

Project ID: PW22UD02

Project Title: Regional Voice Assistant

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Project Abstract:

The recent technological advances have helped humanity connect with each other and unlock several abilities to conquer many of the modern-world problems. Communication gap has been a major issue for many natives and locals trying to learn or move ahead in this tech-savvy English-speaking world. To communicate effectively it is not only essential to have a single language translator but also a tool that can help understand a mixture of different languages to bridge the gap of communication with the non-English speaking communities. Integrating a multilingual translator with the power of a smart phone voice assistant can help aid this process. Native language speaking communities can now travel to cities of their choice and not get the feeling of being lost or unable to ask their queries to a local. We aim to develop a model that will identify the different languages (English and Kannada) in the query and generate an appropriate output of the multilingual audio query. The query can be recorded and is first sent to a model which helps recognise the mixture of languages in use and simultaneously convert the speech to text. This mixed sentence is converted to a single language for ease of deriving a result and fed to an existing API to fetch the result for the query. This model can help travellers commute through the cities and towns with ease, find out information about any nearby hospitals or restaurants and thus make their lives less troublesome. Communication and language barrier will no longer be an issue with the help of this app and since multilingual speech recognition and integration to a voice assistant is a less researched domain, the addition of this app will help make improvements in the technical domain.

Code Execution:

8.1 Splitting of sentence

This is the visualization of a wav file for the recording of the sentence “how to hang painting on gode”.

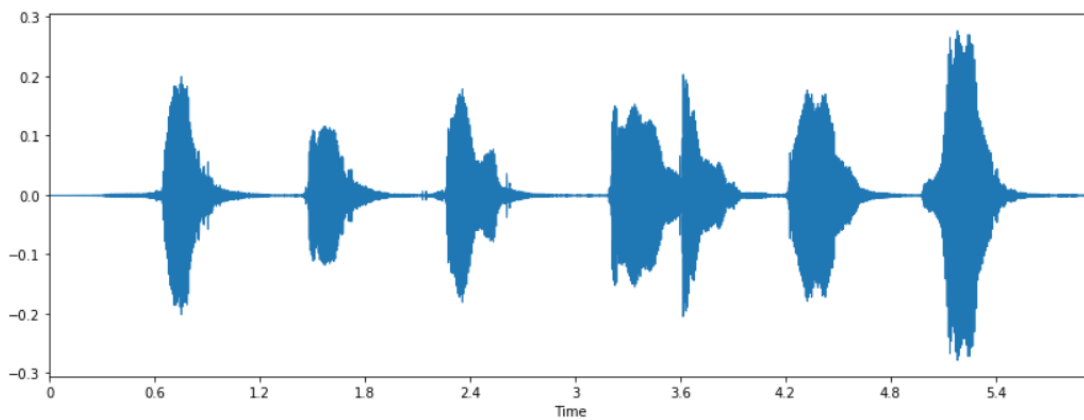


Fig 25 signal for the recording of a sample sentence

After smoothing, the minimas are defined clearly and hence split at these points :

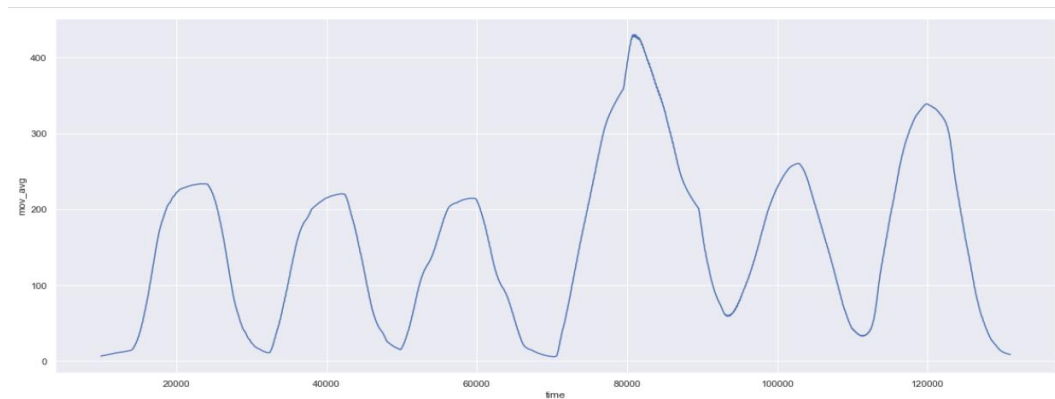


Fig 26 *smoothened signal*

	Splitting Module	
Tested Sentence	Actual Number of Words	Predicted Number of Words
nanna next turn yenu	4	4
what is my next saradi	5	5
what is my mundina saradi	5	5
how is the datthane ahead	5	5
munde traffic hegidhe	3	3
how is the datthane munde	5	5
what are the nearby anila stations	6	6
what are the nearby gas kendragalu	6	6
what are the nearby anila kendragalu	6	6
hathira gas stations yavdu	4	4
hathira gas kendragalu yavdu	4	4
hathira anila stations yavdu	4	4
are there any kredaa mydana near me	7	7
nanna hathira yavude sports ground idhya	6	6
are there any sports mydana near me	7	7
are there any kredaa grounds near me	7	7

what are some good nearby stalagalu to visit	8	8
what are some uttama hathiradha places to visit	8	8
what are some uttama hathiradha stalagalu to visit	8	9
bheti needalu hathiradha good places yavuvu	6	6
hathiradha park yaavaaga thereyuthadhe	4	5
When does the nearest udhyaana open	6	6
hathiradha udhyaanavu yaavaaga open aagothe	5	6
Nanna hathira iro plumbing service	5	5
Hathira iro kolaayi service	4	4
Hathira iro plumbing service	4	4
hathiradha job openings	3	3
Udhyogavakaasha near me	3	3
Kelasa openings near me	4	4

Table 1: Test results of splitting module

The splitting algorithm was tested on 30 sentences out of which 28 were correctly splitted into respective words as shown in the table. The incorrectly splitted sentences were re-recorded with sufficient gaps between words after which the splitting was done accurately.

8.2 Word Prediction:

```

model.fit(train_inputs,train_targets,epochs=500,verbose=1)
model.save("modelOne.h5")
Epoch 491/500
4/4 [=====] - 0s 4ms/step - loss: 0.2042 - accuracy: 0.8899
Epoch 492/500
4/4 [=====] - 0s 4ms/step - loss: 0.2360 - accuracy: 0.8300
Epoch 493/500
4/4 [=====] - 0s 4ms/step - loss: 0.2174 - accuracy: 0.8719
Epoch 494/500
4/4 [=====] - 0s 5ms/step - loss: 0.2401 - accuracy: 0.8510
Epoch 495/500
4/4 [=====] - 0s 5ms/step - loss: 0.2281 - accuracy: 0.8731
Epoch 496/500
4/4 [=====] - 0s 5ms/step - loss: 0.1995 - accuracy: 0.8876
Epoch 497/500
4/4 [=====] - 0s 5ms/step - loss: 0.2151 - accuracy: 0.8846
Epoch 498/500
4/4 [=====] - 0s 4ms/step - loss: 0.2099 - accuracy: 0.8877
Epoch 499/500
4/4 [=====] - 0s 4ms/step - loss: 0.2298 - accuracy: 0.8676
Epoch 500/500
4/4 [=====] - 0s 4ms/step - loss: 0.2033 - accuracy: 0.9055

```

Fig 27 performance of word prediction model

Word Predictor model gave 90% accuracy and when predicted top 5 possible next words for a current sentence, the desired word was present in this predicted possible words.

8.3 Speech to text:

8.3.1 Methodology 1: Deep learning

DL Module		
Actual Sentence	Predicted Sentence	Average Accuracy
nanna next turn yenu	nanna next turn yenu	0.83
what is my next saradi	what is my next saradi	0.71
what is my mundina saradi	what aagothe any stalagalu saradi	0.68
how is the datthane ahead	how service the yaavaaga ahead	0.73
munde traffic hegidhe	munde traffic hegidhe	0.78
how is the datthane munde	how service the yaavaaga ahead	0.79

what are the nearby anila stations	what does the nearby anila stations	0.84
what are the nearby gas kendragalu	what aagothe the nearby gas kendragalu	0.84
what are the nearby anila kendragalu	what aagothe the nearby good kendragalu	0.85
hathira gas stations yavdu	what gas stations visit	0.88
hathira gas kendragalu yavdu	hathira gas kendragalu open	0.85
hathira anila stations yavdu	hathira gas stations service	0.85
are there any kredaa mydana near me	hathiradha there any sports plumbing near me	0.89
nanna hathira yavude sports ground idhya	hathira next yavude sports ground idhya	0.87
are there any sports mydana near me	are there any kredaa mydana near me	0.88
are there any kredaa grounds near me	what there any kredaa grounds to me	0.87
what are some good nearby stalagalu to visit	what are the good nearby stalagalu to visit	0.93
what are some uttama hathiradha places to visit	what are hathiradha uttama hathiradha places to visit	0.9
what are some uttama hathiradha stalagalu to visit	what are the uttama hathiradha stalagalu to visit	0.9
bheti needalu hathiradha good places yavuvu	bheti openings hathiradha good places yavuvu	0.89
hathiradha park yaavaaga thereyuthadhe	hathira park yaavaaga thereyuthadhe	0.95
when does the nearest udhyaana open	when there the nearest open openings	0.84
hathiradha udhyaanavu yaavaaga open aagothe	are udhyaanavu yaavaaga open aagothe	0.86
nanna hathira iro plumbing service	hathira traffic iro ground service	0.85
hathira iro kolaayi service	nanna iro kolaayi service	0.87
hathira iro plumbing service	are iro plumbing service	0.84
hathiradha job openings	hathira park openings	0.87

udhyogavakaasha near me	udhyogavakaasha needalu me	0.94
kelasa openings near me	what openings me me	0.86
	Model Accuracy	0.85
	Prediction Accuracy	0.71

Table 2: Test results of speech to text conversion using deep learning

The average accuracy for each sentence was calculated by taking the accuracy of models while predicting each individual word of that corresponding sentence. Model Accuracy is the average accuracy of all the sentences tested. Prediction Accuracy is the number of words correctly predicted divided by the total number of words present.

8.3.2 Methodology 2 : Based on similarity

Speech To Text Module based on similarity				
Actual Sentence	Predicted Sentence(using average similarity of each class)	Accuracy	Predicted Sentence(using maximum count among top 20 most similar recordings)	Accuracy
nanna next turn yenu	nanna next turn yenu	1	nanna next turn yenu	1
what is my next saradi	what is any next yenu	0.6	how is my next saradi	0.8
what is my mundina saradi	are is any mundina yenu	0.4	what is my mundina yenu	0.8
how is the datthane ahead	what is some yaavaaga ahead	0.4	what aagothe my nearest ahead	0.2
munde traffic hegide	are traffic hegide	0.67	are traffic hegide	0.67
how is the datthane munde	are is my nearest munde	0.4	what is some nearest munde	0.4
what are the nearby anila stations	what is the nearby gas stations	0.67	how is some nearby gas kendragalu	0.17

what are the nearby gas kendragalu	what is some nearby gas kendragalu	0.67	what is some nearby gas kendragalu	0.67
what are the nearby anila kendragalu	what is the nearby gas kendragalu	0.67	what is the nearby gas kendragalu	0.67
hathira gas stations yavdu	what iro stations yavdu	0.5	what gas stations yavdu	0.75
hathira gas kendragalu yavdu	hathiradha iro stations yavdu	0.25	hathira gas kendragalu yavdu	1
hathira anila stations yavdu	what gas plumbing yavdu	0.25	what gas kendragalu yavdu	0.25
are there any kredaa mydana near me	are openings yaavaaga kredaa grounds to me	0.43	what does any kredaa grounds to me	0.43
nanna hathira yavude sports ground idhya	nanna next yavude plumbing ground idhya	0.67	nanna next yavude ground ground idhya	0.67
are there any sports mydana near me	are there any mundina plumbing near near	0.57	are there any kredaa mydana near me	0.86
are there any kredaa grounds near me	what there any mundina grounds near near	0.57	how there any mundina grounds near me	0.71
what are some good nearby stalagalu to visit	are are some good nearby mundina to visit	0.75	how are some good nearby places to visit	0.75
what are some uttama hathiradha places to visit	are are the uttama hathiradha places to visit	0.75	are are some good hathiradha places to visit	0.75
what are some uttama hathiradha stalagalu to visit	are are hathiradha uttama kolaayi stalagalu to visit	0.62	are are hathiradha good kolaayi nearby to visit	0.38
bheti needalu hathiradha good places yavuvu	nanna near hathiradha good turn yavuvu	0.5	hathiradha near hathiradha good places yavuvu	0.67

hathiradha park yaavaaga thereyuthadhe	what park anila thereyuthadhe	0.5	hathiradha park any udhyaana	0.5
when does the nearest udhyaana open	when are the iro udhyaana open	0.67	when are the iro udhyaana open	0.67
hathiradha udhyaanavu yaavaaga open aagothe	are udhyaanavu yaavaaga grounds aagothe	0.6	are udhyaanavu yaavaaga grounds aagothe	0.6
nanna hathira iro plumbing service	nanna hathira iro plumbing aagothe	0.8	nanna hathira iro plumbing aagothe	0.8
hathira iro kolaayi service	hathira iro kolaayi yavdu	0.75	hathira iro kolaayi yavdu	0.75
hathira iro plumbing service	hathira iro plumbing service	1	hathira iro plumbing service	1
hathiradha job openings	are udhyaanavu openings	0.33	are job openings	0.67
udhyogavakaasha near me	are near near	0.33	are near me	0.67
kelasa openings near me	nanna openings near near	0.5	nanna openings near me	0.75

Table 3: Test results of speech to text conversion based on similarity

Average similarity of each class is also found and the class with highest average is then predicted as the next occurring word. The second approach was to find similarity between the input chunk and among all the recordings of next possible words. Highest occurring class among the top 20 most similar recordings is then predicted as the next occurring word. The accuracy for both the methods is as shown in the table where it was calculated by taking the ratio of number of correctly predicted words by total number of words in the sentence.

The average accuracy of 0.59 was achieved when prediction was done using average similarity of each class and 0.64 was achieved when using the highest occurring class among the top 20 most similar recordings.