

Localized Occupant Observing Camera

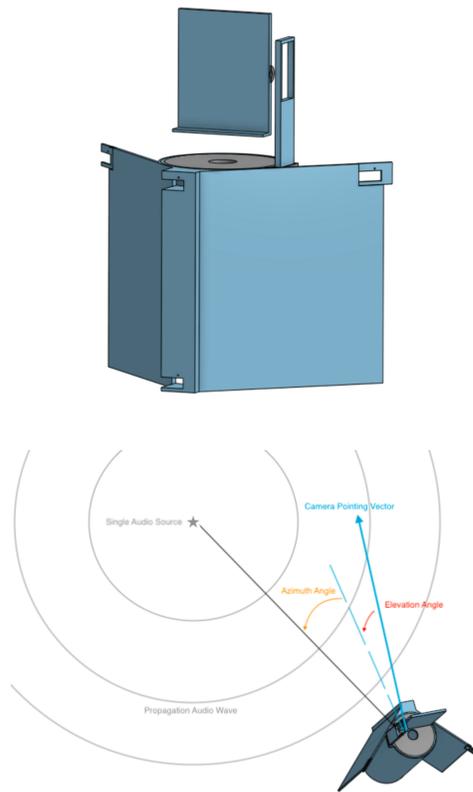
Project

Meetings and classes are commonly performed virtually.

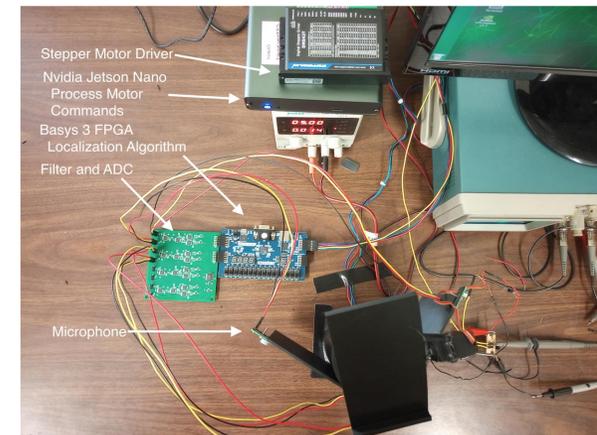
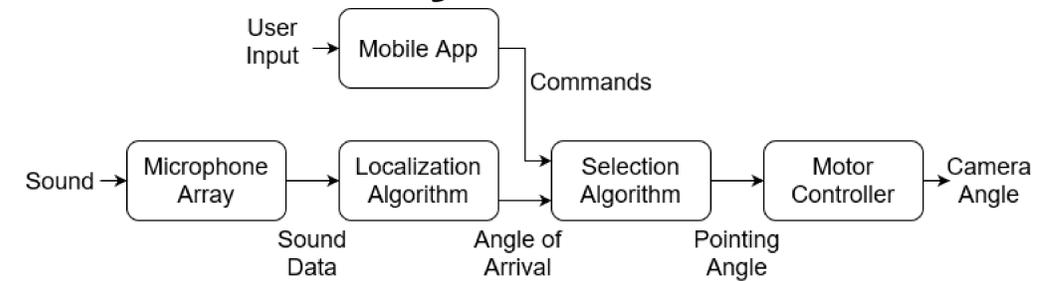
- Cameras don't dynamically follow the speaker.
- Microphone array and beamforming algorithms can be used to perform angle estimation.

The LOOC device follows the speaker.

- The device finds the direction of the speaker.
- The device moves the camera to point at the speaker.

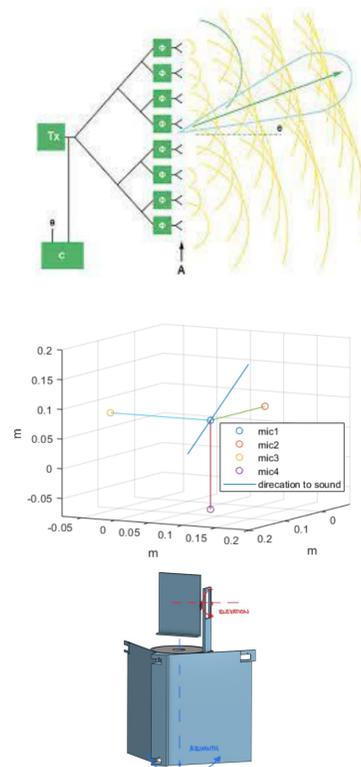


System



Methods

- The Localization algorithm uses beamforming algorithms to estimate the angle of arrival of the sound.
- We take the angle of arrival from multiple pairs of microphones to find the azimuth and elevation of the angle of arrival.
- Given the estimated source, the motor controller then rotates the microphones toward the audio source (azimuth) and it rotates the mount up toward the audio source (elevation).
- At any point during operation the mode of operation can be adjusted to manual control, ignoring audio sources, the motors will turn as commanded from user entries.



Conclusion

- In simulation, the Localization algorithm tracks incoming single source signal with an accuracy of +/- 3 degrees.
- Hardware implementation in simple listening environments with a single source and a single path proved to be accurate.
- Topics Covered
 - Synthesize Complex Numbers in FPGA, Implementing Advanced Signal Processing in Hardware
 - Stepper and Servo Motor Control, Bluetooth Communication, Mobile App Development, 3D Modeling
- Future Work
 - Source separation for complex tracking environment
 - Dead zones for user customization
 - Echo cancelation for multipath