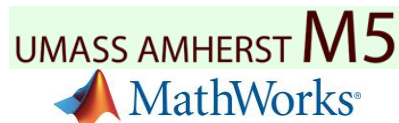


PROJECT SAURON

CUMULATIVE DESIGN REVIEW

Senior Design Project
Spring 2016

Sponsors:



The Team



Advisor:
Tilman Wolf



Zach Goodman
EE



Walter Brown
CSE & CS



Omid Meh
CSE & EE



Jose LaSalle
EE

Overview

- Project Sauron
 1. Problem
 2. Scope
 3. Specs
 4. Deliverables
 5. Work Breakdown Structure
 - a) Block Diagram
 - b) Mic Modules
 - c) New Array
 - d) Real-Time System
 - e) Beamforming
 - f) User Interface
 - g) Integration
- Responsibilities
- Demo
- Outlook

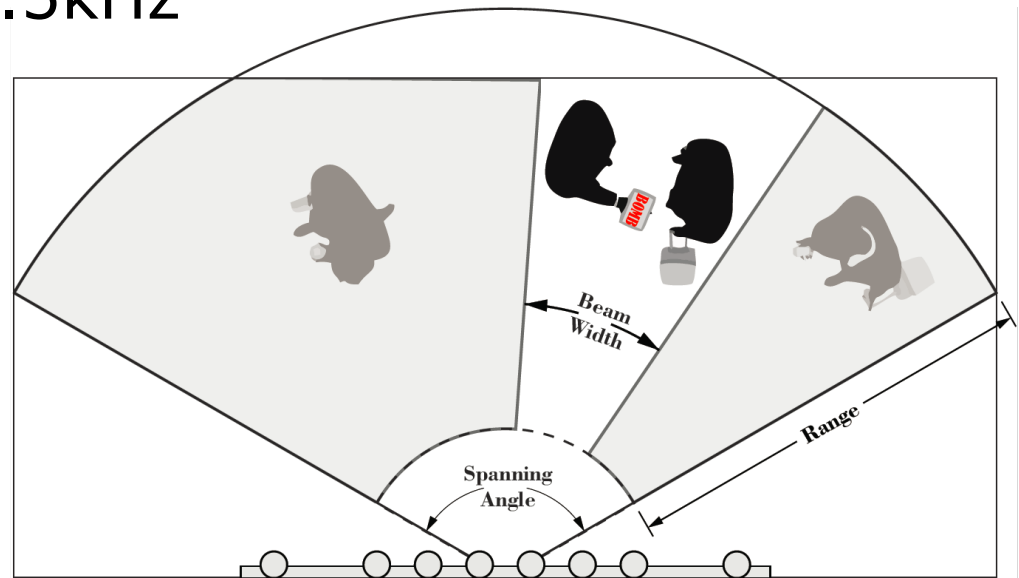
Project Sauron – Refresher

A surveillance system in which a user selects an individual in the camera's field of vision, directs our microphone array to focus on the selected individual and isolate their audio.



Project Sauron – Specs

- Range: 1 to 3 meters
- Spanning Angle: 130°
(-65° to 65° from center)
- Frequency: 500Hz-3.5kHz
- Beam Width: 40°

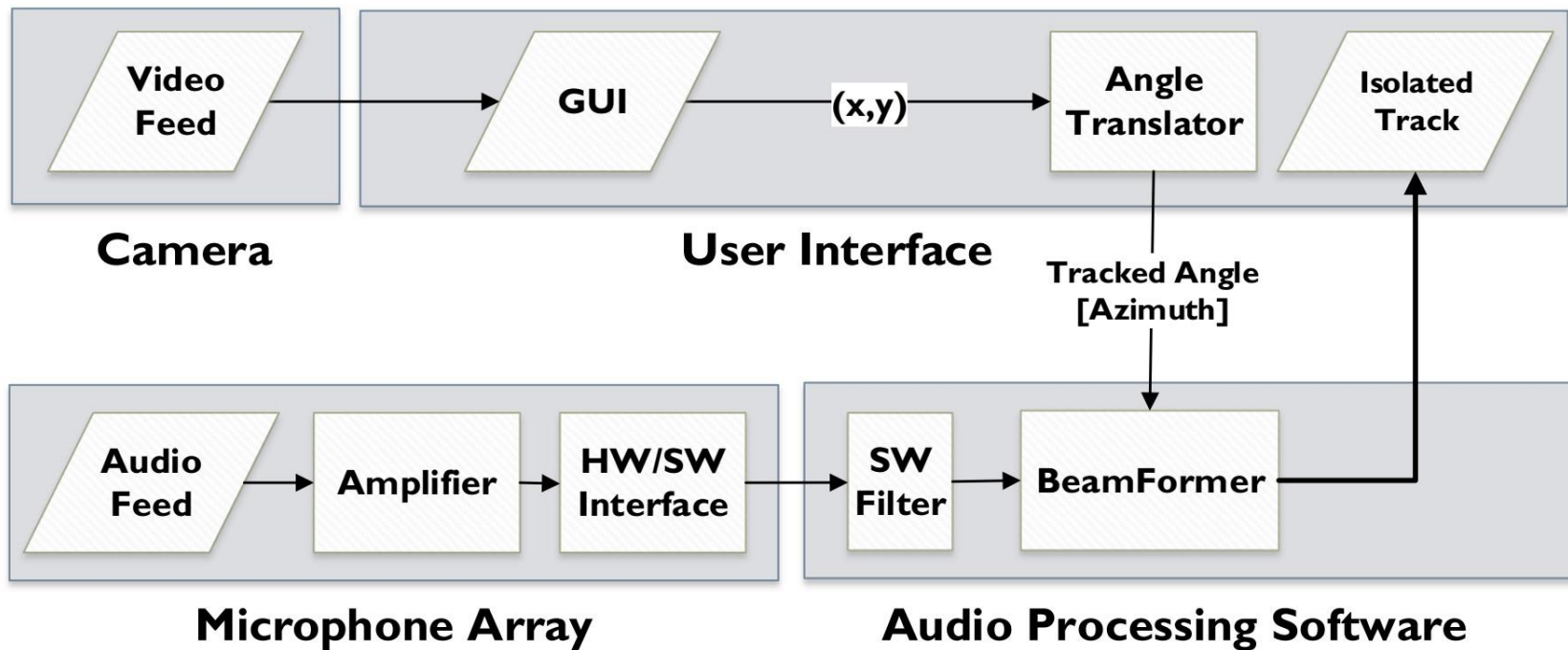


Project Sauron – CDR Deliverables

- Promised Deliverables (Achieved)
 - Mic Modules Designed
 - Prototype of the New Array
 - Working draft of UI
 - Integration (HW, SW, UI)
- Additional Accomplishments
 - Real-time Code
 - Working Compound Array
 - Speech Isolation on the Compound Array

Work Breakdown Structure

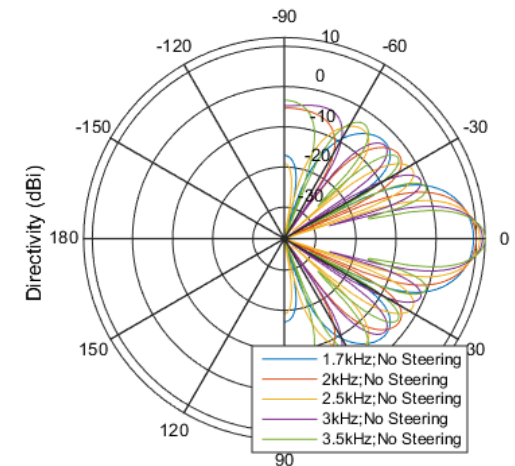
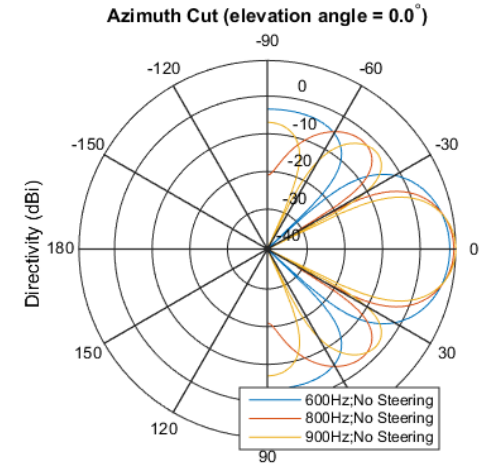
Block Diagram



Work Breakdown Structure

New Array Design

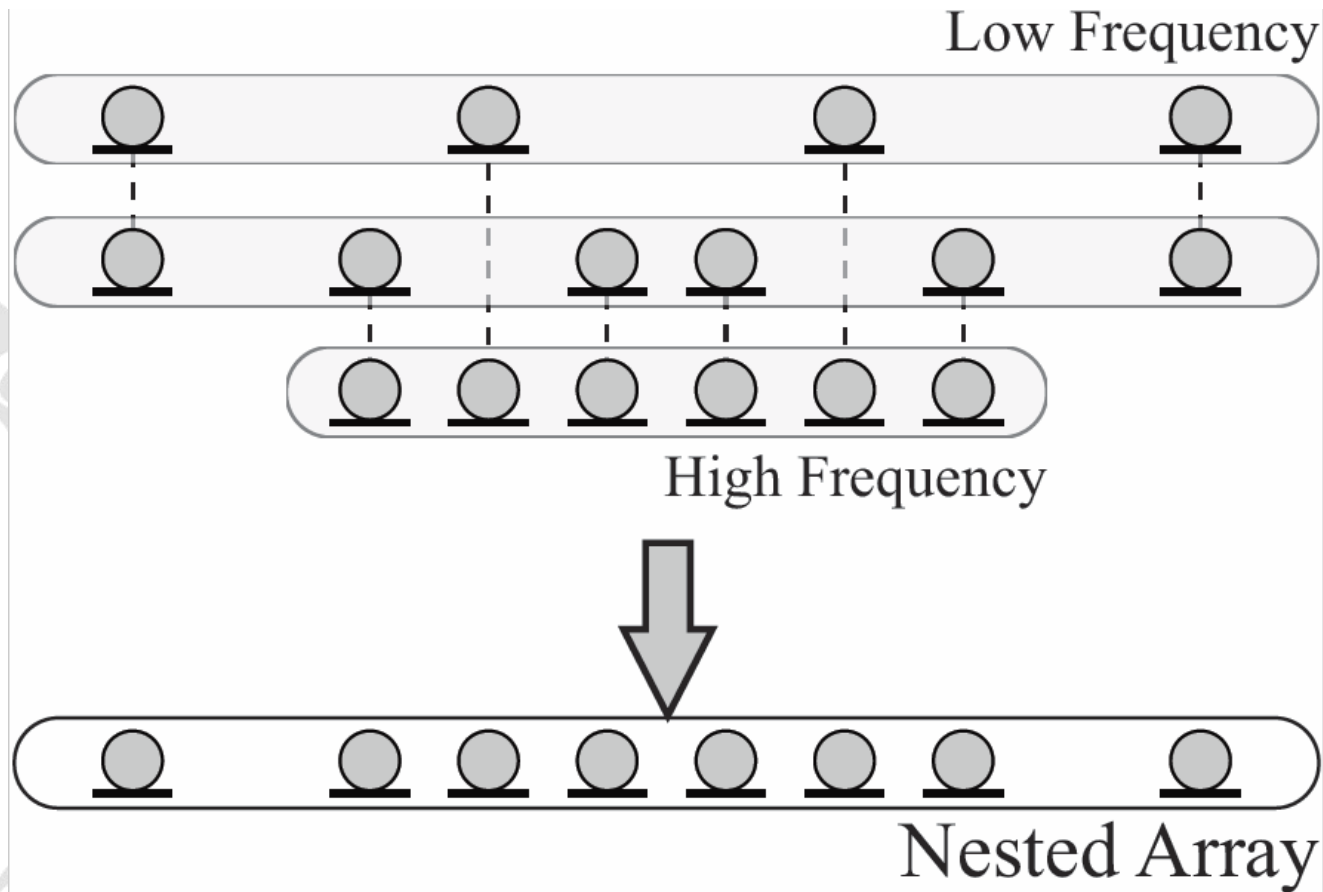
- Engineered for Human Voice
- Compound Array
- Ground Shielded Alpha Wires
- Chassis/Mic Acoustic Separation
- Vantage Point Placement
- Low-Noise Voltage Source



Directivity (dBi), Broadside at 0.00 degrees

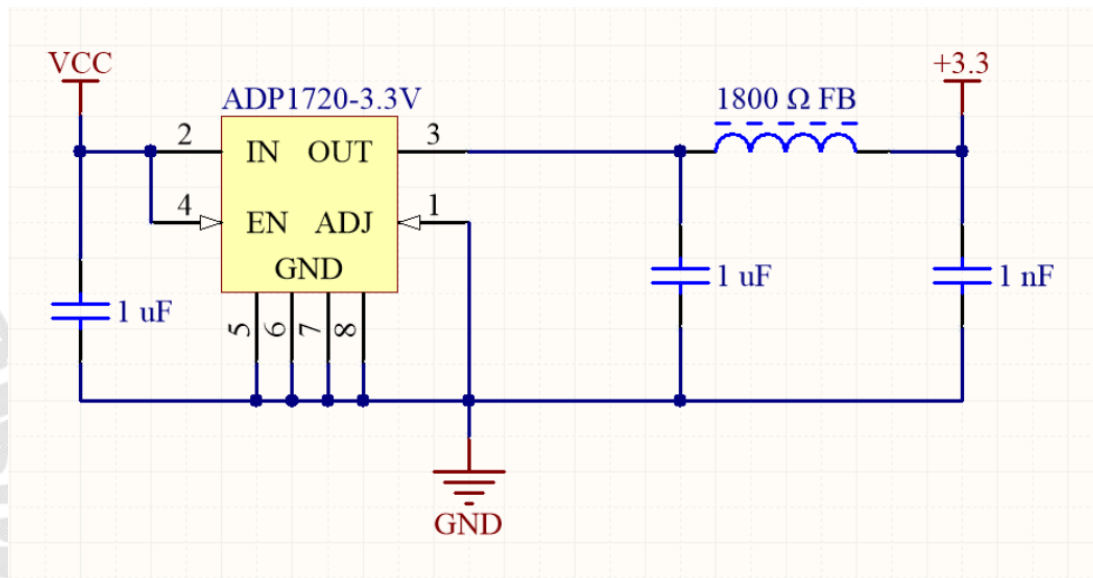
Work Breakdown Structure

New Array Design



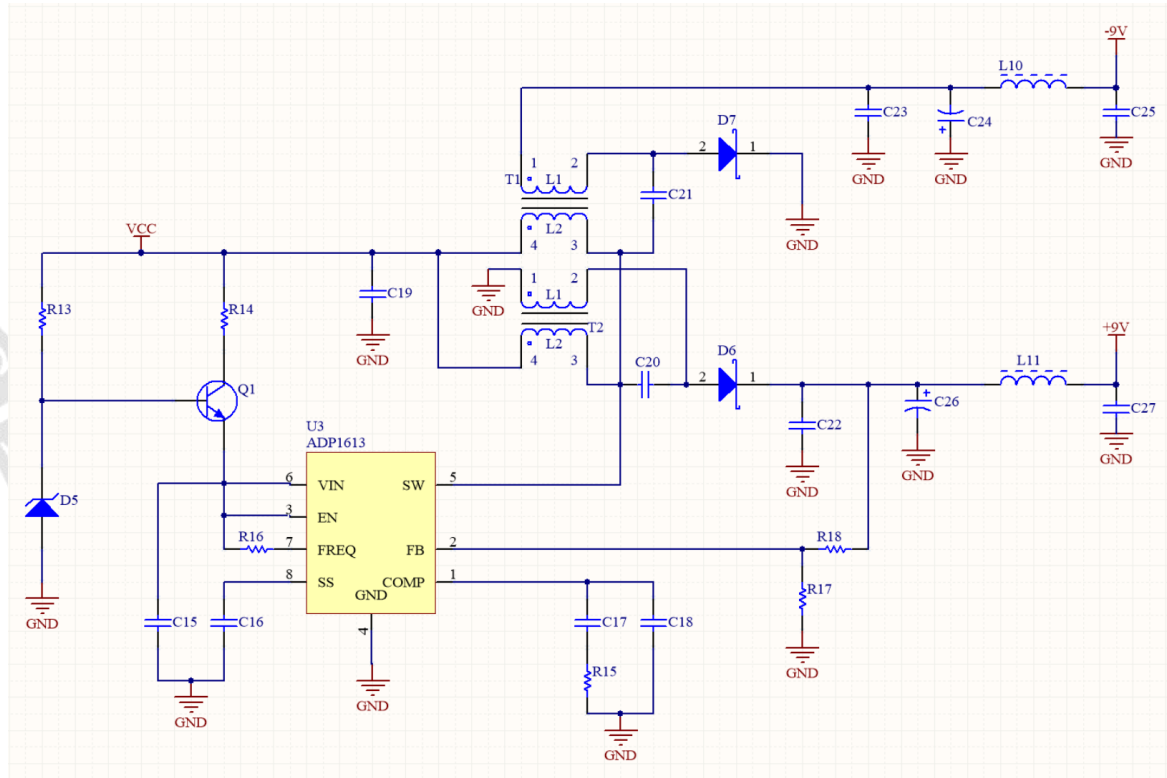
Work Breakdown Structure

3.3V Power Supply



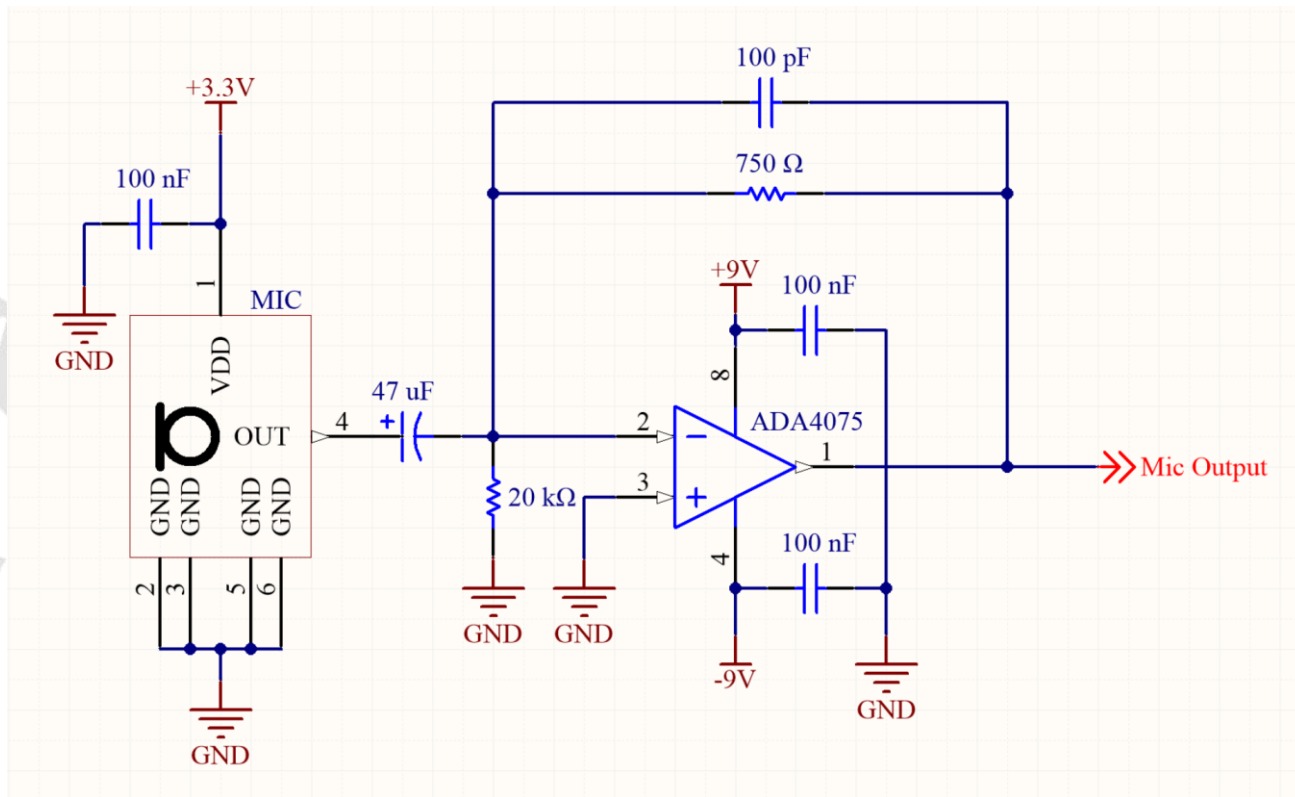
Work Breakdown Structure

$\pm 9V$ Power Supply



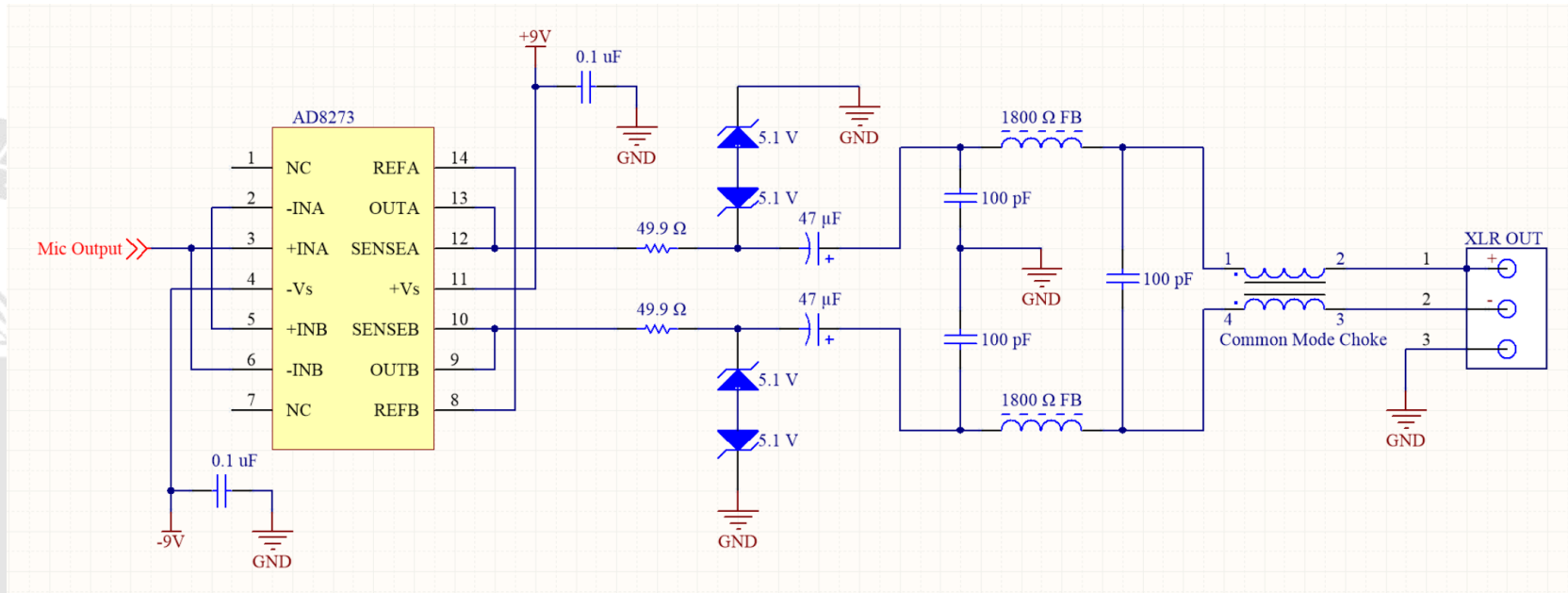
Work Breakdown Structure

Mic Modules



Work Breakdown Structure

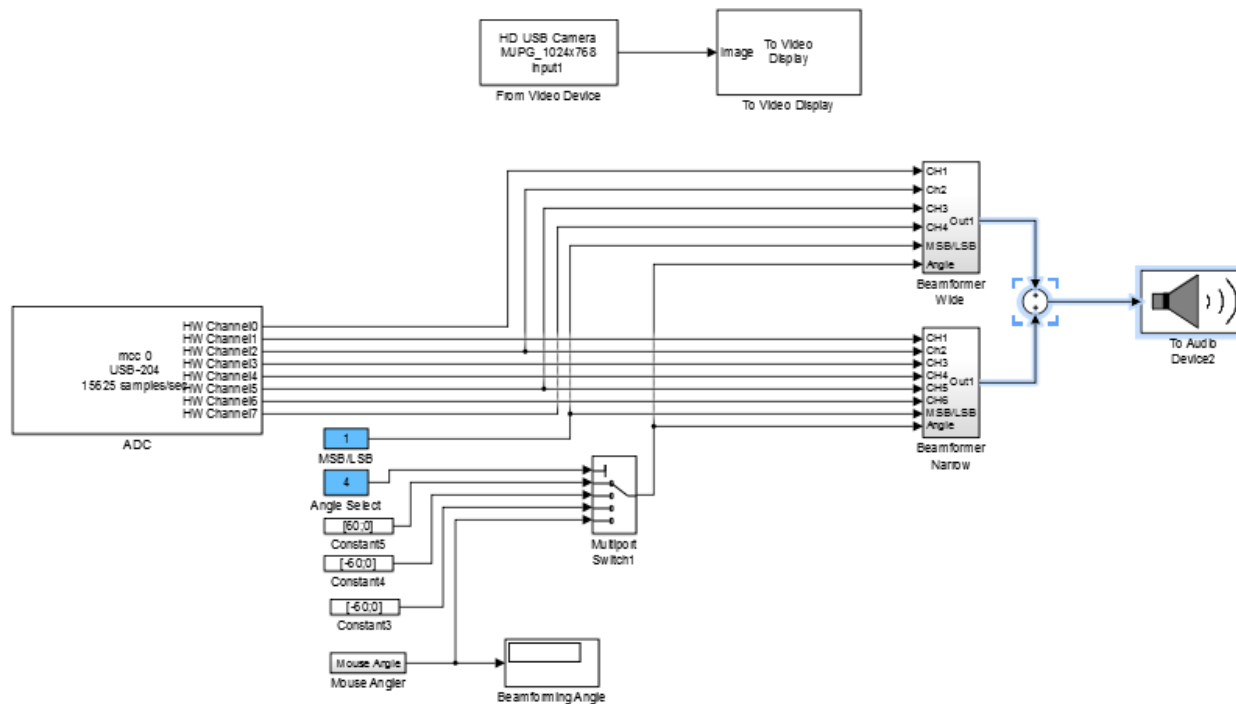
Differential Pair



Work Breakdown Structure

Real-time system design

- Moved from Matlab to Simulink



Work Breakdown Structure

Beamforming

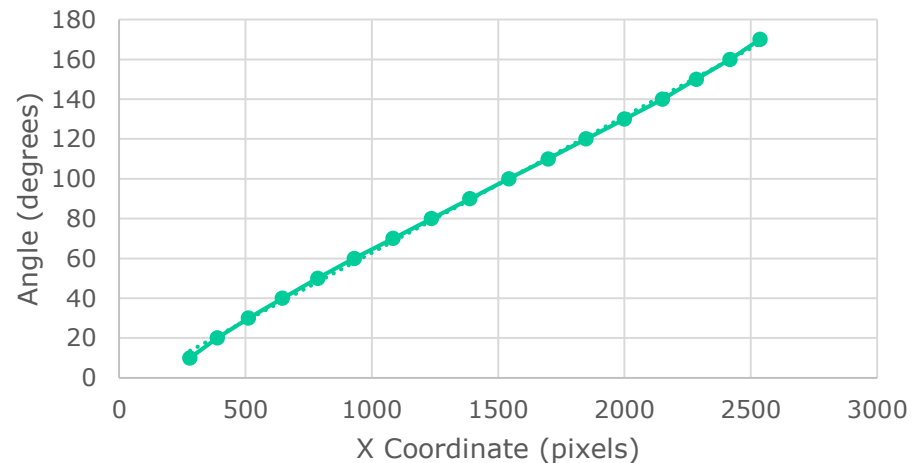
- Compound Array Interface
 - SW DC block
 - Optimal Sampling rate
 - Modular Design
- Parallel Sub-band Processing
- Time-delay Beamforming
- Beam Pattern Analysis

Work Breakdown Structure

User Interface

- Camera Interface
 - USB
- Mouse Location
 - S2 Block
- Deriving Expression
 - Assume centered horizontal
 - Expression Almost Linear

Angle VS X Coordinate on Picture



Work Breakdown Structure

User Interface



Fisheye Picture of Protractor

Work Breakdown Structure

Integration

- UI Gives Beamformer Direction
- Buffering Frame Size



Team Responsibilities

- New Array (Jose/Zach)
- Microphone Module Design (Zach)
- Real-Time (Omid/Walter)
- Beamforming with New Array (Omid)
- User Interface (Walter)
- Hardware Debugging (Jose)
- Software Debugging (All)

Project Sauron – Outlook

- Enclosure
- Power Source
- Use both mouse coordinates to find azimuth
- Mark spanning angle in UI
- Mark beamforming area in UI
- Reduce Noise with new modules

Project Sauron – Demo

Prototype Demo



Project Sauron – Questions

Any Questions?

