**Chapter 6 : Conclusion and Future Works**

Conclusion

Accuracy of the classification process by the deep neural network architecture suggests that the designed architecture is sufficient and powerful enough to be able to identify various languages. After trying various implementation of our project, we conclude that our two stage classification model is definitely an improvement over single stage model for language identification. Our main inspiration for adopting such a model comes from our early observations that languages are better resolved when considered pairwise. That is we noticed that a feature which is useful in distinguishing some languages was not irrelevant for some pair of languages. Our observations were finally confirmed when we got significant improvement in accuracy of our model when we added a second binary classifier stage.

Future Works

The most noticeable scope of improvement is having an effective noise filtering system to provide clean human voice to our processing model. Our current real time analysis suffers from this problem which is highly noisy as opposed to clean audio samples on which our network was trained.

Also accuracy can be further improved by using Shifted Delta Cepstral(SDC) features[cite]. The use of the Shifted Delta Cepstral Feature Vectors allows for a pseudo-prosodic feature vector to be computed without having to explicitly find or model the prosodic structure of the speech signal. A shifting delta operation is applied to frame based acoustic feature vectors in order to create the new combined feature vectors for each frame.

Moreover we can improve our implementation of model by providing incremental training facility. That is whenever new language is needed to be added, the model need not to be trained again, instead can only be trained on new language and merging it with existing trained model.

Cite : H. Wang, C.-C. Leung, T. Lee, B. Ma, H. Li, "Shifted-delta MLP features for spoken language recognition", IEEE Signal Process. Lett., vol. 20, no. 1, pp. 15-18, 2013.