ONLINE LEARNING PLATFORM FOR HEARING IMPAIRED PEOPLE

PROJECT ID : 2022-59

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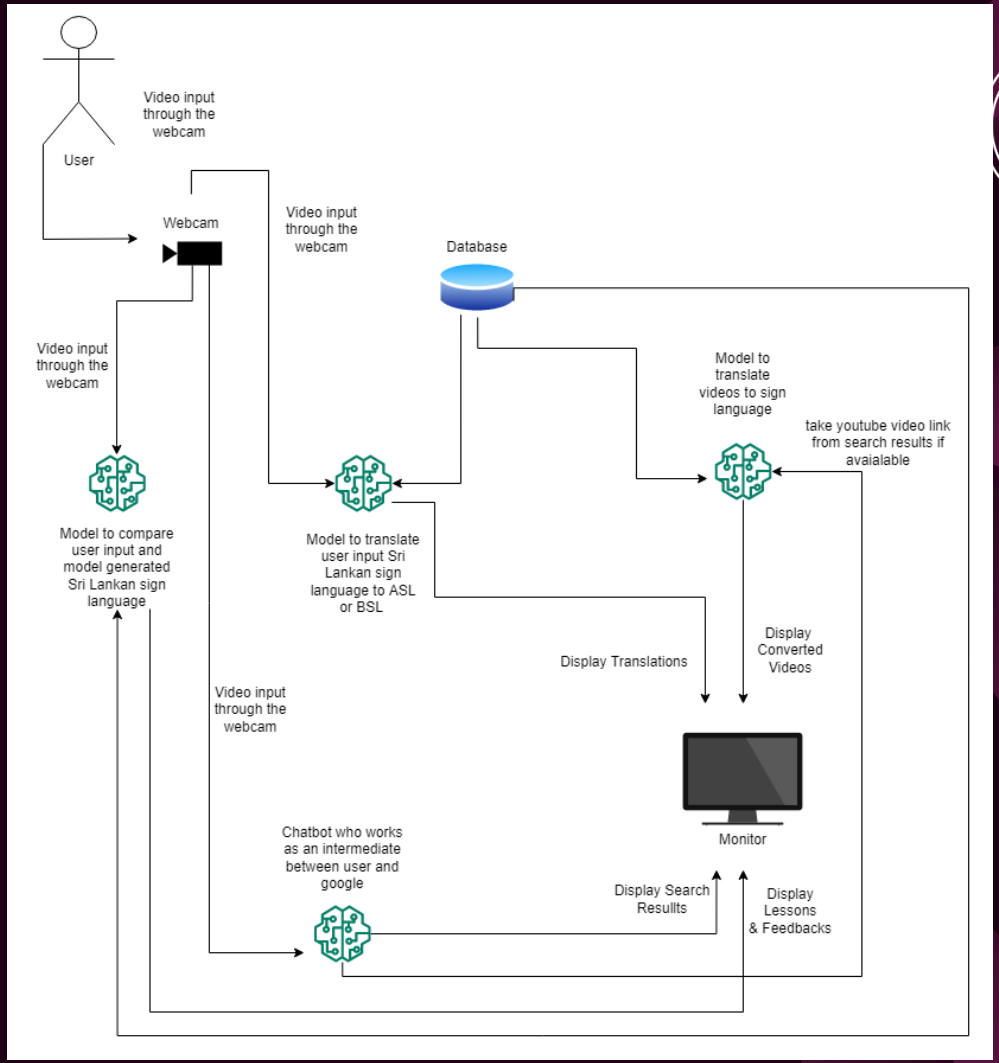
INTRODUCTION

- 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 sign language as caption

- Existing learning platforms or translations do not use emotion analysis

4. OBJECTIVES

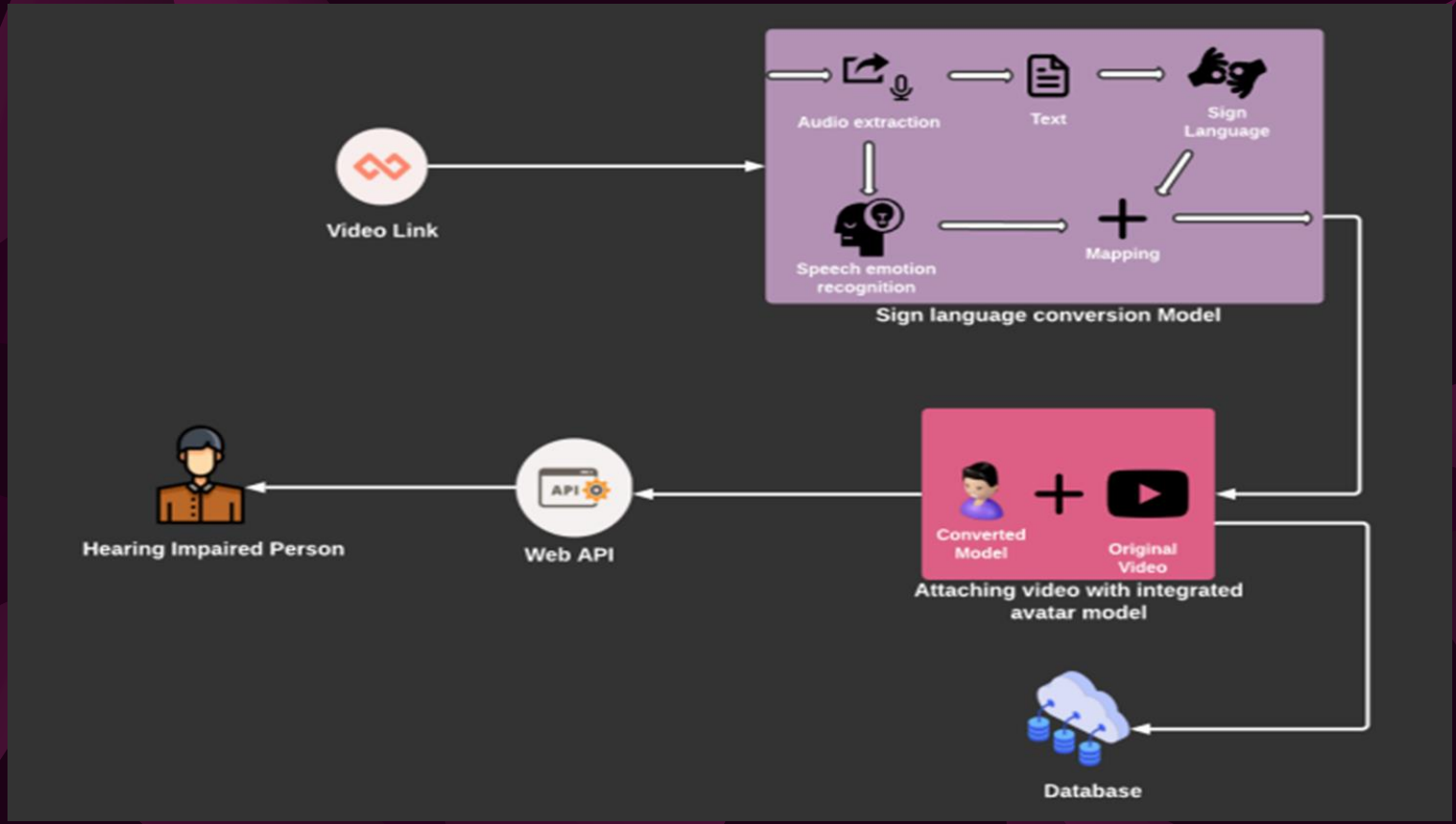
MAIN OBJECTIVE

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 recognition.
- Implement an algorithm to map converted sign language and the identified emotions.
- Implement an algorithm to translate content to SLSL

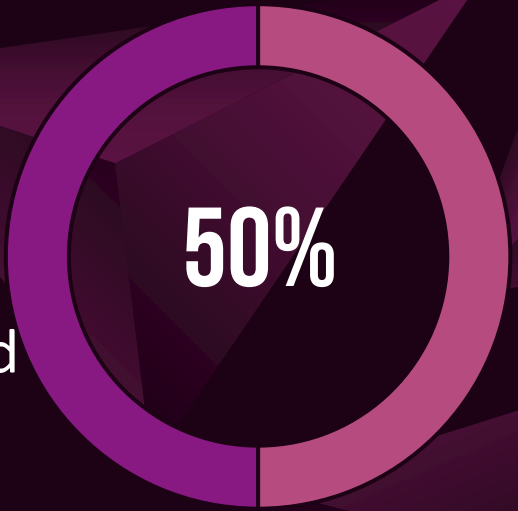
5. OVERALL SYSTEM DIAGRAM


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

6. PROGRESS

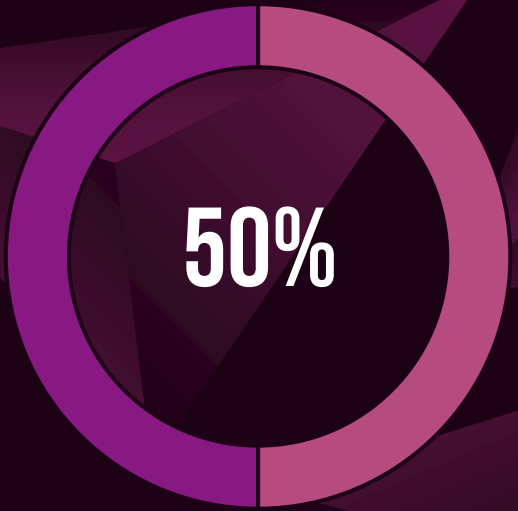
CURRENT PROGRESS

- Trained model for Speech Emotion Recognition with an accuracy of 81%
- Model to extract audio from the video and convert to text.
- Algorithm to break text to be converted to sign language
- Mapping relevant Emotion with converted text



EXPECTED FUTURE PROGRESS

- Using converted text building caption avatar to be embedded to the video.
- React Frontend Design
- Testing for functionality and possible improvements



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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[1] DailyFT, "Sinhala Sign Language the main communication mode for the Deaf in Sri Lanka", p. Single, 2019. [Online]. Available: https://www.ft.lk/Opinion-andIssues/Sinhala-Sign-Language-the-main-communication-mode-for-the-Deaf-in-SriLanka/14-67107

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

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

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1. INTRODUTION

NATIONAL
GEOGRAPHIC
Encarta
kids
People
Places
History
Social Studies
Games and Fun Stuff!
Animals
Science
ANIMAL JAM
HOME
2048
LEARN
GEOMETRY
SHAPES
ABCya!
nickelodeon

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
  - “Wadhan” application
  - “Nihada Ridma”
  - “Sawadana” mobile application

RESEARCH PROBLEM

- Knowledge evaluation is not present in Sign language based learning platforms
  - Nihanda
  - Snap E-learning

4. OBJECTIVES

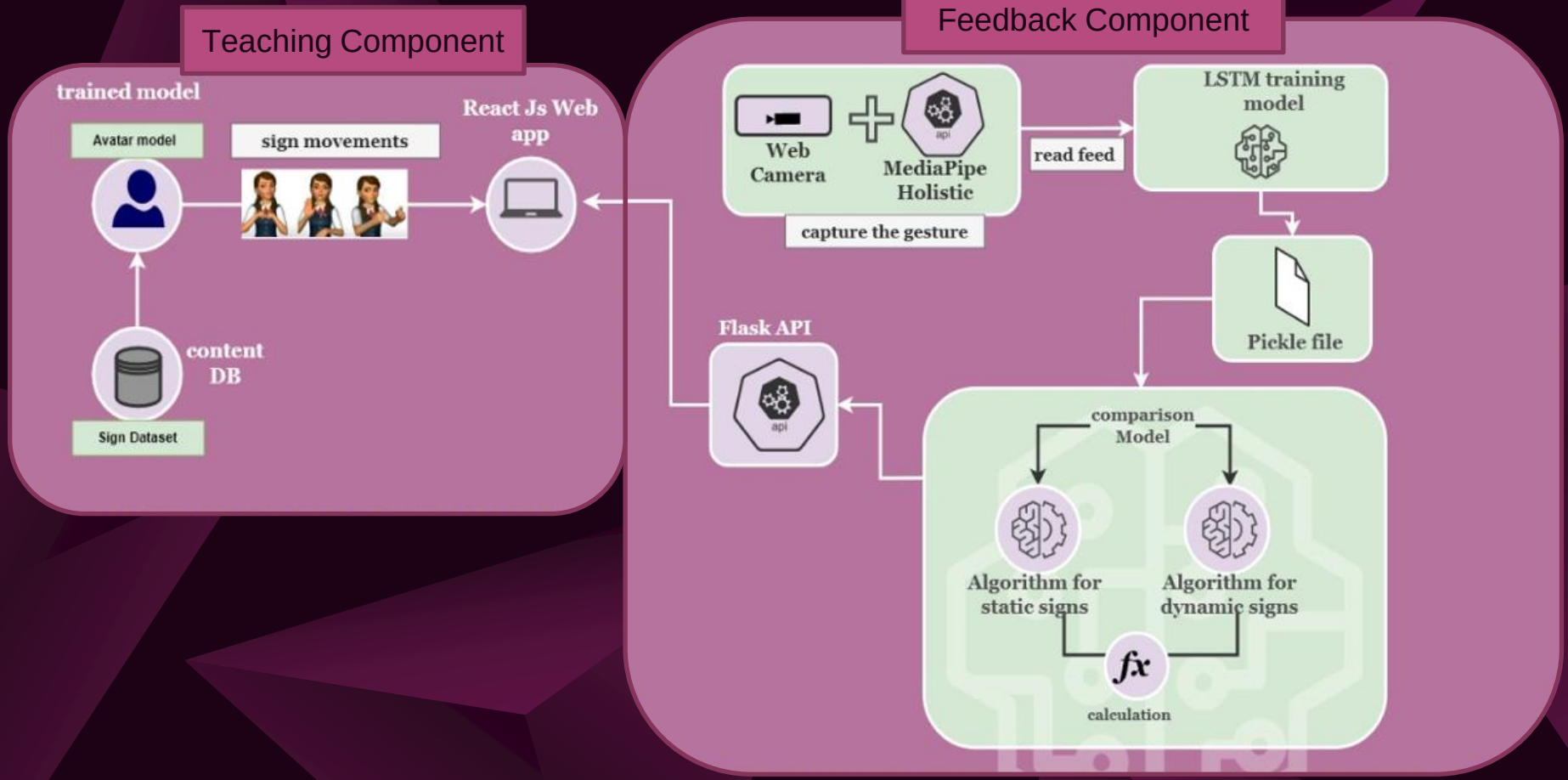
MAIN OBJECTIVE

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

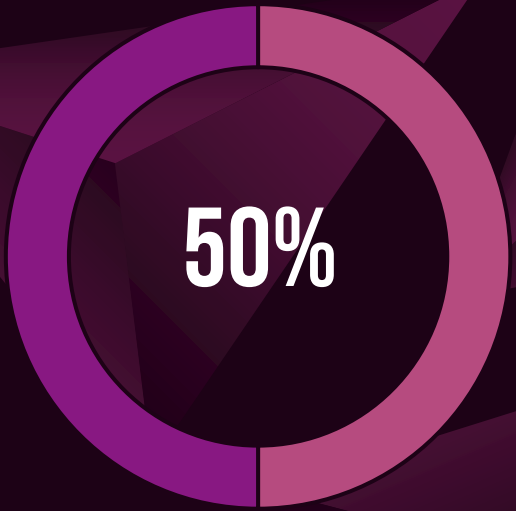
5. OVERALL SYSTEM DIAGRAM


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

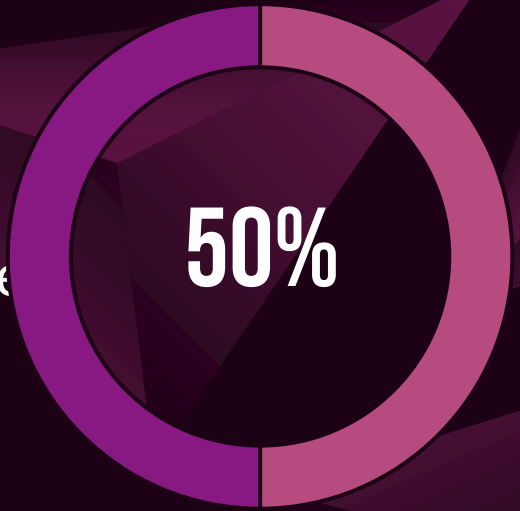
CURRENT PROGRESS

- Trained Detection Model for two quiz levels
- Algorithm to calculate correct percentage of simple & advanced Dynamic gestures
- Implement a mechanism to provide feedback effectively
- API to pass Feedback results
- Backend to React frontend



EXPECTED FUTURE PROGRESS

- Detection Model for another two quiz levels
- React Frontend Design
- GIF avatar model to teach sign language
- Testing for functionality and possible improvements



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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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

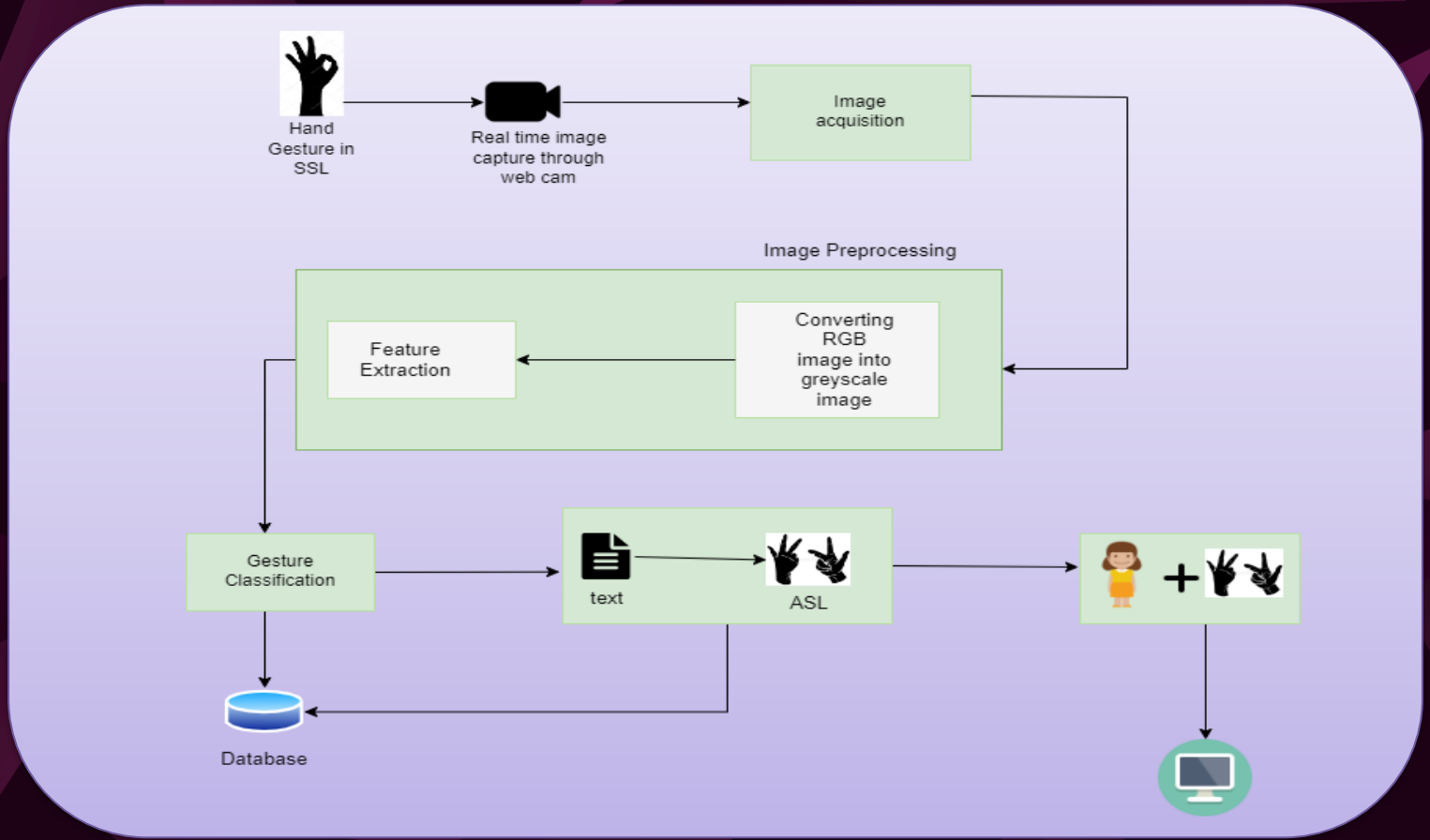
MAIN OBJECTIVE

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

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

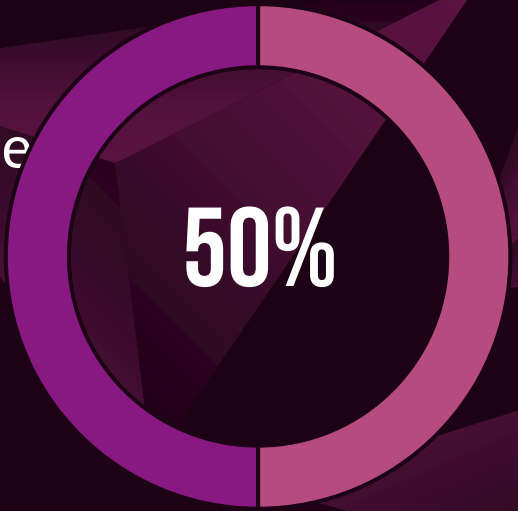
5. OVERALL SYSTEM DIAGRAM


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

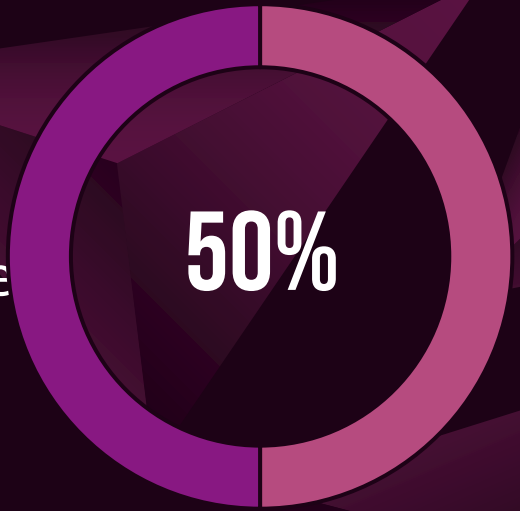
CURRENT PROGRESS

- Collecting images of the hand gestures from the web camera
- Converted the RGB images into a greyscale format.
- Trained the collected images
- Built a CNN model for image recognition and processing



EXPECTED FUTURE PROGRESS

- Mapping the ASL gestures with the detected text.
- Building the avatar model.
- Mapping the relevant gestures with the avatar.
- Improving the accuracy of the overall system.



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: http://www.ijmlc.org/vol9/879-L0320.pdf

[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.

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

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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

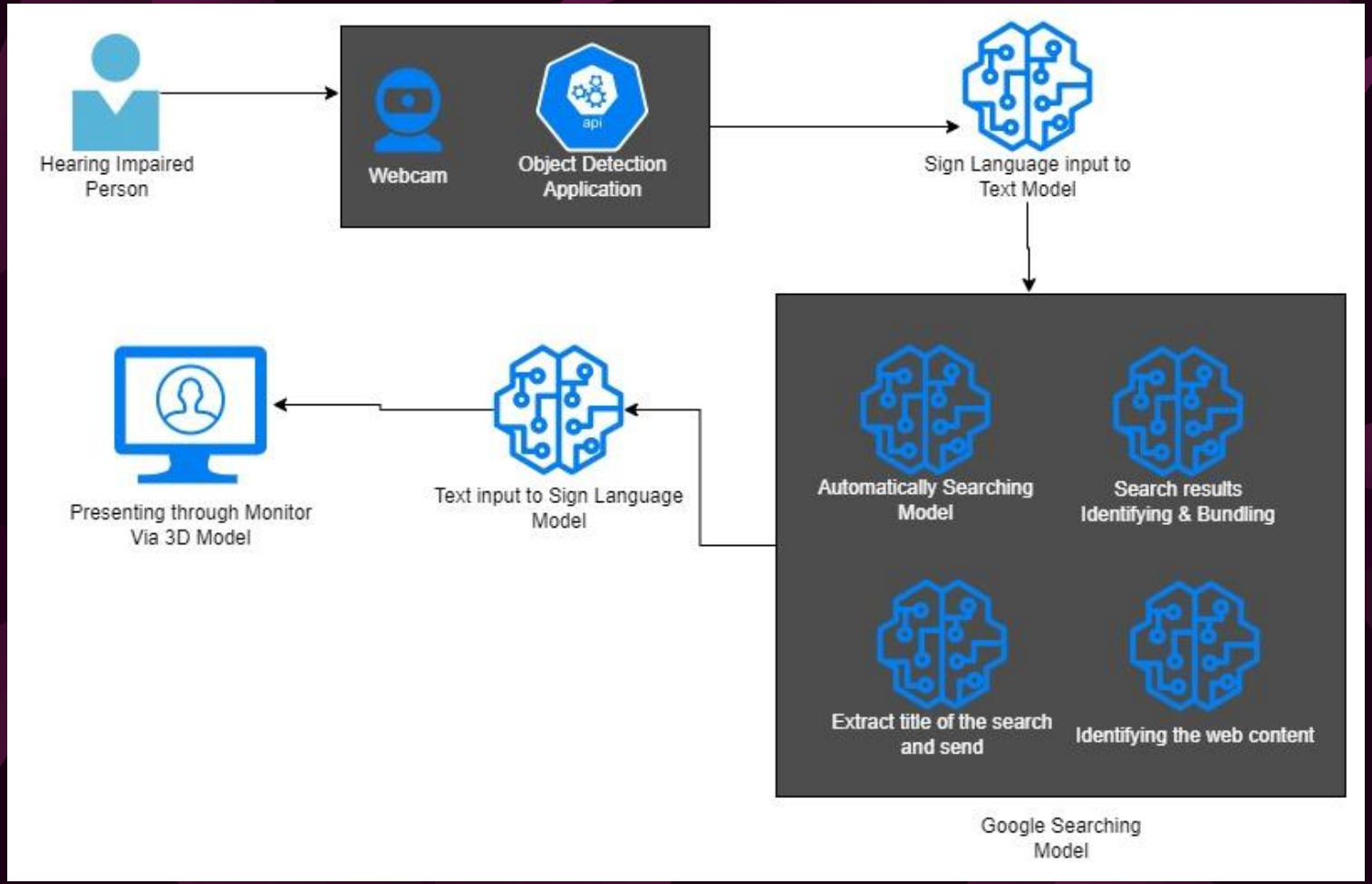
MAIN OBJECTIVE

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.

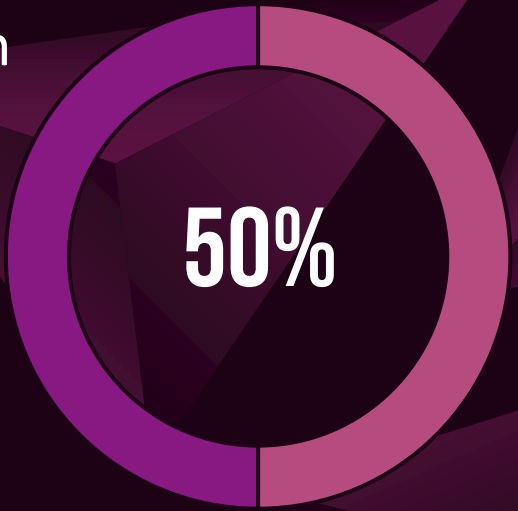
5. OVERALL SYSTEM DIAGRAM


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

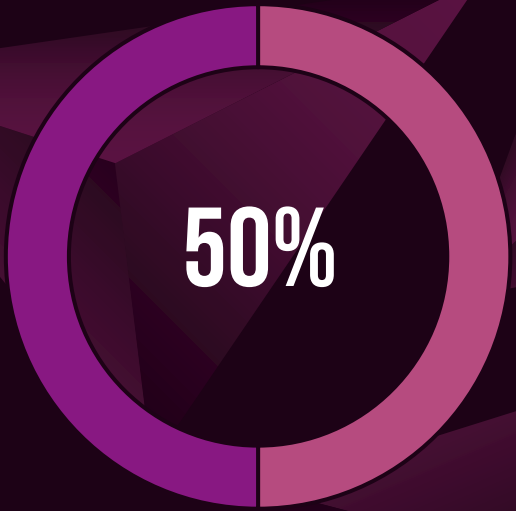
CURRENT PROGRESS

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



EXPECTED FUTURE PROGRESS

- Finalize front end and take more than one search results.
- Implement Sri Lankan Sign Language to text model.
- Finalize animation model with fellow members



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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THANKS!

Any questions?