Overview

Acoustic sound source localization has been a complex and important issue among audio engineers and telepresence technology developers. These days, people have become more concerned with the quality of sound perception in many situations, such as films watching in cinemas, virtual conferencing, etc. In this project, our focus is on finding the location of an acoustic source and to apply this capability in telepresence.

We use 2 condenser microphones and a MATLAB based software called SIMULINK to locate the sound source and find the angle of signal arrival with respect to the microphones.

Aims and Objectives

• develop a stereo audio output from the speakers
• improve users’ audio experience by increasing the quality of the output sound signal
• solve problems that cannot be corrected by simple room equalization

Methodology

A model is developed to estimate the direction of arrival of acoustic sound source in real-time basis by means of time delay estimation algorithm using SIMULINK. In our design, we assume there are a total of five people in the room. Whenever there is a source (that is the voice of different speakers), the model will select the most likely position as an estimate of the source location in a real time basis.

The position of the sound source is determined by calculating the angle of arrival ($\theta$), which is the angle of the microphones with respect to the sound source.

\[
\text{The estimated position} = \begin{cases} 
\text{Position A} & 30^\circ < \theta \leq 90^\circ \\
\text{Position B} & 10^\circ < \theta \leq 30^\circ \\
\text{Position C} & -10^\circ < \theta \leq 10^\circ \\
\text{Position D} & -30^\circ < \theta \leq -10^\circ \\
\text{Position E} & -90^\circ < \theta \leq -30^\circ 
\end{cases}
\]

Results

In the overall performance, the percentage of correct estimation of each position is consistently above 70%. From the graph, out of 150 trials, the model can correctly estimate the position for 134 times which corresponds to 89.3%. Out of the 16 errors, the location of the source is recognized as a neighboring position 14 times while recognized as a non-neighboring position only 2 times.