Diagram



4.4Details of Hardware and Software

- Hardware Details
  - Windows 10
  - Processor: Intel Chipset
  - Memory : 8GB
  - i5 Processor Based Computer or higher
- Software Requirement:
  - Android Studio
  - Visual Studio

6. IMPLEMENTATION PLAN

The implementation of the above would be followed by a training and testing phase to train and enhance the model. The proposed model is to run in real-time, that is to say that the ultimate design would accept video inputs and work on that. However, in the initial phases of development, the focus would be on capturing and translating stationary gestures. Therefore, the inputs would be taken as still images of signs that do not involve any motion. Specifically with regards to ISL, stationary signs are usually utilized for a majority of the alphabets and for simple words. Complex grammatical structures such as sentence formation require gestures with motion. The dataset should ideally be a range of predetermined set of gestures as made by a token number of individuals. The intention behind using such a dataset is to identify the same gestures as made by different individuals. The tool constructed should be able to identify the gestures accurately irrespective of the person signing. This would also mean that the variances in the styles and body languages of individuals would need to be covered in order for the tool to accurately recognize and translate signs.

The variations in the dataset would also serve to cover the differences in the physical attributes of people – including differences in structure of hands (length of fingers, size of palm, et al) and skin texture – as well as variations in image quality. Furthermore, the dataset should involve variations in other graphic factors, such as the attire of the signer or the color of their clothes, which might impact the capturing and identification of the signs by the algorithm during image processing.

The wider the varieties in the training dataset, the more accurate and stable the resultant model would be. The variety included in the dataset would help avoid overfitting of the model and thereby, provide relatively better and apt outcomes for the images or signs processed through the system. Increasing the variation in the dataset would lead to reduced bias in the resulting, trained model.

Once compiled, the dataset would be required to be split into three categories – training, validation and testing data. The training and validation data would have to be labelled for the system to be able to understand the classifications to be made. That would mean that every sign or gesture in the training data would need to be labelled with the equivalent English translation.

The testing data would be a randomized mix of signs and gestures with no classification provided, for which the algorithm of the model will run and test accuracy.

With the dataset compiled and segregated, the model can be run to train and verify its algorithm. For this system, the VGG16 algorithm is used.

The visual inputs can be processed using an assortment of image processing and computer vision techniques. This is integrated in the neural network algorithm employed. The algorithm then works to identify and classify gestures. Moreover, machine learning techniques are incorporated in the algorithm in order to allow for more accurate classifications and for the resultant system to adapt and improvise with use. This serves to train the system better with every iteration of data processed by it.

The results in this case, would be the text output for the sign input. This output is then processed by running it through a text to speech translator. Once run through this translator the outputs can either be played or stored and kept in audio file format. This resulting output is treated as the final outcome of this system which would therefore, in conclusion, be able to convert a sign to speech.

For this, a number of libraries and APIs exist that can function as text-to-speech translators and even be customized to suit requirements. By making use of these, the derived text can be converted to provide an audio output. Based on the library used, the audio can either be played in real time and/or stored as per utilization. For the purposes of this system, the preference would obviously be to play the audio output in real time.

7. CONCLUSION

With this application, we have created a proper Indian Sign Language Recognition system that can deal with both static and dynamic gestures. This system is as close to real-time as possible, with optimizations for speed wherever necessary. This system also handles one-handed and two-handed gestures within the same model. Having delved into this project with very little work to refer to, due to the relative negligence towards ISL by researchers, we have made significant inroads into making a system that can deal with ISL gestures. It is also observed that a diverse and extravagant dataset with more variations could make the model robust to sign variations, and improve the results significantly. By focusing this system towards programming basics, we have introduced a novel method to take programming knowledge to the disabled of people all over the world, and improve access to education for all.

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Program Educational Objectives (PEO)

1. To prepare the candidate for a successful career in the industry and make him acquainted with the latest software and hardware,
2. To enable student to work productively as computer engineers, including supportive teamwork and leadership roles on multidisciplinary teams,
3. Graduates are prepared to be responsible computing professionals in their own area of interest,
4. To provide the candidate with a sound foundation in mathematics, software technologies, database technologies, networking, hardware and to prepare them for post graduate studies and research programs.
5. To promote the awareness of lifelong learning among students and to introduce them to professional ethics and codes of professional practice,
6. To demonstrate effective communication skills in oral, written and electronic media.

Program Outcomes (PO)

At the end of the program, a student will be able to:

1. Apply knowledge of mathematics, science and engineering.
2. Utilize the computer engineering knowledge in all domains, viz., health care, banking and Finance, other professions such as medical, law, etc.
3. Design and conduct experiments as well as to analyze and interpret data.
4. Analyze the problem, subdivide it into smaller tasks with well-defined interface for interaction among components, and complete the task within the specified time frame and financial constraints,
5. Design a system, component or process to meet the desired needs within realistic constraints such as economic, environmental, social, political and Ethical ability,
6. Design, implement, and evaluate secure hardware and/or software systems with assured quality and efficiency,
7. Communicate effectively the engineering solution to customers/users or peers,
8. Understand professional and ethical responsibilities,
9. Understand contemporary issues and to get engaged in lifelong learning by independently and continually expanding knowledge and abilities,
10. Function in multidisciplinary teams,
11. Identify, formulate and solve engineering problems.

Course Objective and Scope:

1. To understand the problem and to design and implement a solution.
2. Gain project management skills
3. Understand current tools and market trends
4. Develop the management and team management skills
5. Acquire presentation skills.

Expected Outcomes:

1. Ability to critically analyze a problem and to design, implement and evaluate a computing solution that meets requirements.

2. An ability to cooperatively work in a team and meet deadlines

3. Use current tools and methodologies in effective way for solution

4. Understand social and ethical responsibility of working as a professional in the field of Information Technology.

5. Sustain diverse acts with parameters to complete a quality project

6.Ability to present their project work.