American International University-Bangladesh (AIUB)

Department of Computer Science

Faculty of Science &Technology (FST)

Summer 22-23

SOFTWARE REQUIREMENT ENGINEERING [C]

INSTRUCTOR: DR. MOHAMMAD RABIUL ISLAM

FINAL TERM PROJECT

TOPIC: SIGN LANGUAGE RECOGNITION SYSTEM

Project submitted by

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1. PROBLEM DOMAIN

1.1 Background to the Problem

Sign Language is mainly used by deaf (hard hearing) and dumb people to exchange information between their own community and with other people. It is a language where people use their hand gestures to communicate as they can't speak or hear. Sign Language Recognition System (SLRS) deals with the hand gestures acquisition and continues till text or speech is generated for corresponding hand gestures. This type of gesture-based language allows people to convey ideas and thoughts easily overcoming the barriers caused by difficulties from hearing issues.

1.2 Solution to the Problem

Sign language is one of the most reliable ways of communicating with special needs people, as it can be done anywhere. However, Sign language is one of the most reliable ways of communicating with special needs people, as it can be done anywhere. The main objectives of this project are to contribute to the field of automatic sign language recognition and translation to text or speech.
Sign Language Recognition System enables the hearing-impaired user to communicate efficiently in sign language, and the application will translate the same into text/speech. The user has to train the model, by recording its own sign language gestures.

Develop a Mobile Application: Creating a mobile application that utilizes computer vision algorithms to recognize and interpret sign language gestures. The application can use the smartphone's camera to capture video or images of hand movements and analyze them in real-time.
Feasibility: Developing a mobile application with computer vision capabilities is feasible due to the availability of mobile development frameworks, libraries, and pre-trained models. However, the accuracy and real-time performance of the application may depend on the computational capabilities of the user's device.

2. SOLUTION DESCRIPTION

2.1 System Features

Functional requirements

- Sign Recognition
- Real-Time Recognition
- Multi-Angle Recognition
- Feedback
- Adaptability
- Phrase and Sentence Recognition
- User Interface
- User Data Storage

- Customized Learning Paths
- Recognition Accuracy

2.2 UML Diagrams

Use-case Diagram

A use case diagram is usually simple. It does not show the detail of the use cases:

- It only summarizes some of the relationships between use cases, actors, and systems.
- It does not show the order in which steps are performed to achieve the goals of each use case.

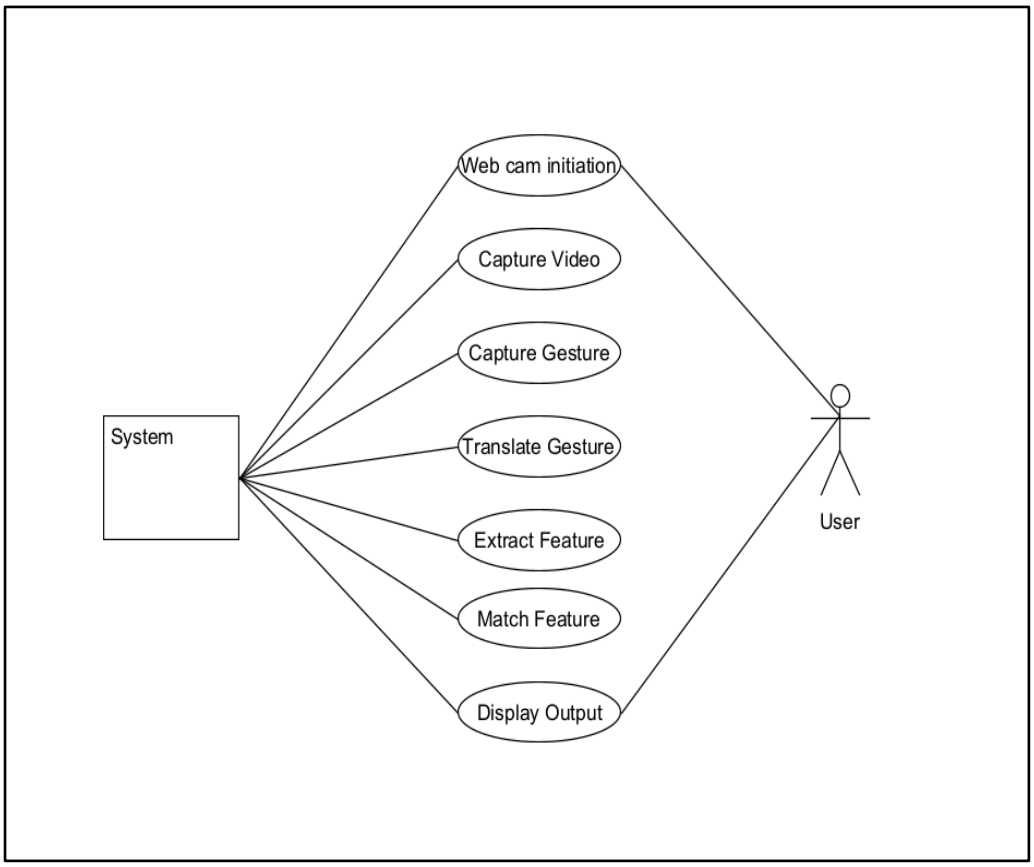


Figure 1: Usecase Diagram of Sign Language Recognition System.

Class Diagram

Class diagram is basically a graphical representation of the static view of the system and represents different aspects of the application. A collection of class diagrams represents the whole system.

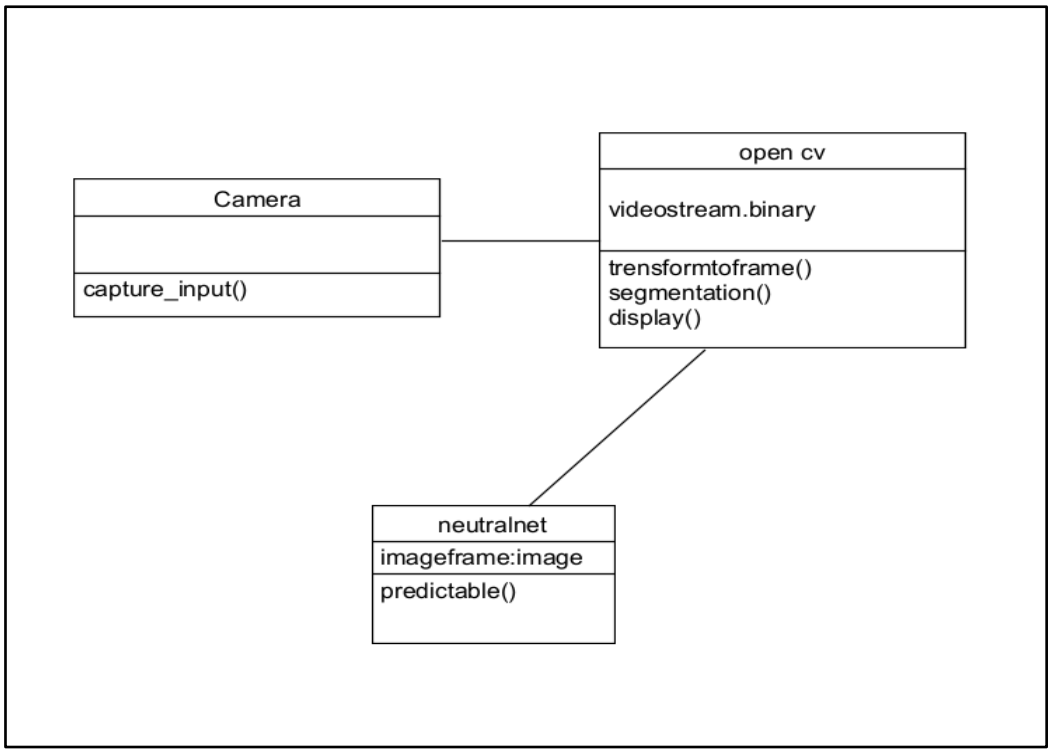


Figure 2: Class diagram of Sign Language Recognition System

Activity Diagram

Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system.

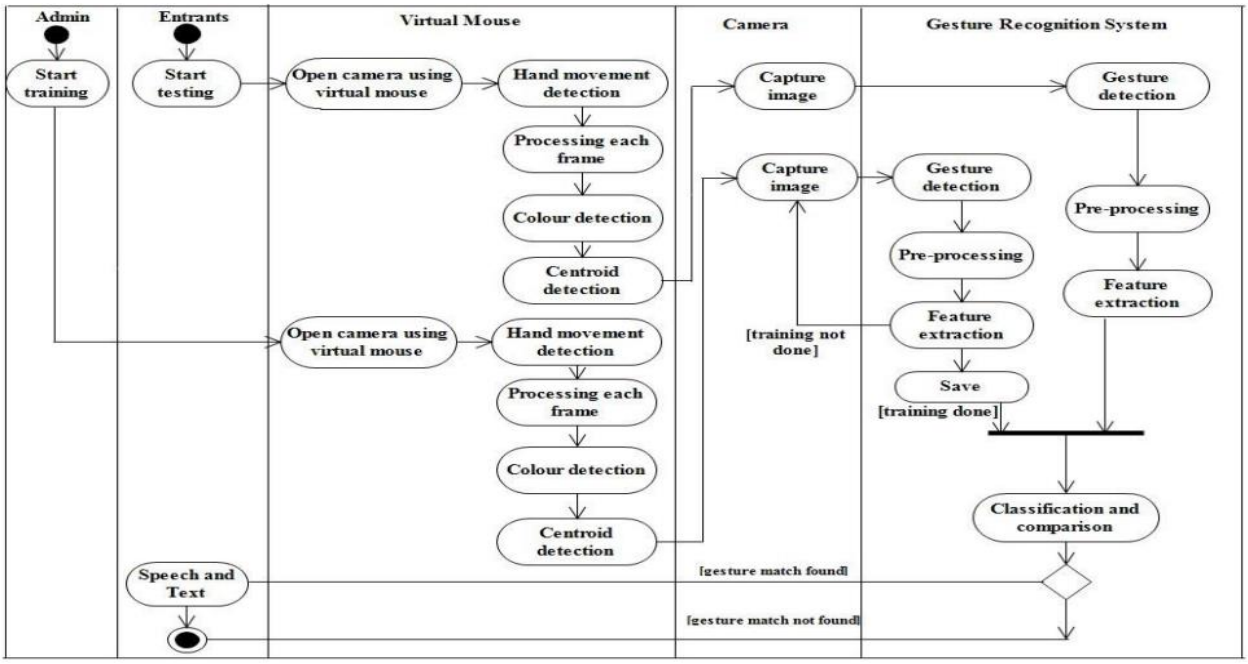


Figure 3: Activity diagram of Sign Language Recognition System

3. SOCIAL IMPACT

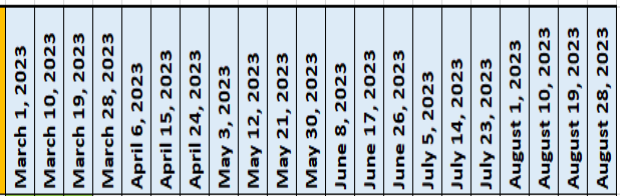
The system facilitates enhanced communication between people with hearing challenges and the wider community, fostering stronger social bonds and minimizing feelings of isolation. It also improves engagement within educational settings, enabling better participation and learning for students with hearing impairments. In professional contexts, the system eliminates communication obstacles, granting equal access to career opportunities and advancement for the deaf. Moreover, it plays a vital role in preserving and celebrating sign language as a significant cultural and linguistic emblem. By doing so, it raises consciousness and empathy toward the needs of the deaf and hard-of-hearing population, thereby promoting inclusivity. The information generated by this technology holds the potential to contribute to various research areas, propelling technological progress and benefiting society on a broader scale.

4. DEVELOPMENT PLAN WITH PROJECT SCHEDULE

To efficiently manage the development of sign language recognition system, a comprehensive development plan has been prepared which will start from 1st March 2023 and end on 30th August, 2023 for a total of 6-Months. The project is divided into 8 distinct parts according to Work Breakdown Structure.

Project Name	Project Duration	Project Start Date	Project End Date
Sign Language Recognision System	6-months	March 1, 2023	August 30,2023

Task ID	Work Breakdown Structure	Task Duration	Start Date	End Date
1.1	Project Management	18	March 1, 2023	March 19, 2023
1.2	System Engineering	25	March 22, 2023	April 16, 2023
1.3	Software Components	35	April 19, 2023	May 24, 2023
1.4	Hardware Components	15	May 27, 2023	June 11, 2023
1.5	Deleverables Management	25	June 14, 2023	July 9, 2023
1.6	System Test	10	July 12, 2023	July 22, 2023
1.7	Support services	15	July 25, 2023	August 9, 2023
1.8	Installation	5	August 14, 2023	August 19, 2023



5. MARKETING PLAN

The Sign Language Recognition System is an innovative solution that bridges the communication gap between the hearing-impaired community and the general public. So, this plan outlines short-term, long-term, and continuous strategies for popularizing sign language recognition systems in the community.

Short-Term Marketing Plan (0-6 months):

1. System Rollout Blitz: A specific campaign needs to be run using many processes such as social media, news stories and teaming up with supporters.

2. Influencer Amplification: Need to talk to sign language experts who can show and talk about how great the system is. They will actually support and demonstrate how it works.

3. Webinar Onboarding: Using online webinars to help communities and people interested in learning how sign language recognition system is useful also makes it an exciting presentation during webinars.

4. Global Localization: Use smart ways, tools, and guides to make things easier for people around the world. This will help everyone to use and like the system.

Long-Term Marketing Plan (6-18 months):

1. Engagement Ecosystem Formation: Create an online platform to bring people together around the system, to share their experiences. It will make them feel like themselves and keep them interested in a long time.

2. NGO and Foundation Alliances: Implement smart ideas to create connections with groups like NGOs and related foundations. Work together on activities, projects, and partnerships to inform and benefit more people about the systems.

3. System Evolution: Use smart data to make systems better. Also add simple features for users, smoothing their experience.

4. Referral Network Optimization: Implement better ideas to make referral programs better, so users want to tell others about it Create special rewards for loyal users, which will keep people using the system for a long time.

Continuous Marketing Plan (18+ months):

1. Iterative Enhancement Cycle: Apply smart analytics to always improve the system. Listen to what users have to say and use new technologies to update regularly. This will help the system remain truly innovative.

2. Thought Leadership Fueling: Apply clever searches to create engaging content that gets people thinking. It will help to become a leader in sign language recognition and people trust the system.

3. Holistic Sustainability: Apply insights to align the brand with socially conscious initiatives, effectively amplifying the social impact of the system.

4. User-Generated Content Cultivation: Deploy informed campaigns, and create a stream of authentic narratives demonstrating the transformative impact of sign language recognition systems.

6. COST AND PROFIT ANALYSIS

COST AND PROFIT ANALYSIS

Job Holder	Sal/Month	Sal/Day	Markup Cost	Sal/Day+Markup Cost	Total Project Working Days	Total Cost
Developer_1	20000	769.23	230.769231	1000	45	45000
Developer_2	10000	384.62	115.384615	500	48	24000
Designer_1	20000	769.23	230.769231	1000	40	40000

Original Project Cost	109000
Cost With Profit	174400
Net Profit	32700

		Cost Per Section
Original Cost	109000	109000
Profit Margin	25%	27250
Nagotiation Margin	5%	5450
Net Profit		32700
Cost with Net Profit		174400

Using COCOMO MODEL

Source line of code = 10000

- Effort = PM = Coefficient_{<Effort Factor>}*(SLOC/1000)^P
  = 2.4 * (10000/1000)^1.05

  = 22.928 person-month

- Development time = DM = 2.50*(PM)^T
  = 2.50 * 22.928 ^ 0.38

  = 6.738 month

- Required number of people = ST = PM/DM
  =22.928/6.738
  =3.08 persons

7. REFERENCE

1. Sultan, A., Makram, W., Kayed, M., & Ali, A. A. (2022). Sign language identification and recognition: A comparative study. *Open Computer Science*, *12*(1), 191-210.

2. Trigueiros, P., Ribeiro, F., & Reis, L. P. (2014). Vision-based Portuguese sign language recognition system. In *New Perspectives in Information Systems and Technologies, Volume 1* (pp. 605-617). Springer International Publishing.

3. https://www.sciencedirect.com/topics/computer-science/sign-language-recognition