Final Project

Introduction
Sound localization is used in applications such as speech recognition, teleconferencing, and other military and scientific applications. Real-time processing of multiple acoustic signals is prohibitively expensive because it requires multiple signal processors. Even a dedicated DSP system requires a large real-time computing power. An alternative is to use FPGAs which can be used to implement concurrent signal processors that are capable to keep up with high data rates.

Project Objectives
The objective of the project is to use an FPGA development platform to implement a proof-of-concept of a portable real-time sound localization system. The system should consist of an array of four microphones to compute the times-of-arrival (TOA) of an acoustic source to the array, and be able to located it in 3D space.
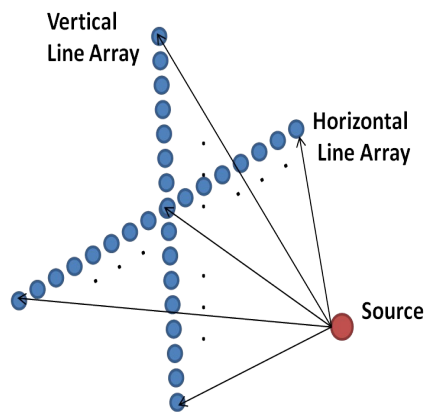

Fig 1. 3D sound localization (Source: Wikipedia).

Project Requirements
The system should have the following components: a) four microphones, b) a GPS system, and b) a SD card. When the system is turned on, it should save all the signals to an SD card, i.e. the four corresponding signals from the microphones . The computation may be done off-line using MATLAB via the standard cross-correlation method.

Deliverables
Each team should implement and demonstrate an acoustic source localization system on the DE-0 FPGA. The team should deliver a written and the electronic version of a formal report that includes the names of the team members, introduction, and description of the procedure and materials, and a summary of the results. Source code in Verilog, C, and MATLAB, as well as detailed diagrams and any other pertinent information, should be attached as an appendix.