TMP-21-069

# Sri Lanka Institute of Information Technology

## Project Topic Assessment – 2021

Topic

**E-learning System For Hearing-Impaired Students**

Abstract (200 Words Max):

Due to the prevailing COVID-19 situation we can observe that almost everything has been converted to online systems, especially education. While this might be comfortable for a certain group of people, there are people who suffer to adjust to it; the deaf and dumb. Even though they are trying hard to understand the content delivered online, we are exploring to provide a solution to them.

The instructor/lecturer who provides the online content is assumed to upload the video to the Learning Management System (LMS).

The proposed system will enable the students to learn from the lectures who don't know Sign language. This will increase the educational quest of the deaf and dumb community and help them to get an education through the best educators in their field.

The proposed system will generate signlanguage for the videos uploaded by the lecturers using machine learning and Natural Language Processing tenchniques and students will be able to upload a video in case of having doubts, and the exact process will happen in reverse. Further, all the web content in the LMS including notices and other details, will also be converted into sign language and be made available to the deaf and dumb users.

Research Area/Group: Select the area by referring to the document uploaded to the Courseweb

**Human Computer Interaction**

**Supervisor should fill this part**

Supervisor: I certify here that co-supervisor and myself can guide this students to acquire required knowledge skills and attitudes pertaining to above sub domains of his/her specialization.

Supervisor: **Ms. Janani Tharmaseelan** Signature

Continuation of Previous Year Project? ☐

If yes, state the Project ID

and year

Co-Supervisor: **Ms. Samanthi Eranga Siriwardene** Signature

External Supervisor Name

Team Members:

| Student Name | Student ID | Specialization |
|---|---|---|
| Leader : Sangeeth Raj A | IT18152074 | SE |
| Member 1: Pirathikaran V | IT18068610 | SE |
| Member 2: Niroshan K | IT18144772 | SE |
| Member 3: Accash R | IT18069600 | DS |

## Research Problem:

In the current situation, only a few numbers of higher education institutions used e-learning method, because of lack of telecommunications, devices, multimedia software and high implementation cost [1]. In normal teaching method not suitable for a deaf student. They need more time to understand than normal students [1]. Deaf and dumb sign languages difficult to understand by normal people, where e-learning student should ask a question while teaching, then lecturer should understand the sign-language [2].

Another main problem is 143 existing different sign languages all over the world [3]. When we develop the e-learning platform we consider only British Sign language. When capture hand gesture it difficult to detect by the system when using two hands with real-time, because both hand gestures may give wrong outputs additionally [4].

**Research Papers :**

[1] N.Vinoth , K Nirmala "Deaf Students Higher Education System Using E-Learning", Journal of Education and Learning. Vol. 11 (1) pp. 41-46

Available: https://www.researchgate.net/publication/316870431_Deaf_Students_Higher_Education_System_Using_E-Learning

[2] Pooja Gupta , Dr. Shahnaz Fatima ,"Massive Online Course for Deaf and Dumb People" , WCCCE '16, May 06-07, 2016, Kamloops, BC, Canada

Available: https://www.researchgate.net/publication/301793657_Massive_Online_Course_for_Deaf_and_Dumb_People

[3] Surbhi Rathi**,** Ujwalla Gawande ,"Development of full duplex intelligent communication system for deaf and dumb people" **,** 2017 7th International Conference on Cloud Computing, Data Science & Engineering - Confluence (Confluence)

Available: https://www.researchgate.net/publication/317419850_Development_of_full_duplex_intelligent_communication_system_for_deaf_and_dumb_people

[4] Christian Vogler, Dimitris Metaxas," Handshapes and Movements: Multiple-Channel American Sign Language Recognition" , Camurri and G. Volpe (Eds.): GW 2003, LNAI 2915, pp. 247–258, 2004

Available: https://www.researchgate.net/publication/221260232_Handshapes_and_Movements_Multiple-Channel_American_Sign_Language_Recognition

Solution proposed:

There are two types of users for the system.

- Instructor
- Student

The Instructor is allowed to upload videos for the system which can be viewed by the students. We also allow hearing impaired students to access the content of the videos by various alternative techniques of video conversion. They are mainly

- Realtime captioning of the videos.
- Converting the videos to Sign Language.

Apart from these functions the Hearing-impaired students can also view Notices and Web content which will be converted to sign language and they can post their queries using sign language which will be converted to English and can be answered by the instructors.

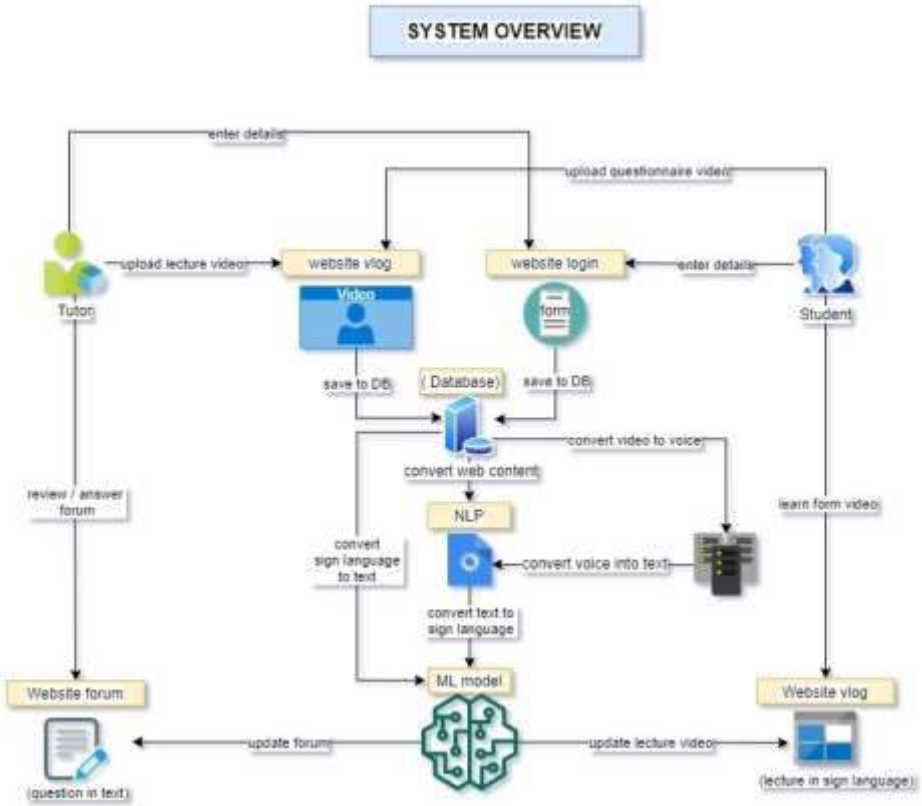
For Realtime captioning we are planning to use the Natural Language Processing (NLP) algorithms used in the Automatic Speech Recognition (ASR) captioning Systems. The converted captions is then sent to an AI Model which has the library of the ASL library which can predict signs for some words. This overall conversion of video to Sign Language is Displayed to the user.

The Notices and other special Artifacts can also be converted to Sign Language with use of the developed Model.

The queries of the Student interpreted in Sign Language can also be converted to English which is easily Understandable by the instructor for which he can provide answers. For this we can use the Same Model we developed to identify the Sign and covert it to words.

System Overview Diagram for the solution proposed. Recommended to draw using draw.io. Note: This is not an activity/flow (UML) diagram

1. **Man components including the data sources, stakeholders, interaction among the stakeholders, etc.**
2. **Interconnection among the components**
3. **Major SW and HW components**



Objectives (1 main objective and 4 sub objectives):

**Main Objective:**

Solving communication and learning barrier between tutors and hearing-impaired students through learning Management System.

**Sub Objective 1:** Changing physical learning environment to virtual environment for hearing impaired students

**Sub Objective 2:** Motivating hearing-impaired students to adapt virtual learning.

**Sub Objective 3:** Improving Engagement of hearing-impaired students in Web contents.

**Sub Objective 4:** Providing hearing-impaired students to involve in clearing their doubts through Sign Language.

Task divided among the members

**Niroshan K.**

Converting Video Content into Text And providing Realtime captioning for the video content.

**Accash R.**

Converting the captioned text into Sign Language and providing a Gallery of sign images for a video content.

**Sangeeth Raj A.**

Converting the content in Notices and Web pages into Sign Language and Representing them on the gallery of sign images.

**Detecting the User's motion to analyzing the learning and testing user knowledge by quiz with motion detection.**

**Pirathikaran V.**

Converting sign language representation into meaning full words. (2-way communication)

Technologies to be used:

Machine Learning

Natural Language Processing

Video Processing

If supervisor States that this year is a continuation of previous work, state the further work the students should do compared to the previous years.
(NOTE: This part has to be filled by the supervisor)

**<u>This part will be filled by the Topic Screening Panel members</u>**

Acceptable: Mark/select as necessary

| Acceptance/ Rejection | Correction State | |
|---|---|---|
| | Minor Correction | Major Corrections |
| Accepted | ☐ | ☒ |
| Resubmit | ☐ | ☐ |
| Rejected | ☐ | |

Corrections (if necessary)

Justify the usage of both sign language and text. It seems redundant of having both approaches. Please discuss with the supervisor and restructure the research components accordingly.

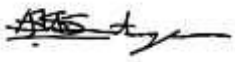
Any other Comments:

_____

_____

_____

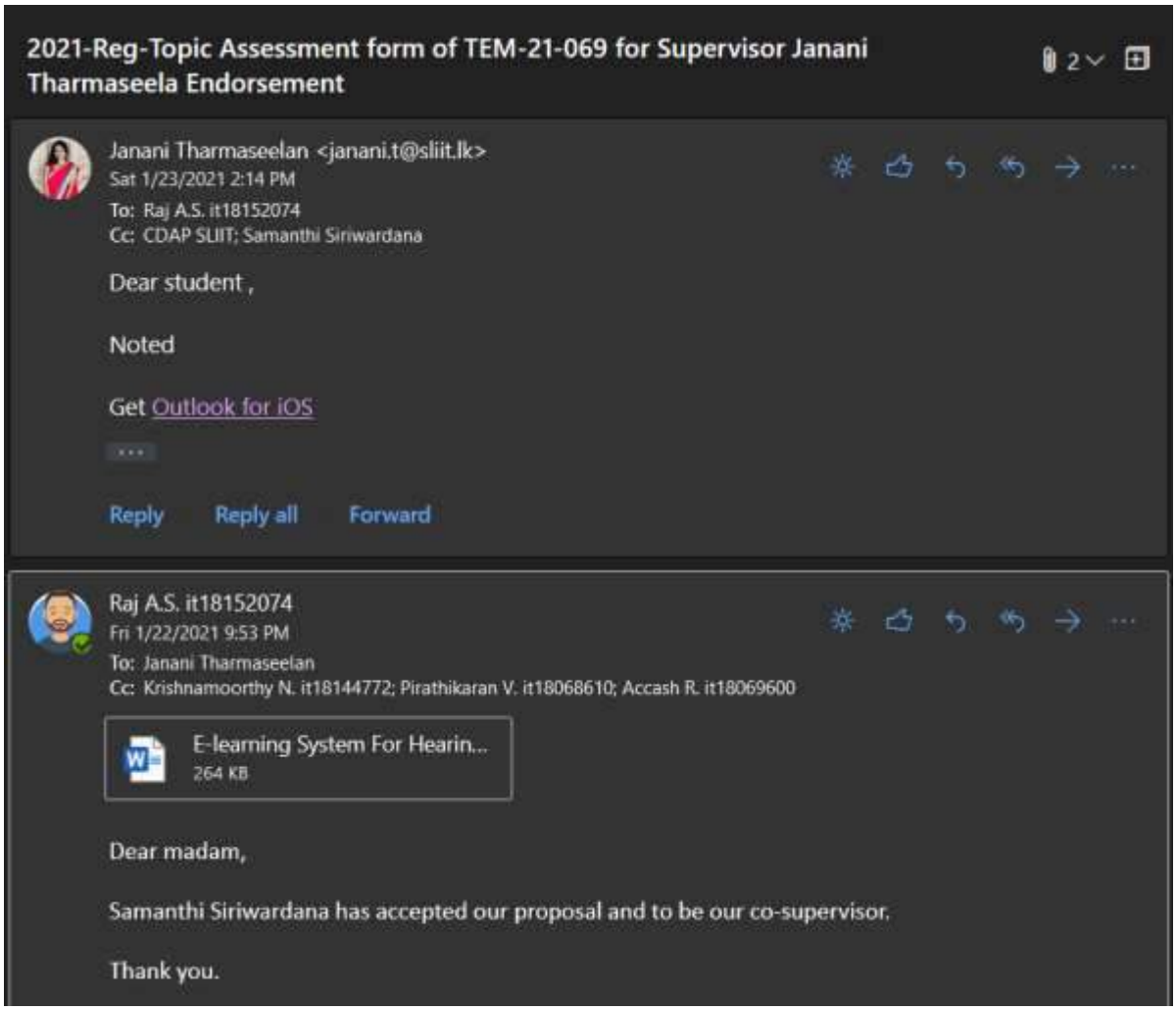
Approved by the review panel:

| Member's Name | Signature |
|---|---|
| Dr. Dharshana Kasthurirathna |  |
| Mr. Udara Samaratunge |  |
| | |

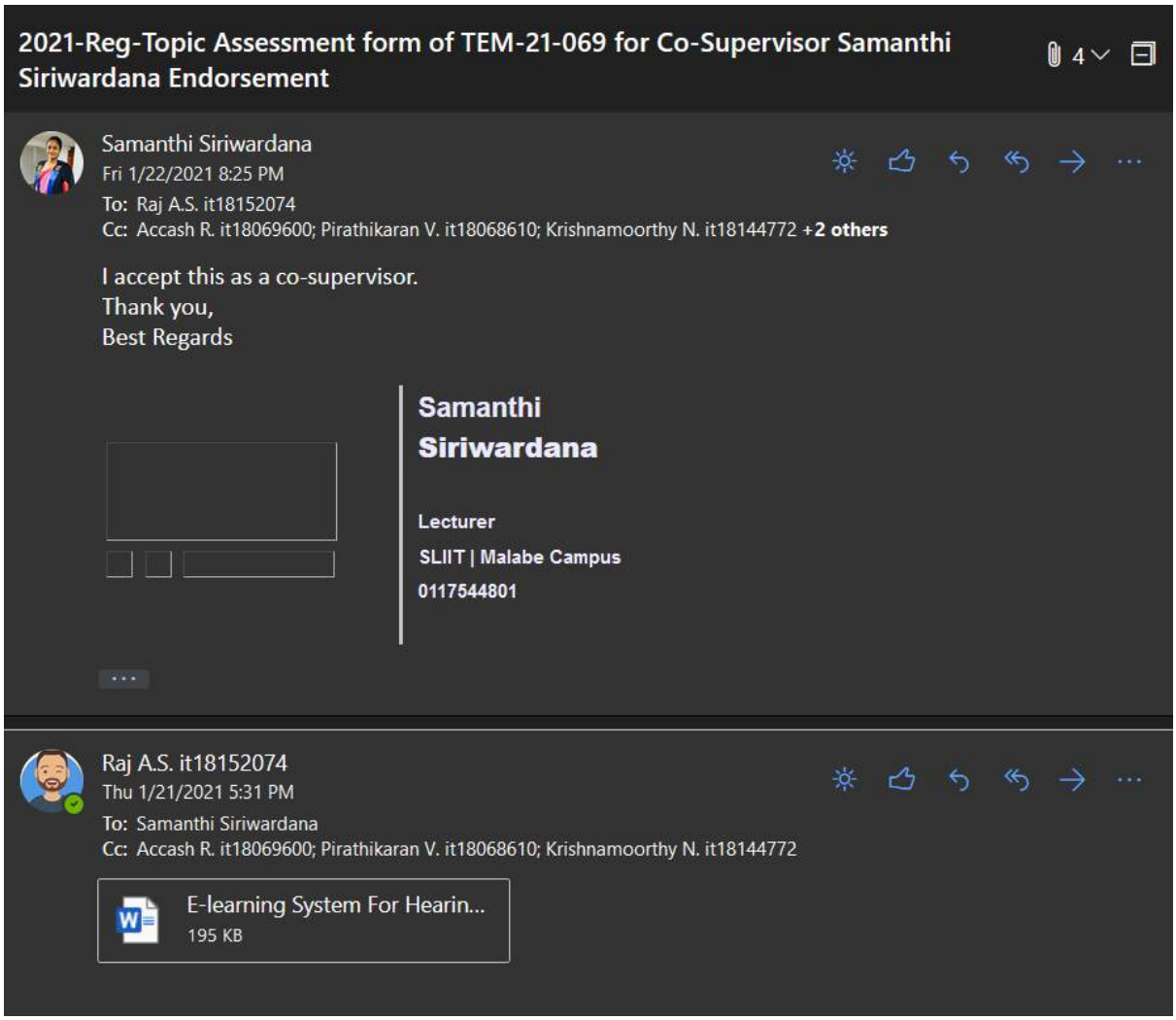
**Important**:

1. According to the comments given by the panel, do the necessary modifications and get the approval by the **same panel**.
2. If the project topic is rejected, find out a new topic and inform the CDAP Group for a new topic pre-assessment.
3. A form approved by the panel must be attached to the **Project Charter Form**.

Appendix 1




Appendix 2


2021-Reg-Topic Assessment form of TEM-21-069 for Co-Supervisor Samanthi Siriwardana Endorsement
4
Samanthi Siriwardana
Fri 1/22/2021 8:25 PM
To: Raj A.S. it18152074
Cc: Accash R. it18069600; Pirathikaran V. it18068610; Krishnamoorthy N. it18144772 +2 others
I accept this as a co-supervisor.
Thank you,
Best Regards
Samanthi
Siriwardana
Lecturer
SLIIT | Malabe Campus
0117544801
Raj A.S. it18152074
Thu 1/21/2021 5:31 PM
To: Samanthi Siriwardana
Cc: Accash R. it18069600; Pirathikaran V. it18068610; Krishnamoorthy N. it18144772
E-learning System For Hearin...
195 KB