

Chapter 5: Conclusions and Future Works

5.1 Conclusions

Malay children vowel recognition using FFBP and Elman NNs was investigated. Various experiments were conducted to find out the optimal performance of the networks in terms of hidden neurons number and signal length. This procedure was time consuming since 1260 models were trained and tested.

FFBP and Elman networks achieved a recognition rate of 83.98 and 82.55%, respectively. Using FFBP network, single-frame 55ms and multi-frame 40ms got the highest performances. Moreover, single-frame 35ms and multi-frame 100ms scored the best recognition rates among other frames trained using Elman network. On the other hand, single-frame 10ms got the lowest performances using both network architectures.

The greatest recognition rates were attained when using number of hidden neurons less than 120. However, the performance drops when using more hidden neurons because of the overfitting. In Elman network, excellent results were obtained for single-frame and multi-frame data when using number of hidden neurons of 20 and 80, respectively. However, optimum results were found for single-frame and multi-frame data utilizing FFBP network when using number of hidden neurons of 120 and 60, respectively.

The best vowel to be classified using both FFBP and Elman networks was /i/. However, the vowel /o/ was confused with /u/ and got the worst recognition rates. Many implemented NN models were wrongly recognized /o/ as /u/.

In FFBP network, single-frame data performed better than multi-frame data; because LM algorithm, used in training the single-frame data, is more efficient than resilient back propagation training algorithm used in training the multi-frame data.

5.2 Future Works

For future work, it is suggested to train multi-frame signals using LM algorithm to get more accurate results. This will demand computer with high memory capacity since LM algorithm requires high memory system.

Furthermore, it is recommended to implement other NN architectures (i.e. probabilistic NN) to train Malay children vowel signals. Then, compare the recognition rates' results with achieved ones in the current study.