ONLINE LEARNING PLATFORM FOR HEARING IMPAIRED PEOPLE

PROJECT ID : 2022-59

TEAM MEMBERS

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Educational Platform

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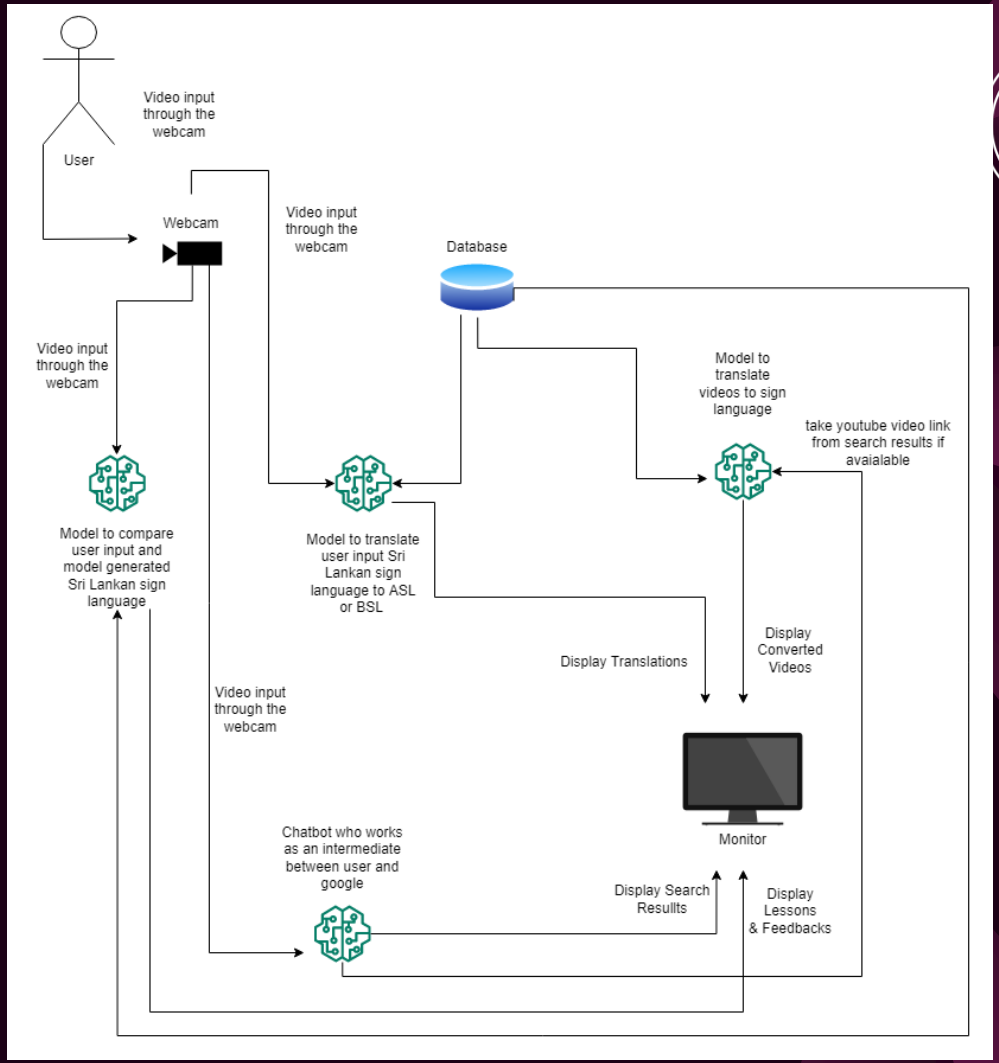
INTRODUCTION

- Who are hearing impaired people?
- How do they communicate?
- What are the main features of expressing sign language?

OVERALL SYSTEM ARCHITECTURE DIAGRAM


User
Video input through the webcam
Webcam
Video input through the webcam
Database
Video input through the webcam
Model to translate videos to sign language
take youtube video link from search results if avaialable
Model to compare user input and model generated Sri Lankan sign language
Model to translate user input Sri Lankan sign language to ASL or BSL
Display Translations
Display Converted Videos
Video input through the webcam
Monitor
Chatbot who works as an intermediate between user and google
Display Search Resullts
Display Lessons & Feedbacks

IT19162706 | Munasinghe M.W.S.S.M.T.M.B

Bachelor of Science (Hons) in Information Technology Specializing in

Data Science

1. INTRODUTION

BACKGROUND STUDY

- 9% of Sri Lankans suffer from hearing loss while 15% of them are completely deaf [1]
- These numbers will keep increasing as for the statistics by WHO from 131 million to 267 million by 2050 in South Asia region
- Majority of HIP does not read better than elementary level.

2. RESEARCH PROBLEM

RESEARCH PROBLEM

- Systems use text as caption and does not use Sri Lankan sign language as caption

- Existing learning platforms or translations do not use emotion analysis

4. OBJECTIVES

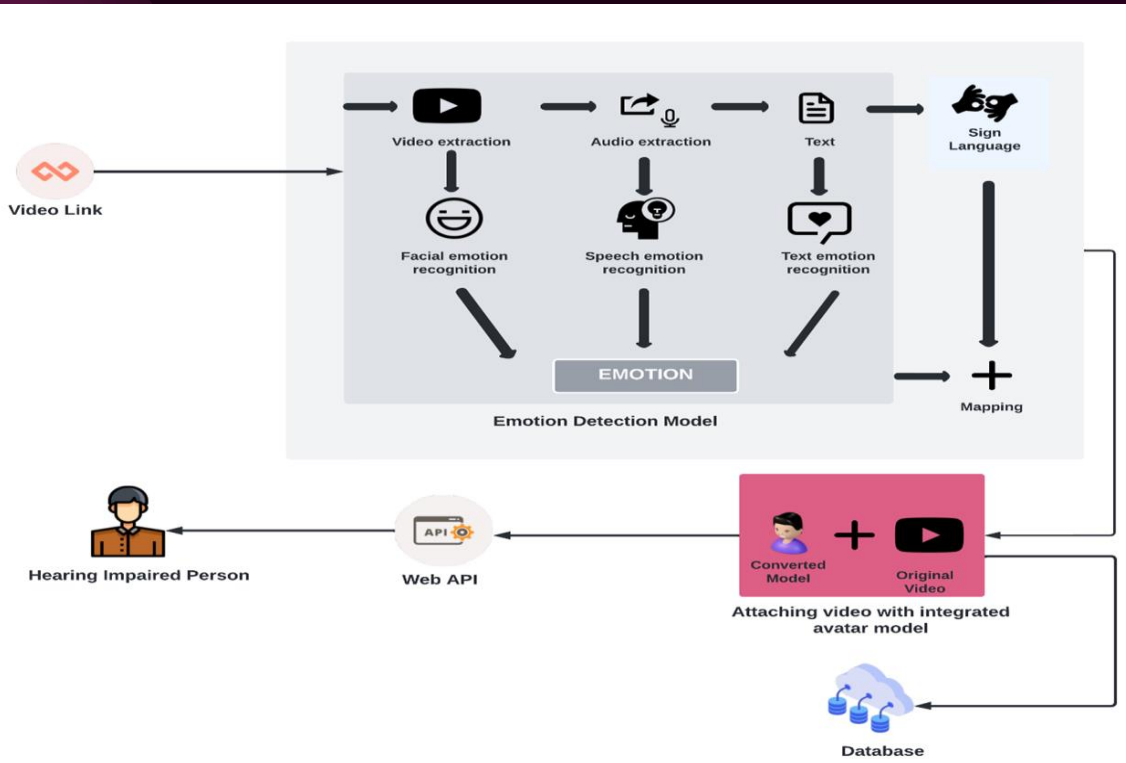
MAIN OBJECTIVE

Objective of this component is to give the opportunity for a HIP to gain knowledge through referencing videos which will be captioned in SLSL.

SUB OBJECTIVES

- Implement an algorithm to identify emotions using speech, Text and Facial Expressions.
- Implement an algorithm to map converted sign language and the identified emotions.
- Implement an algorithm to translate content to SLSL

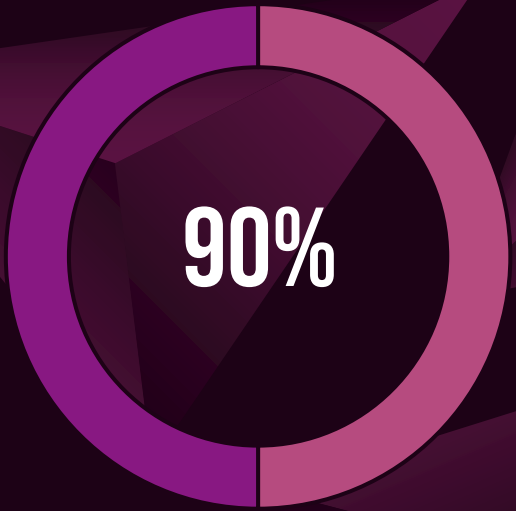
5. OVERALL SYSTEM DIAGRAM


Video Link
Video extraction
Audio extraction
Text
Sign Language
Facial emotion recognition
Speech emotion recognition
Text emotion recognition
EMOTION
Emotion Detection Model
Mapping
Hearing Impaired Person
API
Web API
Converted Model
Original Video
Attaching video with integrated avatar model
Database

6. PROGRESS

CURRENT PROGRESS

- Trained model for Speech Emotion Recognition with an accuracy of 81%
- Trained model for emotion detection using text with an accuracy of 84%
- Model to extract audio from the video and convert to text.



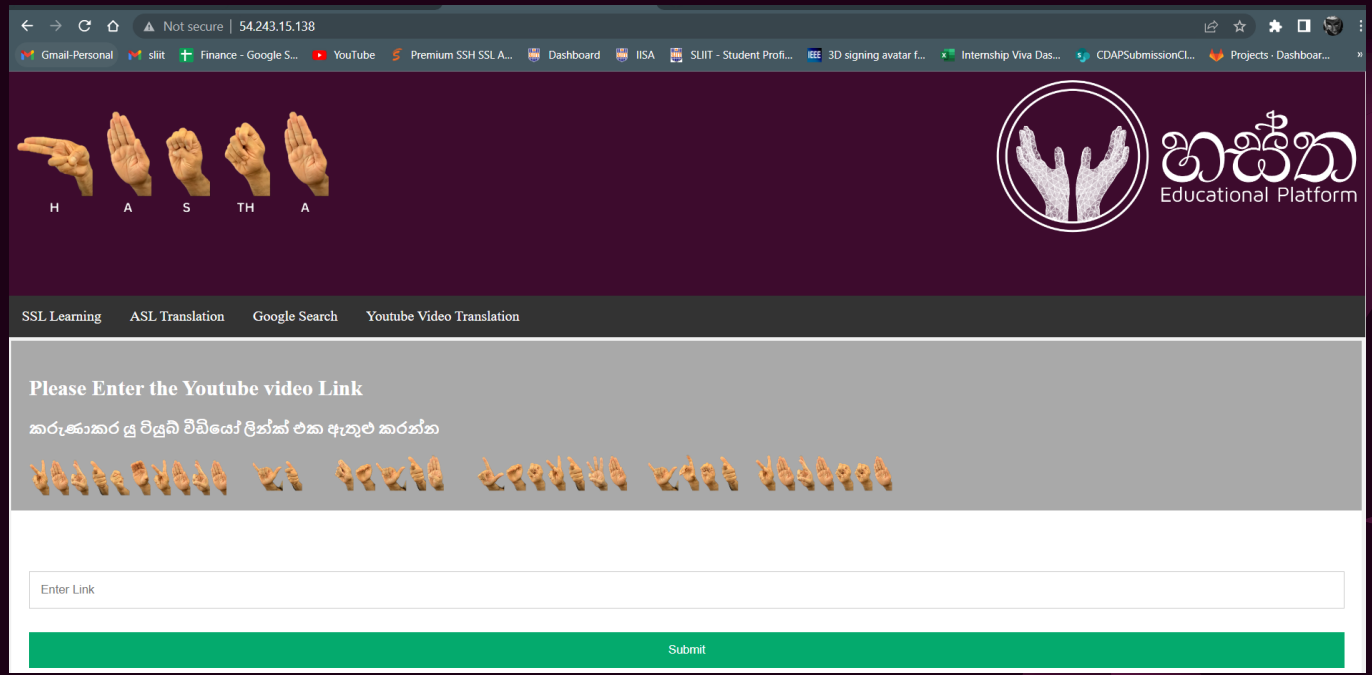
TEST RESULTS


```
{'emotion': {'angry': 0.00010079641615975008,
  'disgust': 1.9879964745697 62e-11,
  'fear': 1.7004362389705323,
  'happy': 0.004079599118413724,
  'sad': 0.07617791870179288,
  'surprise': 1.479451912161822,
  'neutral': 96.73975090621417},
 'dominant_emotion': 'neutral',
 'region': {'x': 16, 'y': 18, 'w': 235, 'h': 235}}
```

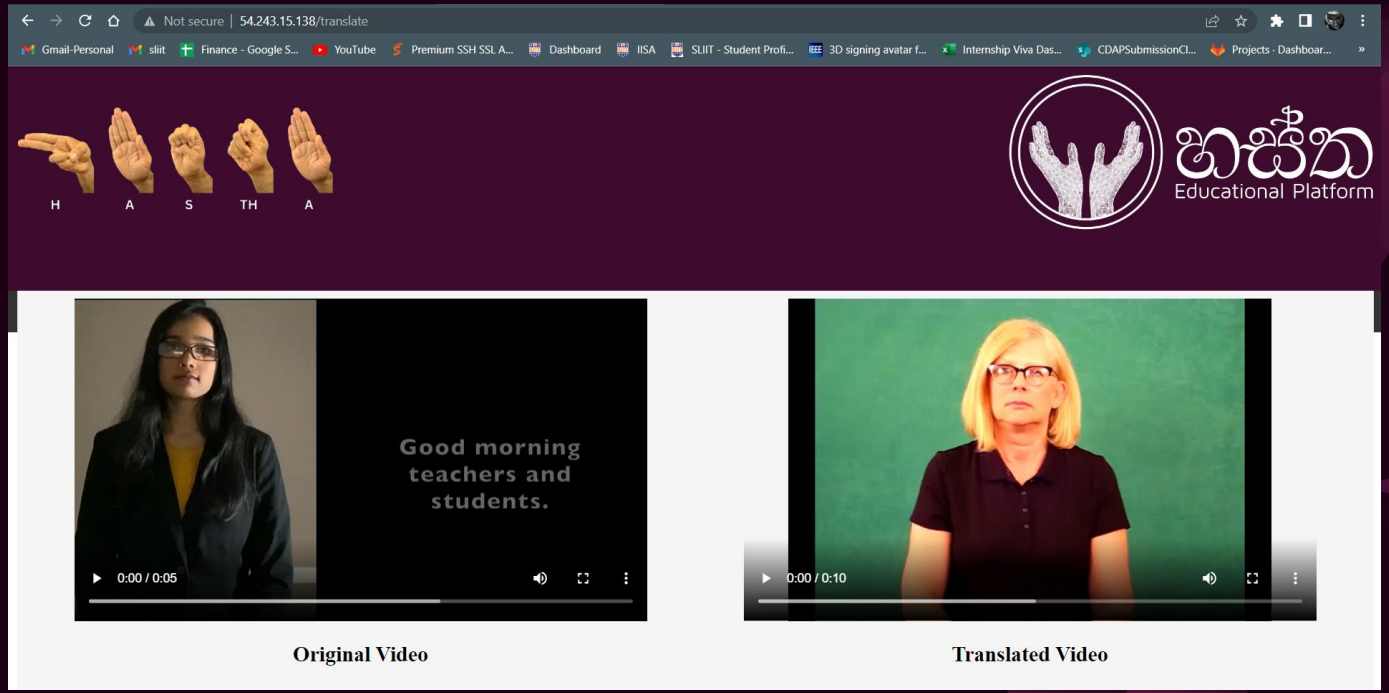
TEST RESULTS

```
MoviePy - Writing audio in static/My school speech on my school in English Trim.wav
MoviePy - Done.
chunk1.wav : Good morning teachers and students.
chunk2.wav : My name is rohan and i am in 6th grade.
chunk3.wav : Today i would like to talk about my school.
['good', 'morn', 'teacher', 'student']
['name', 'rohan', 'i', '6th', 'grade']
['today', 'i', 'like', 'talk', 'school']
Emotion : neutral --- text :  ['good', 'morn', 'teacher', 'student']

Emotion : neutral --- text :  ['name', 'rohan', 'i', '6th', 'grade']

Emotion : neutral --- text :  ['today', 'i', 'like', 'talk', 'school']
```

CURRENT PROGRESS

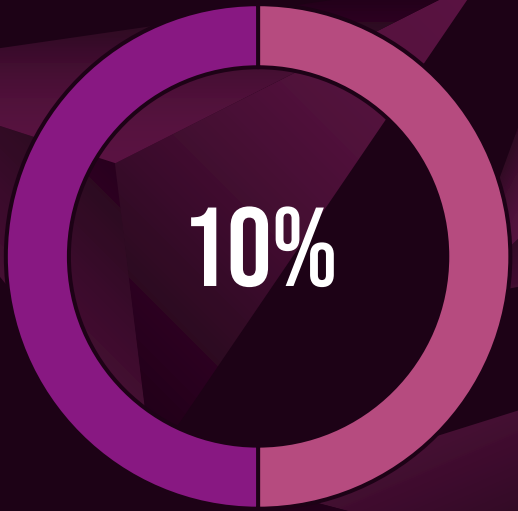


CURRENT PROGRESS



EXPECTED FUTURE PROGRESS

- Development of video library
- Storage Implementation
- Fine tuning user interfaces
- Hosting



6. COMMERTIALIZATION

ABILITY TO COMMERTIALIZATION

- This specific feature has the potential to be integrated into any educational system as an accessibility feature.

- This could be introduced to universities and educational institutes that would allow universities to expand their educational services to the deaf and mute as well combined with other accessibility features.

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[2] J. Elfein, "Statista," 11 June 2020. [Online]. Available: https://www.statista.com/statistics/888654/number-of-people-with-hearingloss-worldwide-projections-by-region/.

[3] D. Kelly, J. McDonald and C. Markham, "A system for teaching sign language using live gesture feedback," 2008 8th IEEE International Conference on Automatic Face & Gesture Recognition, 2008, pp. 1-2, Available: 10.1109/AFGR.2008.4813350

[4] K. Fernando and H. Wickramarathne, 2018, August. “Sri Lankan Sign Language Tutor,” presented at 1st International Conference on Business Innovation 2018.

[5] N. Krishnamoorthy, A. Raveendran, P. Vadiveswaran, S. R. Arulraj, K. Manathunga and S. Siriwardana, "E-Learning Platform for Hearing Impaired Students," 2021 3rd International Conference on Advancements in Computing (ICAC), 2021, pp. 122-127, doi: 10.1109/ICAC54203.2021.9671113.

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Bachelor of Science (Hons) in Information Technology Specializing in

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1. INTRODUTION

BACKGROUND STUDY

- Game based approach is
  - popular among kids around the world
  - Proven to be effective in terms of learning
- There are two types of signs in every sign language
  - Static sign
  - Dynamic sign

2. RESEARCH PROBLEM

RESEARCH PROBLEM

- Most Learning platforms are not Sign language based on SLSL
- Key focus of SLSL based platforms are not based on teaching and learning
- Knowledge evaluation is not present in Sign language based learning platforms

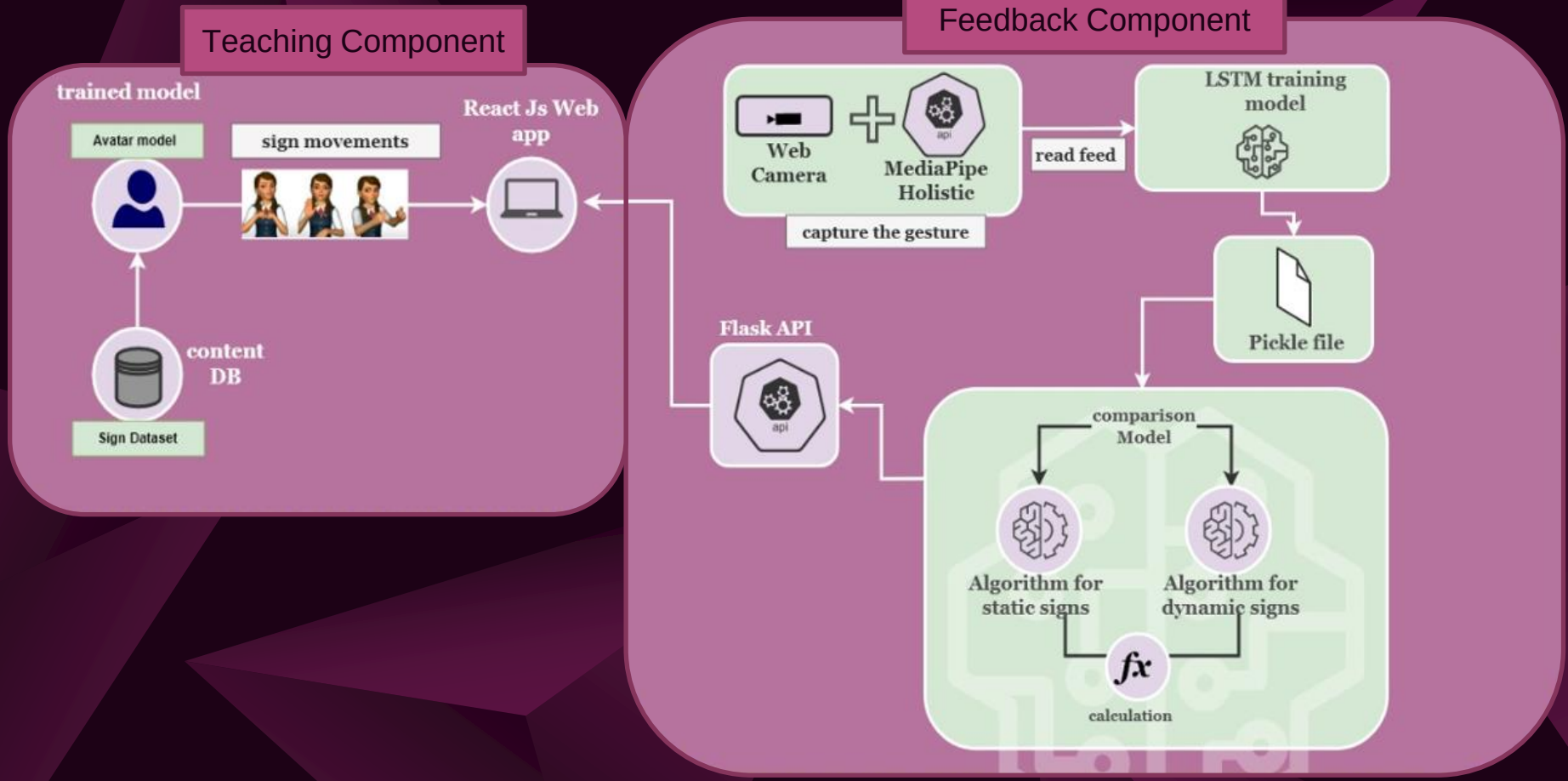
4. OBJECTIVES

MAIN OBJECTIVE

Provide a game-based teaching component with evaluations at each level to check if the user has grabbed the content as expected

SUB OBJECTIVES

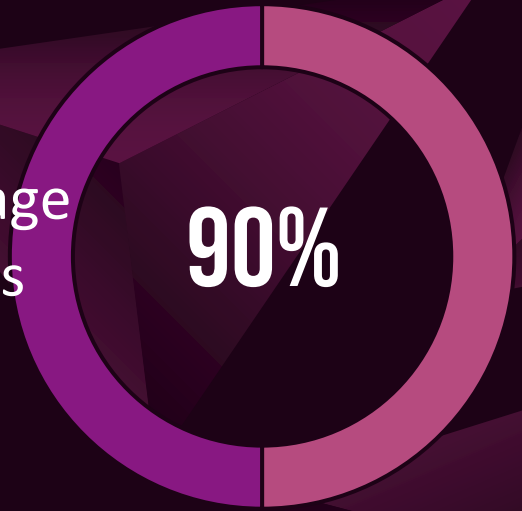
- Implement an avatar model to effectively teach sign language
- Detect the gestures accurately
- Implement an algorithm to check the correct percentage of dynamic gestures
- Implement a mechanism to provide feedback effectively


Teaching Component
trained model
Avatar model
sign movements
React Js Web app
content DB
Sign Dataset
Feedback Component
Web Camera
MediaPipe Holistic
capture the gesture
read feed
LSTM training model
Pickle file
Flask API
comparison Model
Algorithm for static signs
Algorithm for dynamic signs
calculation

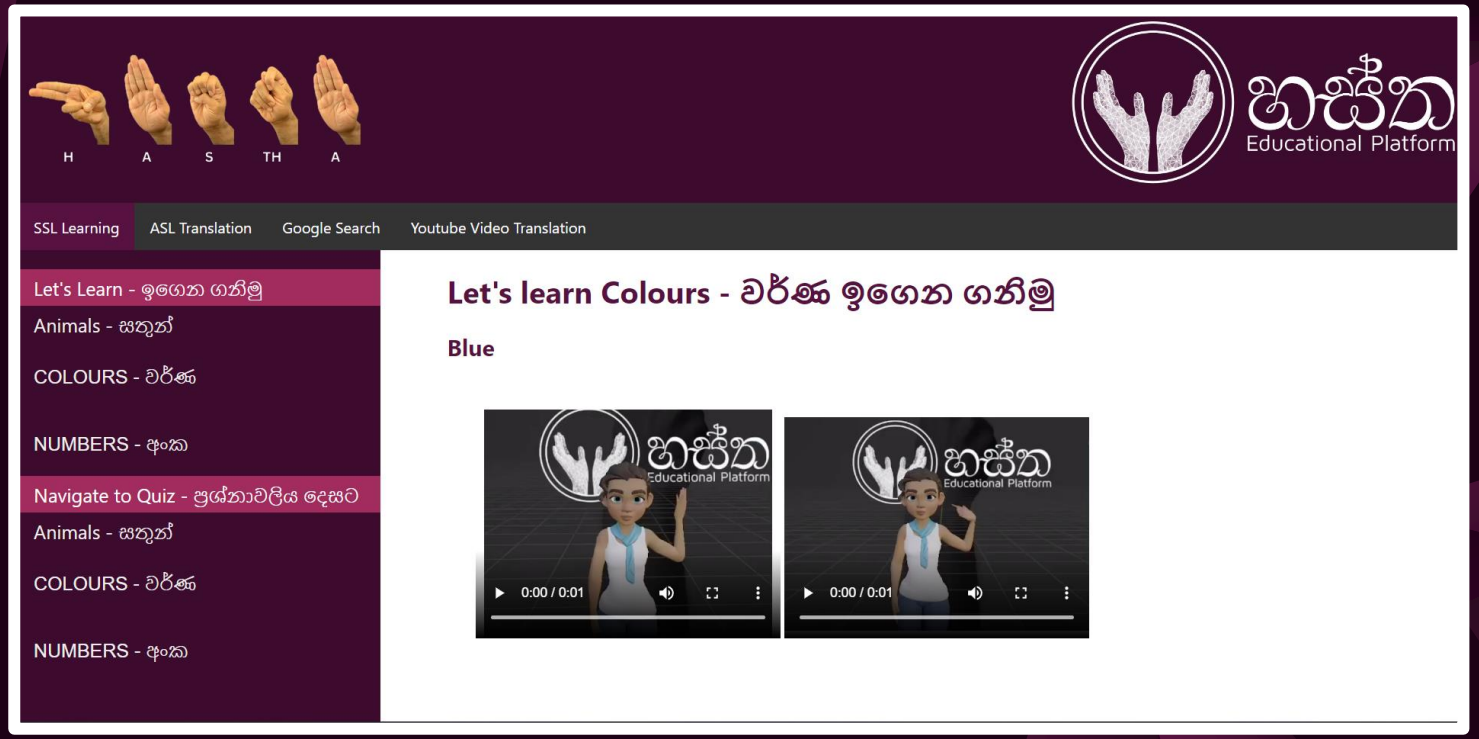
6. PROGRESS

CURRENT PROGRESS

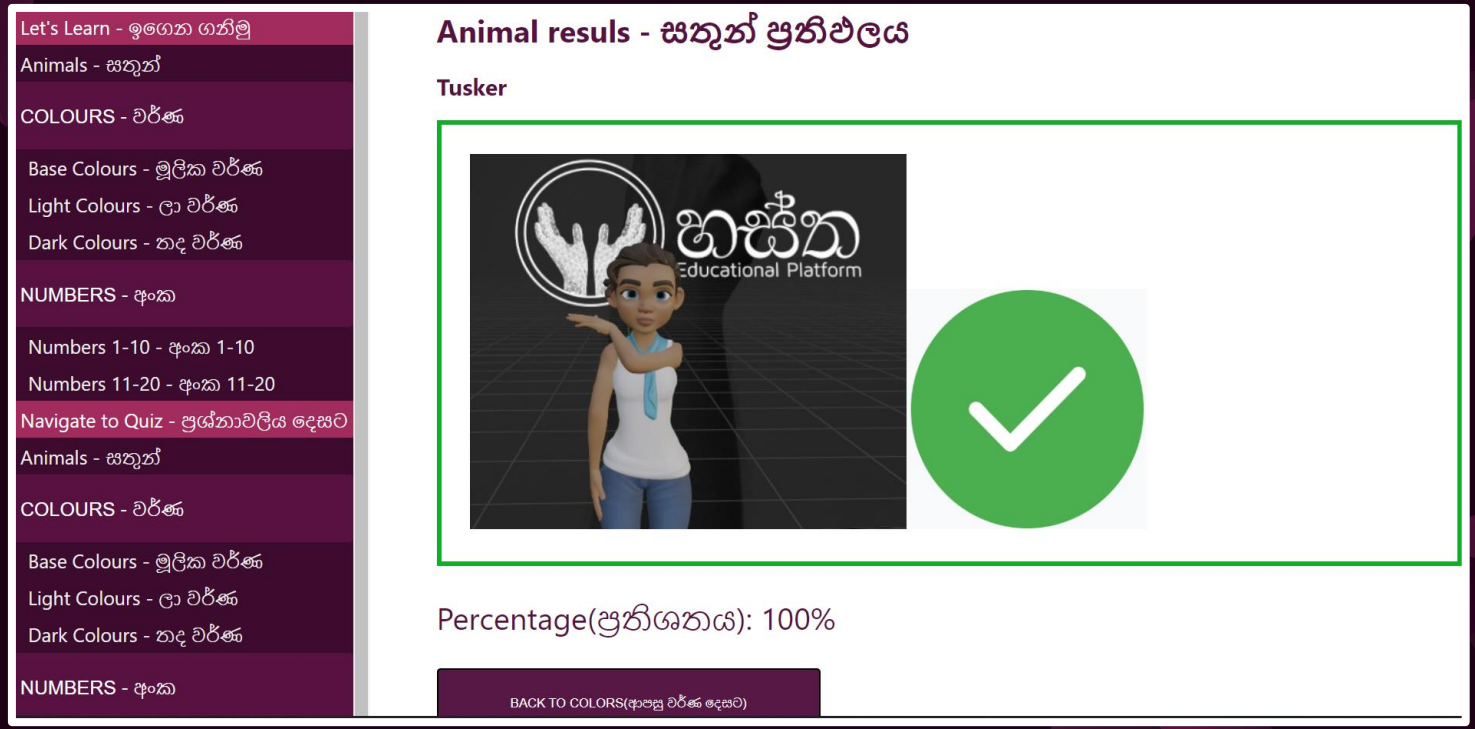
- Trained Detection Model for six quiz levels
- Algorithm to calculate correct percentage of simple & advanced Dynamic gestures
- Implement a mechanism to provide feedback effectively
- Complete frontend design
- Build of avatar model for most quiz levels



CURRENT PROGRESS

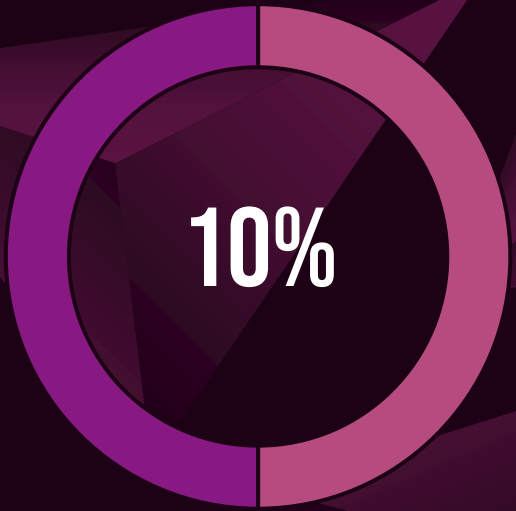


CURRENT PROGRESS



EXPECTED FUTURE PROGRESS

- Avatar model building for few more gestures
- Finetuning web application
- Hosting



6. COMMERTIALIZATION

ABILITY TO COMMERTIALIZATION

- Game based Learning platforms are popular among the kids
- Individual attention to each child in learning
- Customized Feedback
- Unlimited attempts and feedback ensures effective learning
- System will be advertised through welfare organizations

REFERENCES

- [1] D. Dewasurendra, A. Kumar, I. Perera, D. Jayasena and S. Thelijjagoda, "Emergency Communication Application for Speech and Hearing-Impaired Citizens," 2020 From Innovation to Impact (FITI), 2020, pp. 1-6, doi: 10.1109/FITI52050.2020.9424899.

- [2] Kulaveerasingam, N., Wellage, S., Samarawickrama, H., Perera, W., & Yasas, J. (2014). “The Rhythm of Silence” - Gesture Based Intercommunication Platform for Hearing-impaired People (Nihanda Ridma).

- [3] Y. Perera, N. Jayalath, S. Tissera, O. Bandara and S. Thelijjagoda, "Intelligent mobile assistant for hearing impairers to interact with the society in Sinhala language," 2017 11th International Conference on Software, Knowledge, Information Management and Applications (SKIMA), 2017, pp. 1-7, doi: 10.1109/SKIMA.2017.8294116.

- [4] N. Krishnamoorthy, A. Raveendran, P. Vadiveswaran, S. R. Arulraj, K. Manathunga and S. Siriwardana, "E-Learning Platform for Hearing Impaired Students," 2021 3rd International Conference on Advancements in Computing (ICAC), 2021, pp. 122-127, doi: 10.1109/ICAC54203.2021.9671113.

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Bachelor of Science (Hons) in Information Technology Specializing in

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1. INTRODUTION

BACKGROUND STUDY

- Sign language vary across countries.
- Majority of the hearing-impaired communities lacks communication due to the absence of knowledge on other sign languages.
- Lack of access to learn sign language due to economic limitations.
- Enhancing the knowledge on a foreign sign language may increase opportunities to communicate.

2. RESEARCH PROBLEM

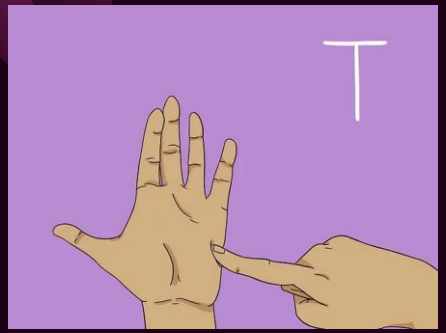
RESEARCH PROBLEM

- Most of the existing systems were implemented to translate from a sign language to a spoken language or vice versa.
- Need for a system that can translate SSL to a non-native sign language.
- Systems that are been implemented for one particular sign language cannot be directly used to understand another.

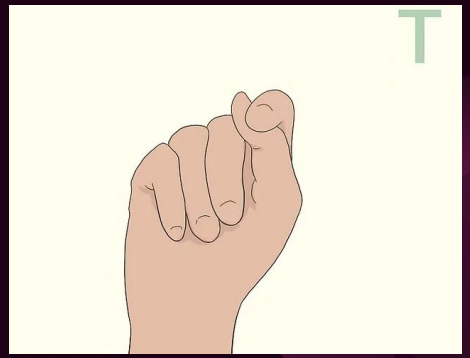
4. OBJECTIVES

MAIN OBJECTIVE

Provide a platform for the hearing-impaired community that can translate a given sign in SriLankan Sign Language into American Sign language.



Srilankan Sign

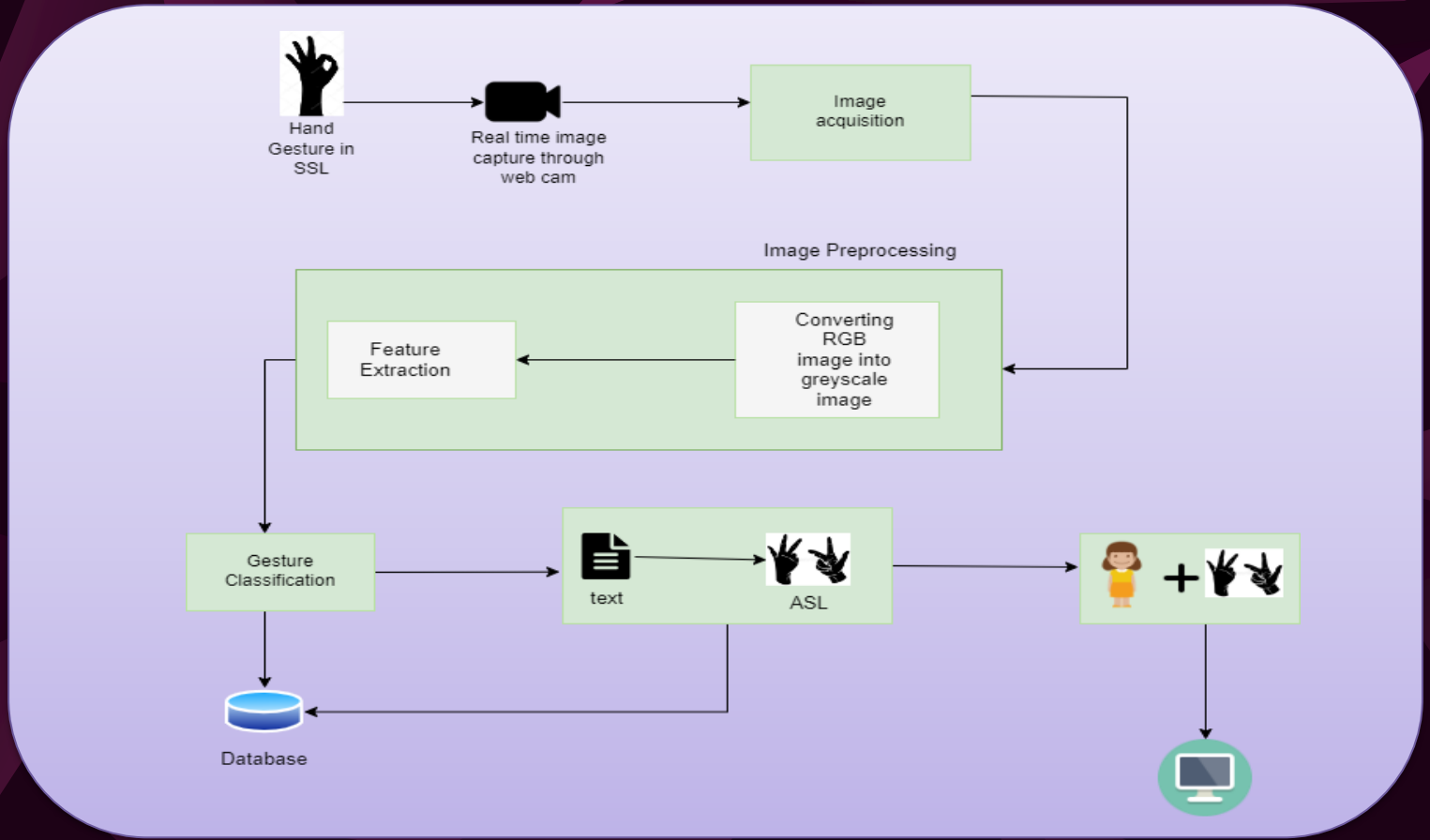


American Sign

SUB OBJECTIVES

- Real time gesture recognition.
- Build a model and train to identify the hand gestures.
- Recognize hand gesture and converting into text format .
- Convert the identified text into ASL.
- Build an avatar model to denote the hand gestures

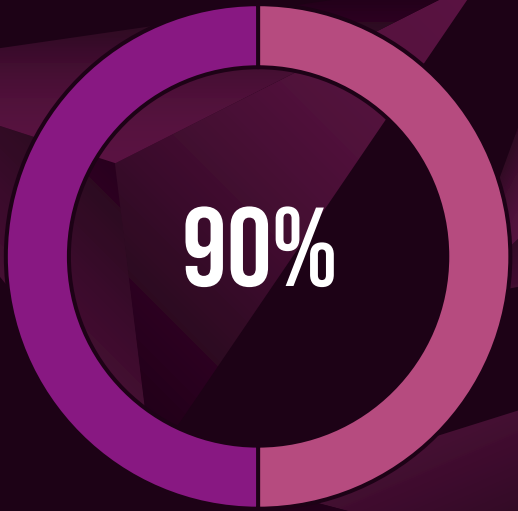
5. OVERALL SYSTEM DIAGRAM


Hand Gesture in SSL
Real time image capture through web cam
Image acquisition
Image Preprocessing
Converting RGB image into greyscale image
Feature Extraction
Gesture Classification
text
ASL
Database

6. PROGRESS

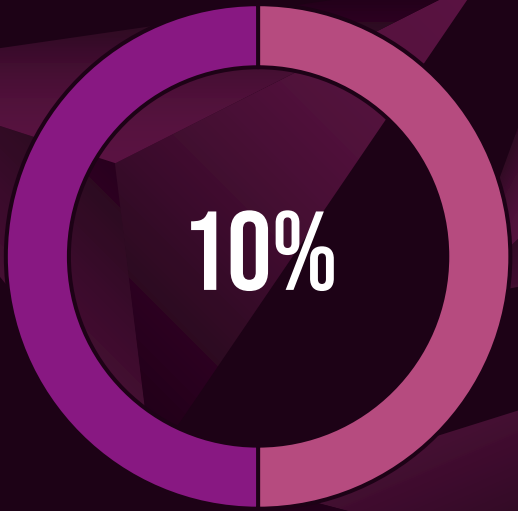
CURRENT PROGRESS

- Trained a model to recognize a given gesture
- Converting the gesture into text.
- Build and avatar model to denote the translated gesture
- Frontend Design

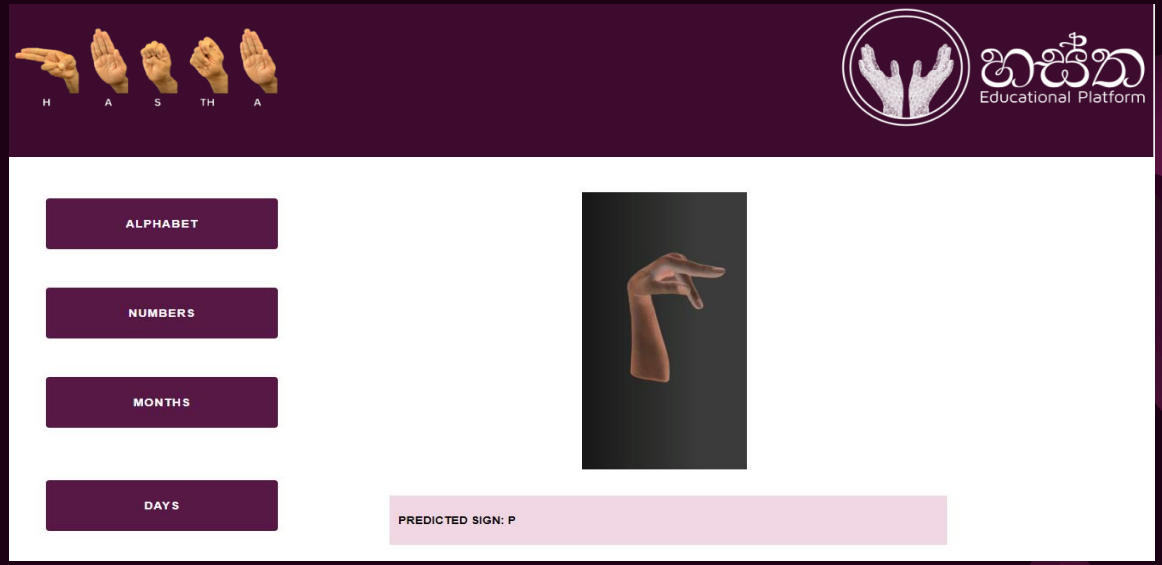


EXPECTED FUTURE PROGRESS

- Fine tuning the web application
- Hosting



CURRENT PROGRESS



CURRENT PROGRESS

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Educational Platform

ALPHABET

NUMBERS

MONTHS

DAYS

PREDICTED SIGN: FRIDAY

6. COMMERTIALIZATION

ABILITY TO COMMERTIALIZATION

- Enhance knowledge on a different language.
- Enhance communication opportunities with a wide range of people.
- Access information that could be off-limit due to language limitations

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[1] I. S. M. Dissanayake, P. J. Wickramanayake, M. A. S. Mudunkotuwa and P. W. N. Fernando, "Utalk: Sri Lankan Sign Language Converter Mobile App using Image Processing and Machine Learning," 2020 2nd International Conference on Advancements in Computing (ICAC), 2020, pp. 31-36, doi: 10.1109/ICAC51239.2020.9357300.

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Available: https://repository.upenn.edu/cgi/viewcontent.cgi?article=1043&context=hms

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Bachelor of Science (Hons) in Information Technology Specializing in

Data Science

1. INTRODUTION

BACKGROUND STUDY

- Interacting with Google Search service is hard
- Majority of HIP users are not interacting with Google Search
- Digital Learning methods are less for target users

2. RESEARCH PROBLEM

RESEARCH PROBLEM

- Most learning platforms are not based on Sri Lankan Sign Language
- Sign language Chatbots are existing but not as an intermediate between Google and User

RESEARCH PROBLEM

- The existing Chatbots are not return results through Sign Language.
- Any Sign language learning platform does not offer Chatbot service to find and learn through google

4. OBJECTIVES

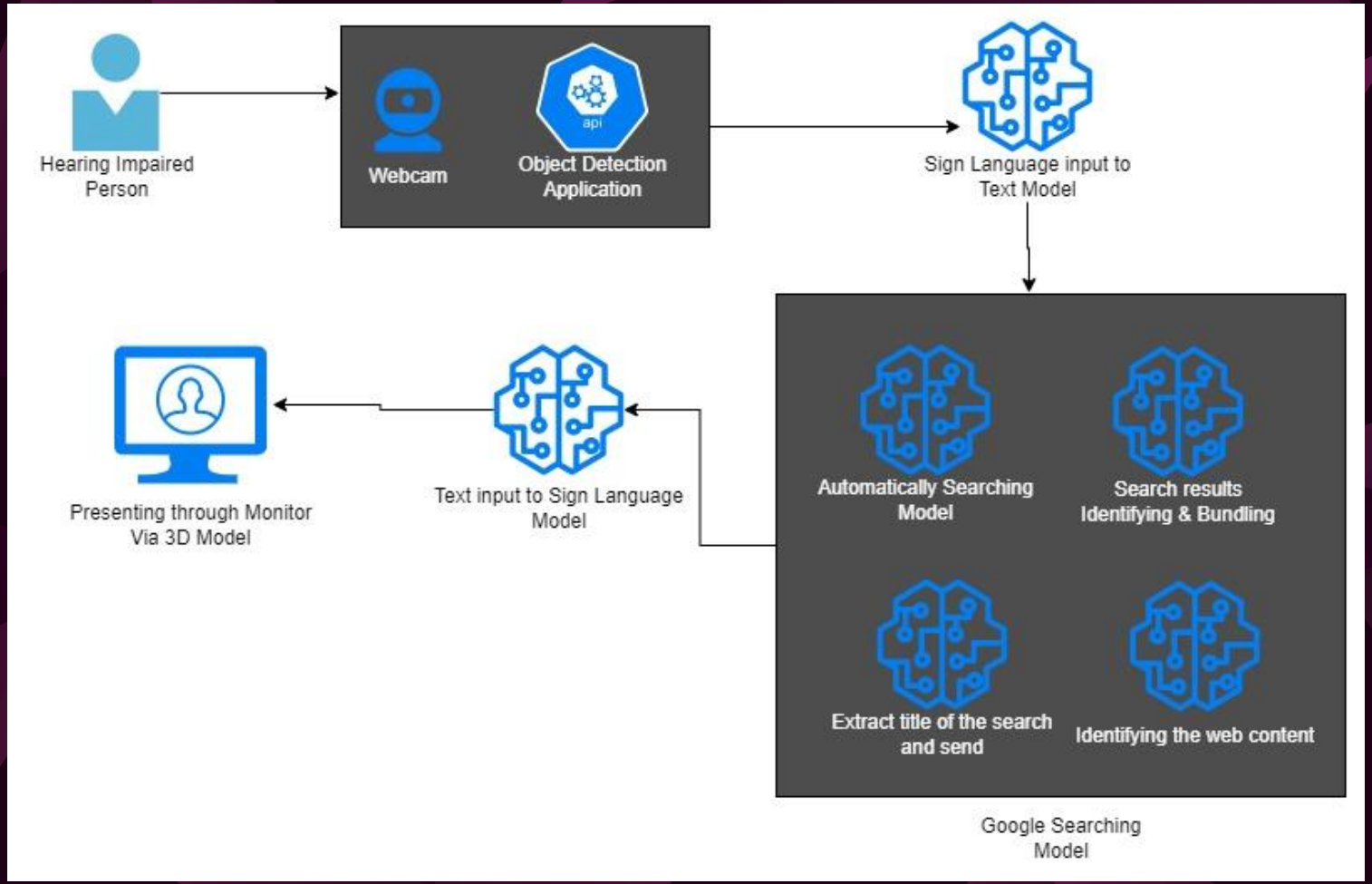
MAIN OBJECTIVE

The objective of letting user to learn through Google easily by using Google search service.

SUB OBJECTIVES

- To make the scope wider to the user in the learning process.
- Engage with the digital world easily and gain the new knowledge
- Make user to interact with new technology and digital world.

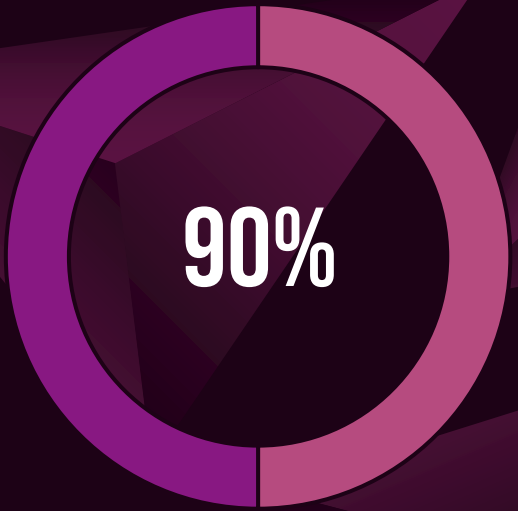
5. OVERALL SYSTEM DIAGRAM


Hearing Impaired Person
Webcam
api
Object Detection Application
Sign Language input to Text Model
Automatically Searching Model
Search results Identifying & Bundling
Extract title of the search and send
Identifying the web content
Google Searching Model
Text input to Sign Language Model
Presenting through Monitor Via 3D Model

6. PROGRESS

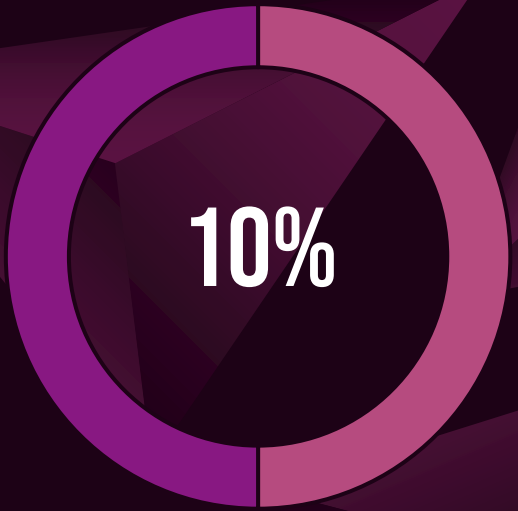
CURRENT PROGRESS

- Built the Sri Lankan Sign Language to Text module,
- Built the chatbot service to return search results with front end.
- Built text to Sri Lankan Sign Language training model.



EXPECTED FUTURE PROGRESS

- Finalize the front end and take more than one search result.
- Finalize the animation model.



6. COMMERTIALIZATION

ABILITY TO COMMERTIALIZATION

- It is rare to find tools that use for Google search with Sign Language.
- Attractive 3D avatar model to present Sign Language and that makes HIP users to identify content correctly.

REFERENCES

- [1] D. Dewasurendra, A. Kumar, I. Perera, D. Jayasena and S. Thelijjagoda, "Emergency Communication Application for Speech and Hearing-Impaired Citizens," 2020 From Innovation to Impact (FITI), 2020, pp. 1-6, doi: 10.1109/FITI52050.2020.9424899.

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OVERALL COMMERCIALIZATION

- Game based learning. – 100% Free
- ASL to SLSL & SLSL to ASL Translator. ASL to SLSL Free
- Chatbot Service. - More than one result for paid
- Video to SLSL Translator. – Without emotions, free

OVERALL COMMERCIALIZATION

FREE VERSION

- ✓ Full access for game-based learning module.
- ✓ American to Sign Language translation feature.
- ✓ One search result for each entry in Chatbot service.
- ✓ Video to Sri Lankan Sign Language presentation.

PRO VERSION

$5.99

- ✓ Everything in Free.
- ✓ SLSL to ASL translation feature.
- ✓ More search results for each entry in Chatbot service.
- ✓ Video to SLSL presentation with emotion analysis.

THANKS!

Any questions?