20/04/2021 Meeting

**Meeting Room:** E301

**Meeting Date:** 20/04/2021

**Meeting Time:** 12.11 – 12.29

**Attendees:** Kevin Taylor, Bill Liu, Laurence Prins, Aryan Srivastava, Toby Bourke, Shayne Crimp

**Agenda:** Group reports of what has been completed since last meeting, plans for the next week, questions.

# Sound

* Higher frequencies have more attenuation with distance
* This implies we want a lower frequency
* The issue is that most office noise is low frequency
* If the distance measurements are done at night, then it would be possible to use low frequencies
* The speakers are only optimised for 600Hz – 2kHz, which is still quite a high frequency
* Need to find a balance for frequency
* Various objects and materials have different frequency responses

# PDM

* PDM represent an analogue signal as digital, essentially is a noisy signal
* Therefore can use a low pass filter to pull out the signal from this noisy signal
  + Can be done digitally with a moving average filter
  + This filter however has a cut off frequency dictated by the sampling frequency and the number of bits in the average
  + Increasing the number of bits averaged increases accuracy but also increases response time
  + We want a fast response time therefore we have a design challenge of accuracy vs response time
  + The signal has 2n steps
  + Typically, resolution of over 16 bits

# Speaker Driver

* Need an amplifier as the MCU can not supply a high enough current to the speaker
* Can use a class D amplifier which consists of a full H bridge and 2 low pass filters
  + This gets more power out of the speaker than using a half bridge
  + Can produce square waves

# Syncing

* Short term use is to use a wire
* Long term would be to develop a system that works like sonar.
  + Device a sends out a signal to device b
  + Device b sends that same signal back to device a, device b is effectively a wall
  + Device a will then send a waveform back at b so b will get a measurement
* Does not need to be synced, each device has its own timer.

# Microphone

* Average the data stream in to reduce the number of bits to be processed
* Convert PDM to PCM
  + Buffer
  + Average
  + Low pass filter
* Have example code for this available
* The microphone has a 94dB sensitivity, what needs to be done to get this? What is the minimum sampling frequency necessary.

# Questions

Q) What kind of office space should we be designing for?

A) All offices, complex or simple. Want to get this product so it is applicable to anything thrown at it. Some use case examples are asset tracking in hospitals, desk booking systems for hot desking.

# Other notes

Devices have a compass which means we can use that for orientating the map.

# To work on

Need to look at options when presenting. E.g. look at options for amplifiers, speakers, microphones, filters and compare.

What is the definition of the start of a signal? Look at how ultrasonic does it.

* Start bit – information – stop bit