

## 8. CONCLUSIONS

Speaker recognition and speech verification systems are currently used in many commercial, industrial, and security applications. In a speaker recognition system, the aim is to identify a speaker among a number of speakers. The features of all the speakers are extracted and are stored in a database. Then, a feature matching algorithm is employed to recognize the unknown speaker. In a speaker verification system, the aim is to verify that a given speaker is actually the one that is claimed. Speaker verification systems find applications in security systems, such as in remote speech based password entry and so on.

In this thesis, a MATLAB based system has been developed for speaker recognition. The system is Graphical User Interface (MENU type) and in addition to speaker recognition, it and enables the user to perform various other tasks such as displaying or playing a speech waveform, displaying the power spectrum, creating a database of speech signals and so on.

The developed speaker recognition system has been tested by creating a database and storing up to 10 speech signals in the database. The system has recognized successfully all the unknown speakers in a matter of a few seconds.

The speaker recognition process has also been tested by modifying the size of the codebook used in the design. It was found that a higher identification rate was obtained when the number of centroids were increased.

Finally, the effect of noise on speaker identification has been investigated. Gaussian noise with different levels of variance was added to the noise signals and the identification rate was investigated as the codebook size was changed. It was found that high identification rate was possible when the noise level was small. With high levels of noise the speakers could only be identified successfully if large codebook size was used.

The speaker identification system developed by the author can be developed further by considering the following points:

- The speaker identification process can be investigated in the presence of natural ambient noise and its performance can be optimized for operation in such environments.
- A larger speech database can be created and the performance of the system can be investigated in more detail.
- The system can be modified by adding a recording option so that speech signals can be recorded and stored directly in the database.
- The developed system can be optimized and implemented to run in real-time on a microcontroller based environment. Such a development will enable the system to be used in real-time embedded security applications.