Intro

Hi everybody, my name is Bill, I’m the microphone guy.

Mic’s role

The microphone plays an important role of detecting sound generated from the speaker to measure distance.

Our Mic

The mic we are using is a Memes Microphone. Mems microphones are very popular for their good Signal to noise ratio and their small size.

Why this mic?

Our sponsor has chosen a Mems PDM microphone. But when we were ordering breakout board, we accidently ordered a different kind of microphone, the I2S microphone break out board. After comparing the two breakout circuit diagrams, and the layout, it seems possible to replace the I2S microphone with the PDM one on the breakout board. But it didn’t work. After comparing the datasheet of the two microphones, the only difference I found was that the sensitivity. Which the I2S microphone is better than the PDM microphone for distance pick up. I assembled the I2S microphone breakout board, some hard. Therefore, I decide to use the I2S microphone instead of troubleshooting.

Firstly, I used the rms function to print out what has the microphone been outputting between 0 and 1 to see if the microphone is working, but the problem I’m getting with it is that it was not very sensitive, and not picking up the 10000hz sound the speaker was generating. I tried the FFT function to analysis the signal input. The problem was that the microphone was only pick up at very close range within 8 cm. this behavior does not follow the datasheet. When having a close look at the FFT, I realize there has been a DC value at 0Hz. After setting a high pass filter to filter out frequency 0-30hz, the sensitivity of the mic becomes a little bit better. To further improve the sensitivity of the microphone, an amplifier has been put in with a gain between 1-500. For a good gain, the microphone can successfully pick up sound from at least 8 – 10 meters in a quiet environment. In a noisy environment, the gain will need to be reduced to ensure the accuracy of the measurement.

Conclusion

With hardware testing, and software coding of applying digital filter and amplifier.

Identify maximum distances that the microphone can reliable measurement and Robustness to ambient noise can be achieve with more testing to set up appropriate gain and filter. A model can be built to measure distance and determine the accuracy of the system.