CHAPTER 5

CONCLUSION AND FUTURE WORK

5.1 Introduction

The main objective of this thesis is to extend automatic emotion recognition system to recognize the ASD children emotional state from speech. The main intend of this research work is to develop Tamil emotional speech database for ASD children but till date no such speech database is available. The efforts carried out for the Tamil language are very less mobile phones to collect the emotional speech data. After summarizing the literature review we found that the language technologies can play a vital role in the development of HCI system. The above chapters have reviewed at the different aspects of the problem and exposed our approach in detail. This chapter concludes the results of the proposed emotion recognition system and outlines the various significant directions to extend the work further by future scholars.

5.2 Conclusion

In this study, an efficient approach for building a HCI system emotion classification from human speech is presented and discussed. The initial goal of this research work is extract the features efficiently using emotional databases. MFCC is investigated and analyzed for feature extraction. Before extracting the features, the given speech emotion database is preprocessed to remove the unwanted information and it is processed based on standard database. Each feature extraction has different abilities for differentiating among the various subsets of the emotions.

Feature extraction alone cannot judge new features which are not measured in the training data. So along with MFCC feature extraction some of the energy related to features like pitch frequency, standard deviation, minimum value, maximum value and fusion of all the values are also be used. The classifier used in this study is ensemble multiclass SVM classifier. The proposed system is capable of classifying the emotion from the speech into one of the five emotions such as Anger, Fear, Happiness, Neutral and Sadness. The evaluation of the system is carried out on EMODB, TamilDB, TeluguDB and ASDDB.

Using this research, emotional state of children with ASD can be extracted with Mel Frequency Cepstral Coefficient and training and classification is done by Multiclass
Support Vector Machine Techniques. This can be used to understand the primary emotion of ASD children through speech signal and it can be used to measure and classify emotion in Human Computer Interaction. This can be applied for psychiatric diagnosis.

5.3 Summary of Findings

Comparison is made for Telugu emotional database with Tamil emotional database, Autism Spectrum Disorder children, and Berlin database. It contains emotion dialogues which are recorded from Special school for ASD database and Telugu database is taken from movies to make comparison. Files are recorded in the form of .mp3, .ogg format and then the files are converted into .wav file format. Standard Berlin emotion database of German language is used for comparison. MFCC feature is extracted from a speech files in .wav format.

The proposed features and methods are evaluated using Tamil ASD children database, Tamil database, Telugu database and obtained results are verified by known standard Berlin emotional speech database. From experimentation, the result is shown in confused matrix for speaker dependent (ASD-DB) and speaker independent (EMO-DB, Telugu DB, Tamil DB) with various parameters. Using this research, the emotions of ASD children can be recognized with the help of MFCC feature extraction and training with classification is done by multiclass SVM.

5.4 Contributions of the Present Work

- Design and development of natural emotional speech database in Tamil language for ASD children
- Different feature extraction methods like MFCC and global parameters are implemented for speech emotion recognition system.
- Compare ASD database with Tamil, Telugu and standard Berlin database and analyzed.

5.5 Highlights of Research Considerations

- A widespread analysis of the literature of ASD on speech emotion recognition.
- Complete study of different speech databases used for speech emotion recognition system.
• Recognizing speech emotion from natural speech corpus for ASD children is implemented.

5.6 Future Direction

As the field of interest and the results of this study turned out to be rich and broad, there are several ways to extend it. Some of the possible ways to investigate this by future scholars are discussed below.

• Embodied robots interacting with ASD affected children.

• In real life finding emotion in continuous speech throughout the day

• ASD affected children recognize their own emotions from others speakers.

• It can be extended to find secondary emotion

• Combination of different feature extraction techniques and different classifiers can be tried to improve accuracy of the speech signals on different database.

• Hybrid classification models can be explored for improving the recognition performance.

• Gender classification of ASD children can be extended.

• It may helpful to group the different Indian languages of ASD children to improve the performance of language identification system based on their emotions characteristics.

• Multimodal emotion may extend to develop emotion recognition system.

• Emotion verification framework can be explored in emergency services based on genuine request.