

University Of Asia Pacific

CSE 306: System Analysis & Design Lab

Project Documentation

SIGN LANGUAGE Recognition

GitHub Repository link: <https://github.com/mehedi-islam/Sign-Language-Recognition>

Submitted to

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Introduction

Sign language is a visual language that uses hand movements, gestures, body language, and facial expressions to communicate. It is a rich and complex form of communication that is the primary language for many deaf and hard-of-hearing individuals.

Problem Statement

Communication is the process of exchanging thoughts and messages through many means such as speech, signals, behavior, and visuals.

Deaf and mute (D&M) people use their hands to make different gestures to communicate their ideas to other people. Gestures are messages communicated non-verbally and these gestures are understood through the eyes. This non-verbal communication between deaf and dumb people is called sign language.

In our project, we focus on building a model that can recognize hand gestures based on finger spelling using American Sign Language and combine each gesture to form a complete word to provide a learning website.

Here,

American Sign Language is a major sign language since the only disability D&M people have been communication related and they cannot use spoken language so the only means of communication for them is sign language.

Motivation

- ❖ **Increased Inclusivity:** Encourages learning sign language and helps deaf people connect more effectively with the community.
- ❖ **Professional Opportunities:** Sign language skills open doors to careers in interpretation, education, and various support services for the deaf community.
- ❖ **Personal Growth:** It provides a unique opportunity to broaden linguistic and cultural understanding while fostering empathy and compassion.

Objectives

- ❖ Purpose: Gesture and Word Recognition: Developing a robust model capable of accurately recognizing hand gestures used in fingerspelling and generating algorithms to combine the recognized gestures into complete words based on the rules of ASL grammar.
- ❖ Learning Resources: Include ASL learning features such as tutorials, courses, quizzes, and interesting games to facilitate ASL learning.
- ❖ User Interface: Designing an intuitive and user-friendly learning website where users can interact with the system to learn ASL.
- ❖ Accessibility: Ensure the system is accessible to the deaf and hard of hearing by providing visual aids, captions, and other assistive features.
- ❖ Probability: Build a scalable system capable of handling a growing user base and expanding the content library.

Output

The final product will be an engaging and user-friendly online platform for learning American Sign Language. Users will be able to:

Using a webcam to interact with the system and practicing fingerspelling ASL gestures by watching and practicing videos, they will know the correct rules of gestures and word formation.

They can access a variety of courses including educational gaming features, tutorials, and quizzes to strengthen their ASL skills.

Track their progress and get personalized recommendations for improvement.

Users can express their opinions to exchange knowledge and experiences related to ASL.

The system will enable users to communicate effectively with the deaf and mute community and open the door to personal knowledge growth.

System Requirement Specification (SRS)

❖ Purpose:

The website aims to facilitate learning of American Sign Language (ASL) through interactive features and resources.

❖ Functional requirements:

- 1) User Registration: Allow users to create accounts with basic information and preferences.
- 2) Sign Language Recognition: Implement a system to accurately recognize and interpret sign language gestures.
- 3) Translation: Convert sign language into text or spoken language and written language into sign language.
- 4) Learning Resources:
 - Provide tutorials covering basic to advanced ASL topics.
 - Offer courses with interactive elements such as quizzes and educational games.
- 5) Communication Interface: Design a user-friendly interface for signers and non-signers to communicate seamlessly.
- 6) Accessibility features: Include high contrast mode and adjustable fonts for visually impaired users.
- 7) Progress Tracking:
 - Develop a system for users to track their learning progress, including completed lessons, quiz scores, and areas for improvement.
 - Provide personalized recommendations based on user performance and learning objectives.

❖ Non-functional Requirements:

- 1) Performance: Ensure that the software can process sign language gestures quickly and accurately
- 2) Security: Protect user data through encryption and secure authentication.
- 3) Compatibility: Ensure compatibility with different devices and operating systems to maximize accessibility.
- 4) Scalability: Design a system for growing user base and service demand.

❖ Hardware and Software Requirements:

- 1) Hardware: Specify the minimum requirements for devices such as processor speed and memory
- 2) Software: List compatible operating systems and dependencies for use

❖ **User Interface Design:**

Design intuitive interfaces with clear navigation and visual cues for effective communication and provide customization options to accommodate individual user preferences and accessibility needs.

❖ **Testing Requirements:**

- 1) Develop comprehensive test cases to verify the accuracy and reliability of sign language recognition and translation.
- 2) Conduct usability testing with target users to identify feedback and improvements.

❖ **Documentation:**

- 1) Create user manuals and documentation to guide setup and software usage.
- 2) Include troubleshooting tips and feedback options to help users solve common problems.

❖ **Maintenance and Support:**

- 1) Regular updates for bug fixes, security, and compatibility.
- 2) Provide support to users through online forums, help desk, and email channels.

Methodology

Sign language for Agile methodology typically involves using specific gestures or signs to represent Agile concepts and practices. While there isn't standardized sign language specifically for Agile, teams often develop their own set of signs or gestures to facilitate communication during Agile ceremonies like stand-up meetings, sprint planning, and retrospectives.

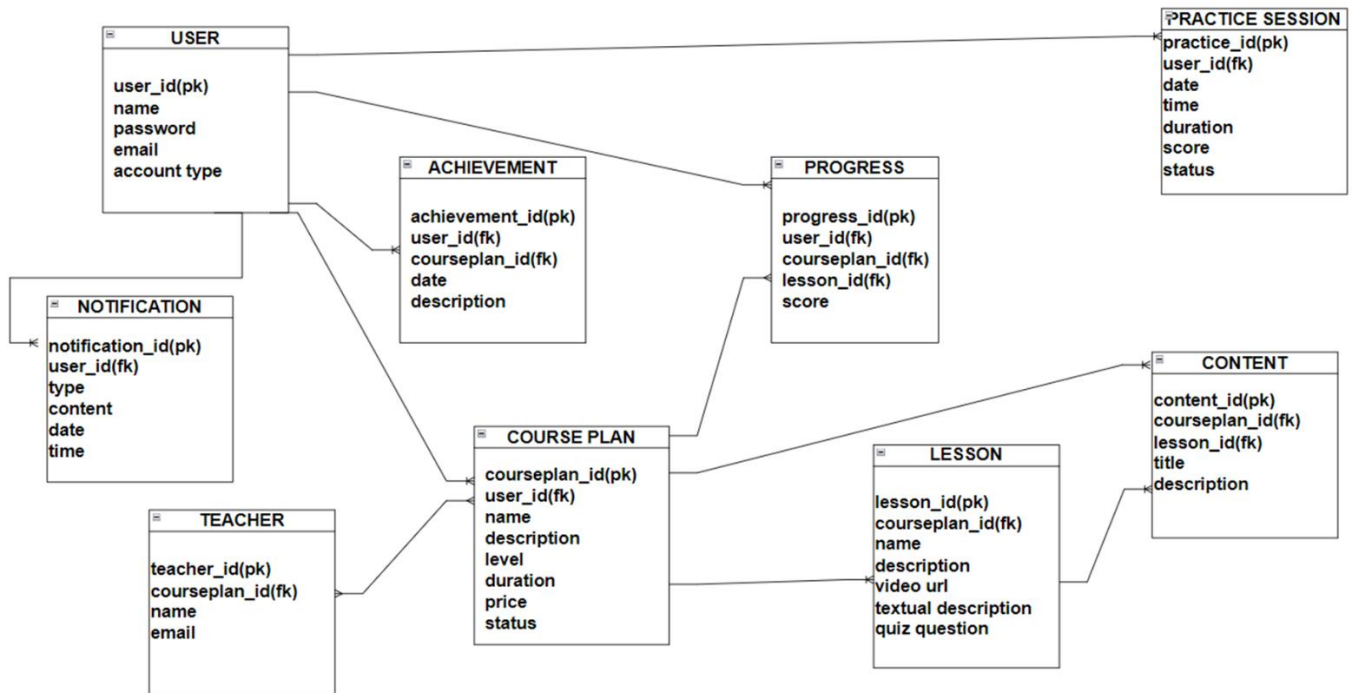
Here are some common examples:

1. Stand-up Meeting: Mimicking standing and pointing to represent the daily stand-up meeting where team members share updates on their progress.
2. Sprint: Make a running motion with your hands to represent the sprint duration, typically 1-4 weeks.
3. Backlog: Patting an imaginary list in front of you to represent the product backlog, where all tasks are listed.
4. Sprint Planning: Using hands to indicate planning and discussing, possibly drawing a circle in the air to represent the sprint planning meeting.
5. Retrospective: Gesturing a reflection motion with your hands, as if looking back, to represent the retrospective meeting where the team reflects on the past sprint.
6. User Story: Make a gesture of opening a book with your hands to represent the user story, which typically describes a feature from an end user's perspective.

These signs are not universal and can vary from team to team. The goal is to create a shared understanding and efficient communication within the team.

System Design

Entity Relationship Diagram (ERD)



Data Flow Diagram (DFD)

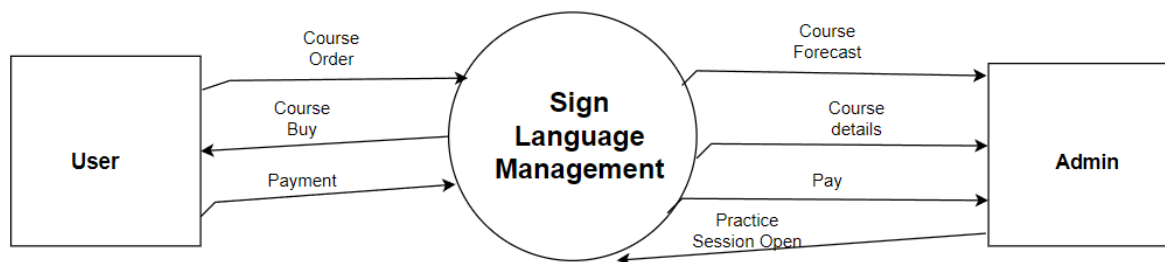


Fig: DFD-0

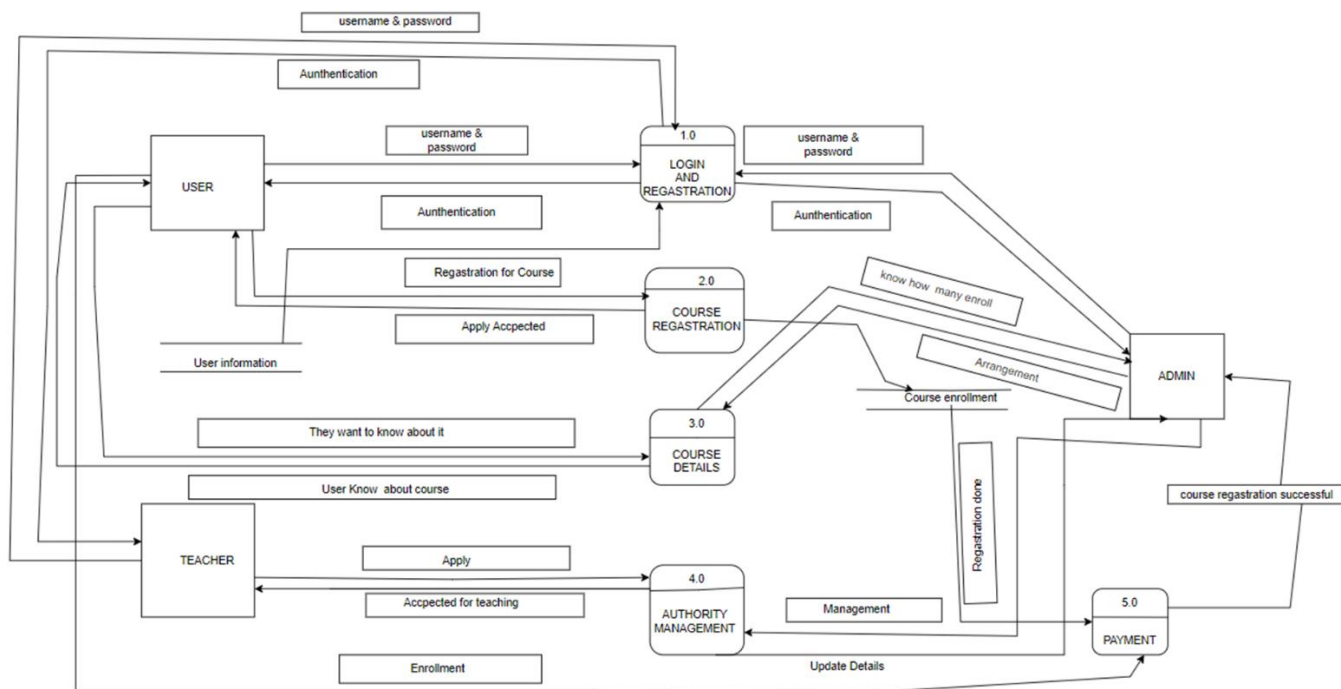
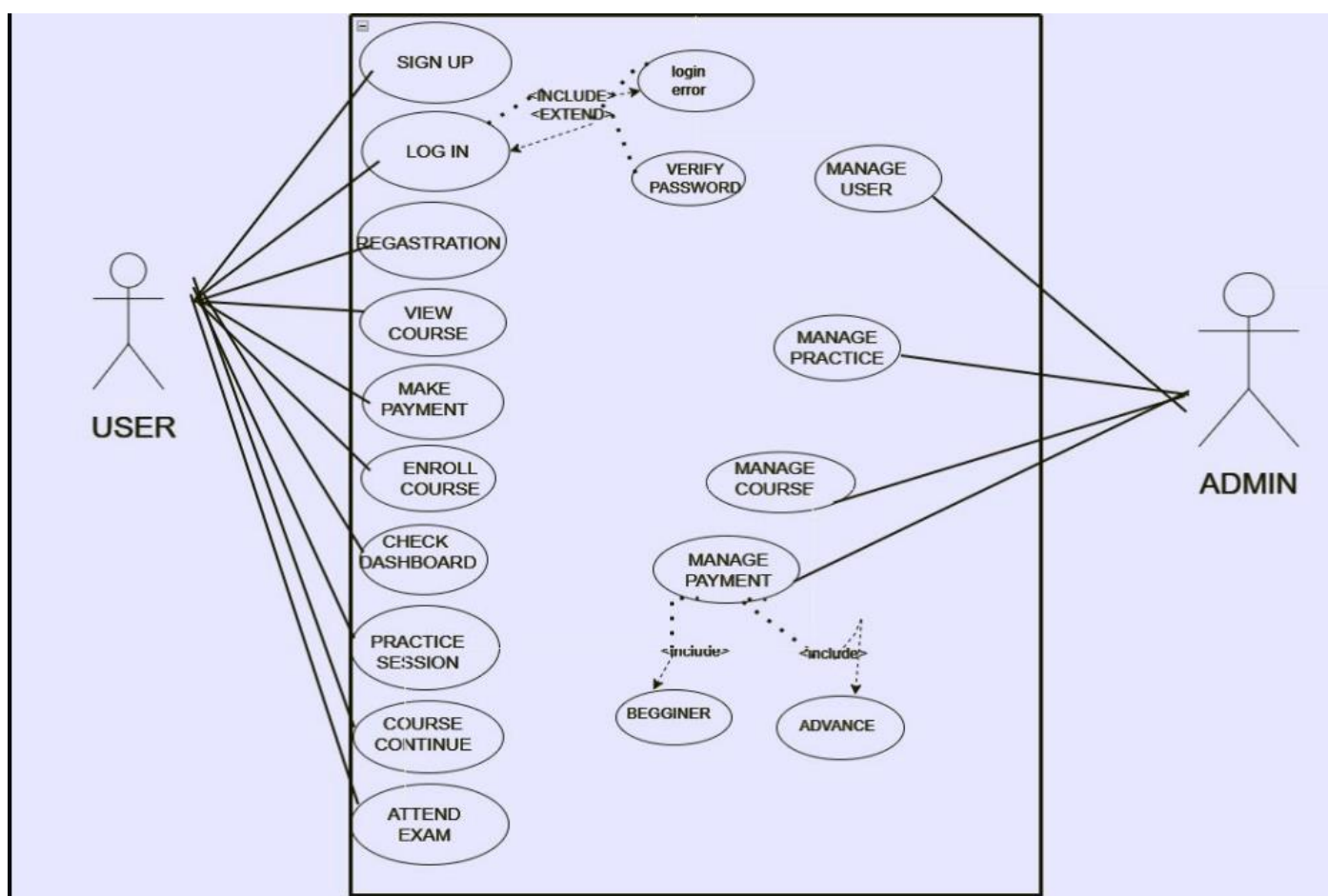
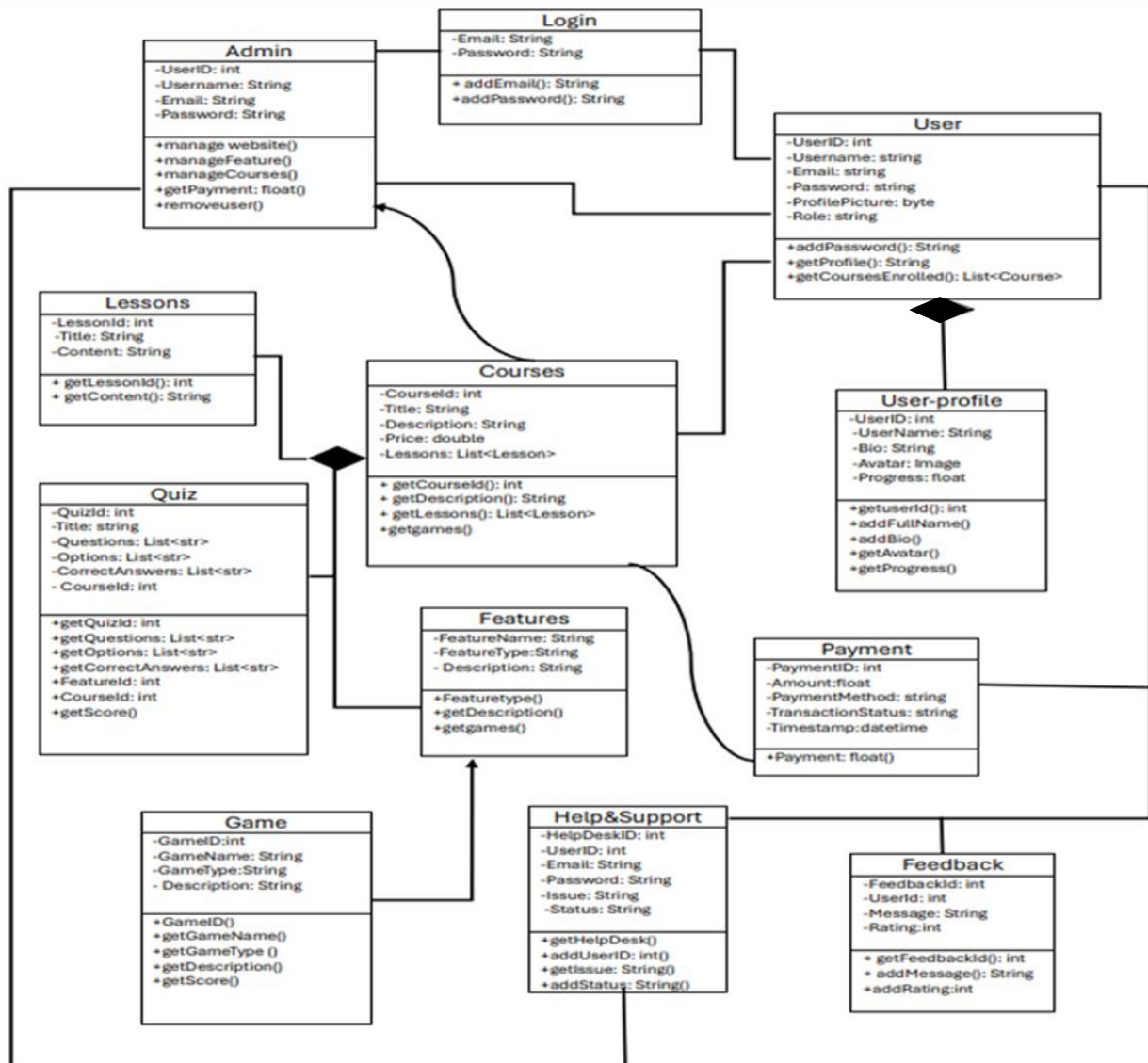


Fig: DFD-1

Use Case Diagram



Class Diagram



Feasibility Analysis

Technical Feasibility:

The technical feasibility of the 'Sign Language Management System'

Familiar with Application	It is teach sign language to beginners, improve communication skills for intermediates. Helps to connect them with Society. The essential duty of us is to design the course content and features. That user can easily understand
Familiarity with technology	Video technology is central to sign language courses. . It helps user to study This language. These platforms offer features for organizing course content, facilitating interactions, and tracking student progress.
Project Size	The project is high. But it is also can vary significantly depending on its scope, complexity, and objectives.
Compatibility	Its ability to work effectively across different platforms, devices, and environments. User easily learns by their courses.

Organizational Feasibility:

The sign language project aligns with the overall goals and mission of the organization. The courses price always user friendly. It mean methodology helps unable talk & listening people easily communicate with the society.

Economic Feasibility:

The economic feasibility of 'Sign language learning management' financially viable and whether the benefits outweigh the costs.

For the development of the project need some financial planning. For why first we check how much cost need for it.

Types Of Costs		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Development Costs	Software Development	30000	0	0	0	0	0	
	Course development	45000	0	0	0	0	0	90,000
	Advertisement	15000	0	0	0	0	0	
	total	90000	0	0	0	0	0	
Operational Cost	Hosting	0	20,000	35,000	45000	70000	55000	5,10,000
	Other Recursing spaces	0	45,000	55,000	65000	85000	35000	
	Total	0	65000	90000	110000	155000	90000	

Benefits	Year 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Percentage From users	0	75,000	89000	1,45000	200000	300000	18,59,000
Transaction fees	0	2,0000	35000	45000	45000	65000	
Advertisements	0	50000	75000	1,25000	200000	2,50000	
Total benefits	0	3,25000	1,99,000	315000	40,5000	6,15000	

Net Calculation	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Net benefit	90000	75000	80000	210000	80000	90000	625000
Cumulative Benefit	90000	390000	35000	515000	185000	200000	1415000

ROI

= (Total Benefit-Total Cost)/Total cost

= (1859000-600000)/600000

=2.09%

Break Even Point (BEP)

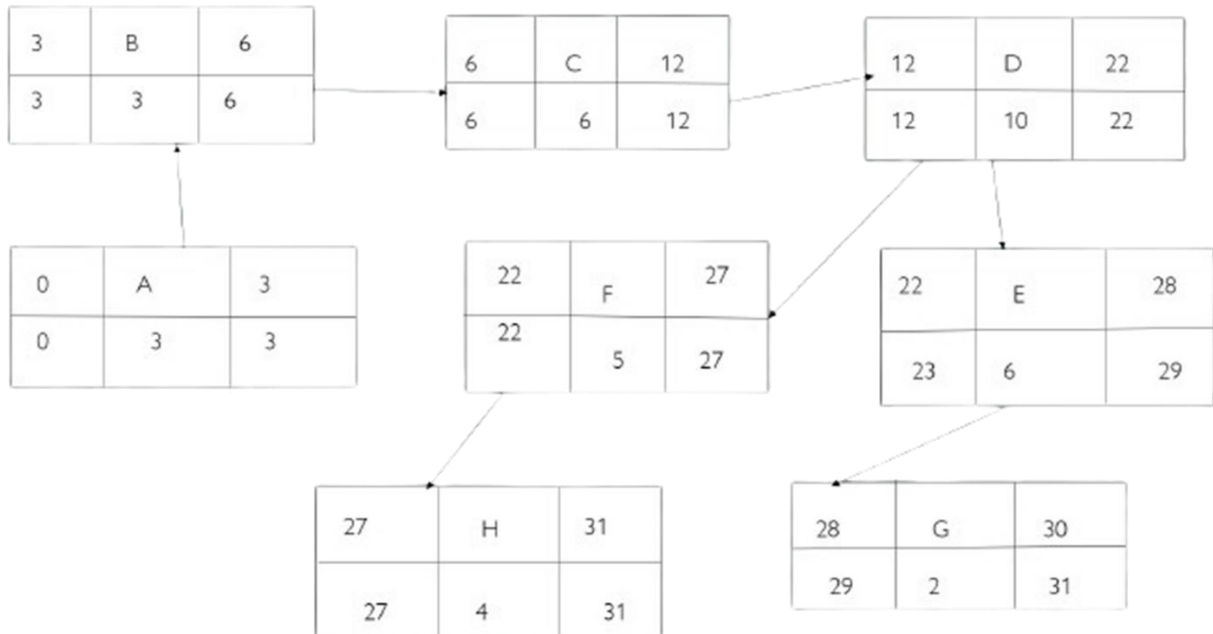
=Number of Years with Negative Cash Flow + (Yearly New Cash Flow - Cumulative Cash Flow in that Year)/Yearly Net Cash Flow

=3+(515000-210000)/515000

=3.59

Project Scheduling (CPM)

Activity No	ACTIVITY	DURATION	PRECENING ACTIVITY
A	Project Initiation	3	-----
B	Requirement Gatherings	3	A
C	System Design	6	B
D	Development	10	C
E	Testing	6	D
F	Documentation	5	D
G	Deployment	2	E
H	Post-Development Support	4	F



ACTIVITY NO	ACTIVITY	DURATION (WEEK)	PRECEDING ACTIVITY	ES	EF	LS	LF	SLACK	CRITICAL PATH OR NOT
A	Project initiation	3	-----	0	3	0	3	0	YES
B	Requirements gathering	3	A	3	6	3	6	0	YES
C	System design	6	B	6	12	6	12	0	YES
D	Development	10	C	12	22	12	22	0	YES
E	Testing	6	D	22	28	23	29	1	NO
F	Documentation	5	D	22	27	22	27	0	YES
G	Deployment	2	E	28	30	29	31	1	NO
H	Post Deployment Support	4	F	27	31	27	31	0	YES

Critical Path: A→B→C→D→H

Total Project Duration: 3+3+6+10+5+4=31

The critical path is A-B-C-D-H with a total duration of 31 months.

CEP MAPPING

How Knowledge Profile (K's) are addressed through our project and mapping among K's Cos, Pos:

K's	Attribute	How K's are addressed Our project	CO	PO
K3	Engineering Fundamentals	Our project needs an understanding of System requirement and proposed methodology knowledge		PO1
K4	Specialist knowledge	Sign Language Related basic to advance knowledge		PO1
K5	Engineering design	We use er diagram, dfd, Class diagram, Use case to design our project	CO3,CO4	PO3, PO5
K6	Engineering practice	Implemented Our project in VSCODE with the help of html, css, js	CO1,CO2 ,CO5	PO5
K7	Comprehension	Our project gives positive. Feedback on management as it will help us to communicate easily with people. People Easily learn sign language	CO6,CO7	PO6, PO7, PO8

How Complex Engineering Problem (P's) are addressed through our project and mapping among P's, Cos, Pos:

P's	Attribute	How P's Are addressed through our project	CO	PO
P1	Depth of Knowledge required	Creating a system design project for sign language to manage various aspects of courses management, user information, practice Session and many more	CO1 CO2 CO3 CO4 CO5	PO1 PO3 PO5 PO6 PO7 PO8
P3	Depth of Analysis required	Analysis the sign language project involves examining various aspects of the society. Such As: Communication, Study. People Completed any course they will Be able communicate With unable listening and Talking people.	CO3, CO4, CO5	PO6 PO7, PO8 PO12
P7	Interdependence	The independence of various sector is an firstly understand the Course and practice Session. Interdependence In context Refers to how Different elements Within the Sign language system Rely on each other and how changes in One area can Affect others	CO8	P10, P11

What Complex Engineering Activities (A's)are Addresses through our project and mapping among A's, Cos, Pos:

A's	Attribute	How A's are addressed Through our project	CO	PO
A1	Range of resources	Resources in the sign language learning sector are. Diverse and encompass Various categories to support the efficient operation, user feedback, the Development This courses, And practice Session. They are enrolling Different level	CO8	PO11
A2	Consequence For society And the environment	The sign language Learning Sector has Both Positive and Negative Consequence for Society and the environment	CO6	PO6 ,PO7

Conclusion

In conclusion, our project aims to create an online platform for learning American Sign Language (ASL), focusing on recognizing hand gestures and translating them into words. Through intuitive interfaces and interactive resources like tutorials and games, we strive to make ASL accessible and engaging. Our platform prioritizes accessibility, with features like visual aids and personalized recommendations for users with diverse needs. Inspired by Agile methodology, we emphasize adaptability and collaboration to ensure continuous improvement. By fostering empathy and cultural understanding, our project not only addresses communication barriers but also promotes personal growth. We believe that by facilitating ASL learning, we contribute to a more inclusive society where everyone can communicate and connect, regardless of linguistic or physical differences.