Technology For Special Needs Education

Project Report

THAT Hearing Assistance and Transcription

Team Invictus

23rd November 2020

Motivation

There wasn't any one source of motivation for this project, there are a lot of things which should be considered. Undoubtedly, it started with this course Technology for Special Needs Education. We learned a lot of things in this course which broadened our perspectives on things we should've known for long. We learnt about Inclusive Education and its importance. But there are some crucial issues which demanded our attention. We learnt that hearing disability causes delays in the development of speech and language. This often leads to learning problems, often resulting in poor academic performance. There are over 2 million children with hearing disability in India, and out of these, around 0.8 million are either dropouts or don't have access to education. These numbers are staggering to even think about. It's almost half certain that a person born with hearing loss would be able to get proper education.

Hearing loss is not an unknown disability, it is a partial or total inability to hear and it may be present at birth or acquired at any time afterwards. There are a number of challenges faced by persons with this disability, but are still not so much talked about in our daily conversation. We have tried our best to address some of those.

The biggest problem which they face on a daily basis, especially during this pandemic, is not being able to engage in video-based communication. This can go as far as not being able to learn from or watch any of the videos on YouTube or somewhere else on the internet.

Not only this, another problem we realised they must be facing would be the inability to figure out their pace of speech while speaking. It should be understandable that a person who has hearing loss present since their birth might not be able to speak, since they wouldn't know how to pronounce words. And with assistance, they try to learn to speak but still lack direction on the way of speaking.

Keeping the above mentioned points in mind, we came up with the following objectives

Objectives

Live Transcript

Aimed for the students who can attend lectures where the audio automatically gets transcribed into text real-time, just like auto-generated captioning on YouTube. The transcription starts as soon as the user hits the play button and automatically gets saved at the end of the lecture.

Speech Assistance

Built for assisting users with their speech of rate. While speaking, the app will show the users whether their speech is fast/perfect/slow or loud/perfect/soft. This feature helps them to assess themselves and improve with time. This will simultaneously improve their vocal skills as well as help them in effective communicating during the class.

Feedback Feature

An indispensable aspect for any hearing impaired student is communication. The application allows the student to submit their feedback about the lecture. The feedback can then be reviewed and the professor can respond to them. This will not only ensure a smooth teaching process, but also put in place a proper communication channel between the two.

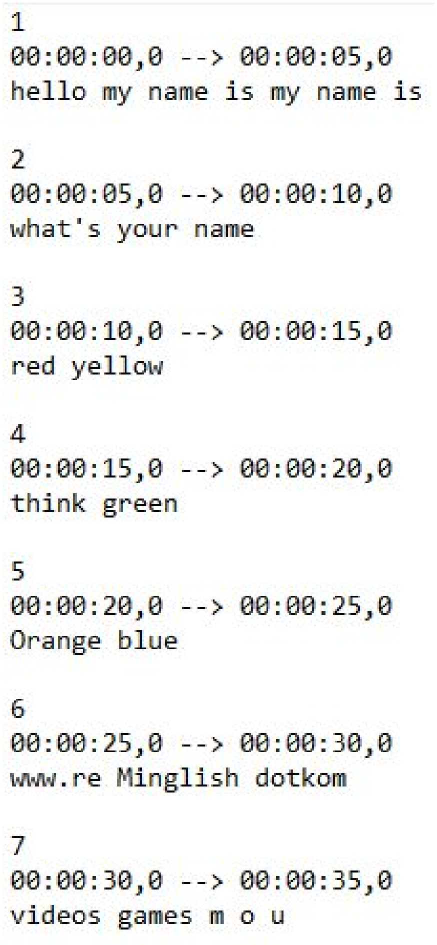
Video Captioning (source code : **makesrt.py**)

- This feature ensures that the uploaded lecture has got the **captions** besides them.
- When the student starts a lecture. The entire audio part of the lecture is processed at once and a **subtitle file** is created.
- **Google API** is used to get captions. Libraries such as **SpeechRecognition**, **srt** are used.
- This part is not fully accurate as the **audio interval of 5secs** is considered at any moment to convert into captions at that time. This might lead to **division** of audio in between a single word as well as caption **showing before a word is pronounced**.

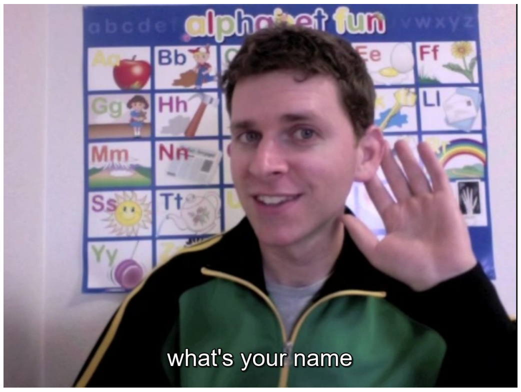
Actual transcript :

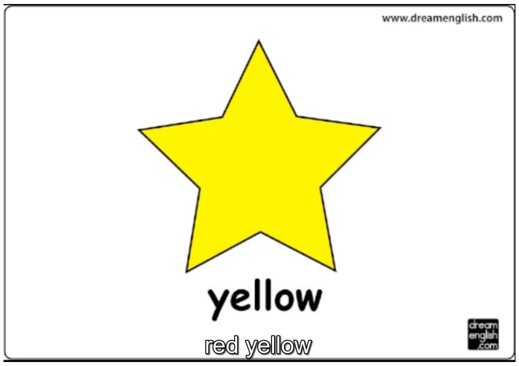
“hello my my name is Mac what's your name red yellow pink green Orange Is It www.dream.com songs videos games and more”

Subtitle file formed :



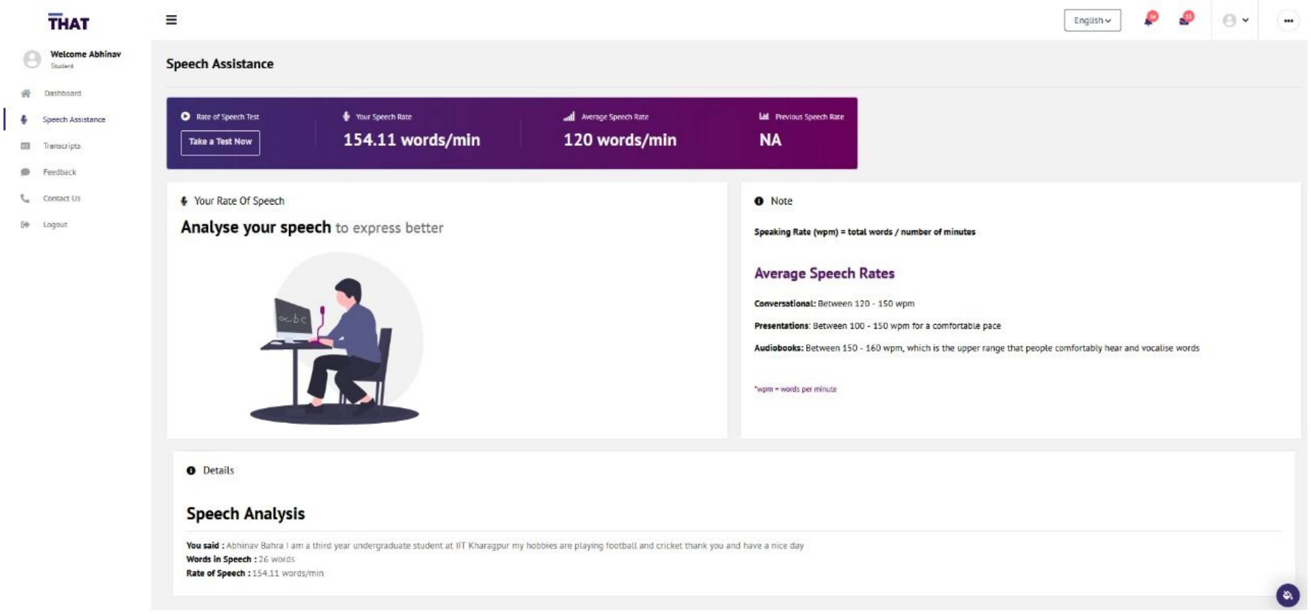
```
1
00:00:00,0 --> 00:00:05,0
hello my name is my name is

2
00:00:05,0 --> 00:00:10,0
what's your name

3
00:00:10,0 --> 00:00:15,0
red yellow

4
00:00:15,0 --> 00:00:20,0
think green

5
00:00:20,0 --> 00:00:25,0
Orange blue

6
00:00:25,0 --> 00:00:30,0
www.re Minglish dotkom

7
00:00:30,0 --> 00:00:35,0
videos games m o u
```





Speech Assistance : Rate of Speech (source code : **features.py**)

- This feature of our app is targeted towards better **oral skill development** of the people with hearing disability.
- When the student clicks on the '*Take a Speech test*', the microphone starts recording the audio till there is a silence of **>2secs**(signalling end of test). The entire audio recorded is then processed to get the **transcript** and **Rate of Speech**.
- The feature ensures that the student improves his/her **pronunciation** and **speech clarity**
- **words/minute** is used as merit to judge speed.
- Google API is used to get transcription .
- Libraries : **SpeechRecognition, pycaw, nltk, comtypes, ctypes, plyer.**



Speech Assistance

Rate of Speech Test

Your Speech Rate: 154.11 words/min

Average Speech Rate: 120 words/min

Previous Speech Rate: NA

Your Rate Of Speech

Analyse your speech to express better

Note

Speaking Rate (wpm) = total words / number of minutes

Average Speech Rates

Conversational: Between 120 - 150 wpm

Presentations: Between 100 - 150 wpm for a comfortable pace

Audiobooks: Between 150 - 160 wpm, which is the upper range that people comfortably hear and vocalise words

*wpm = words per minute

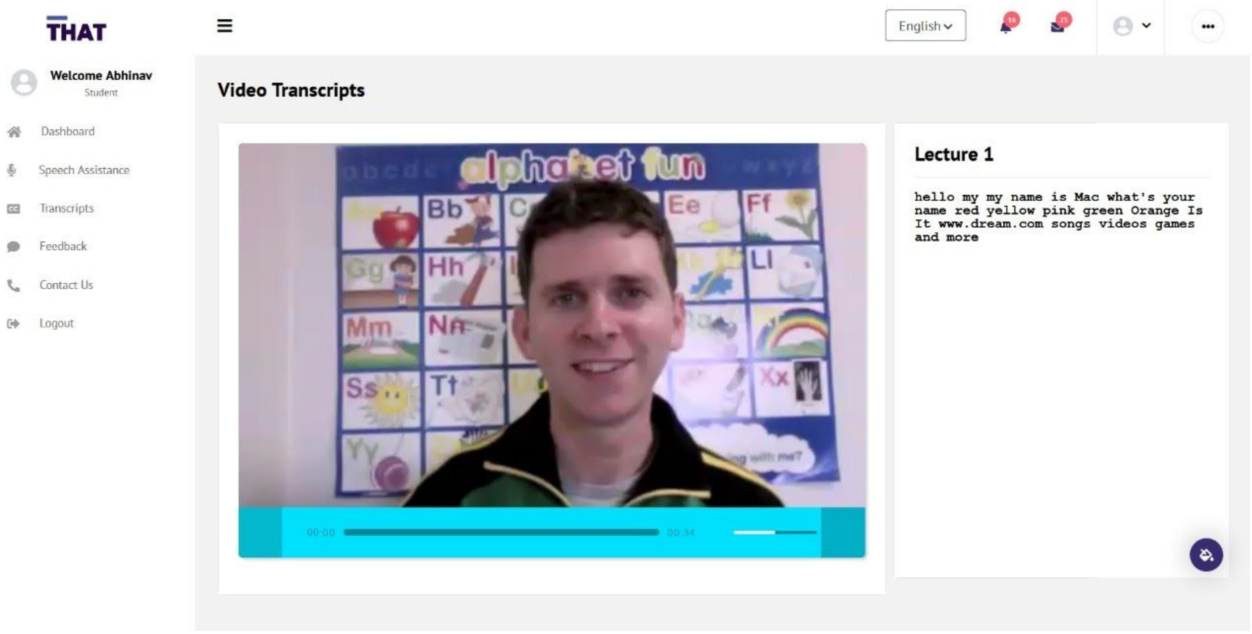
Details

Speech Analysis

You said : Abhinav Bahra I am a third year undergraduate student at IIT Kharagpur my hobbies are playing football and cricket thank you and have a nice day
Words in Speech : 26 words
Rate of Speech : 154.11 words/min

Actual transcript(source code : **features.py**) :

- This feature is introduced to help students to **revise** their lectures **without having to go through the entire lecture**.
- When a student clicks on a lecture the entire transcript of the lecture gets printed besides which helps them to go through stuff **sequentially**, **effectively** and **quickly**.
- They can go through the video with the **entire transcript** besides them.
- **Google API** is used to get transcript and major libraries used are **moviepy**, and **SpeechRecognition**



Video Transcripts

Lecture 1

```
hello my my name is Mac what's your
name red yellow pink green Orange Is
It www.dream.com songs videos games
and more
```

Working of Backend:

- The **routes.py** file forms the backend skeleton, consisting of all decorators and paths.
- **FLASK-SQLALCHEMY** has been used as the Object Relational Mapper (ORM) acting as the interface between our python script and database. It helps in realising the user and lecture models (in **models.py**) as tables in our database.
- **FlaskForm** has been used to create the structure of a form. We've used **WTForms** for form validation. All form classes are included in **forms.py**. **Flask-Bcrypt** has been used to hash account passwords before storing them in the database.
- **search.py** consists of the KMP search algorithm code used to search for any lecture in the dashboard.

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