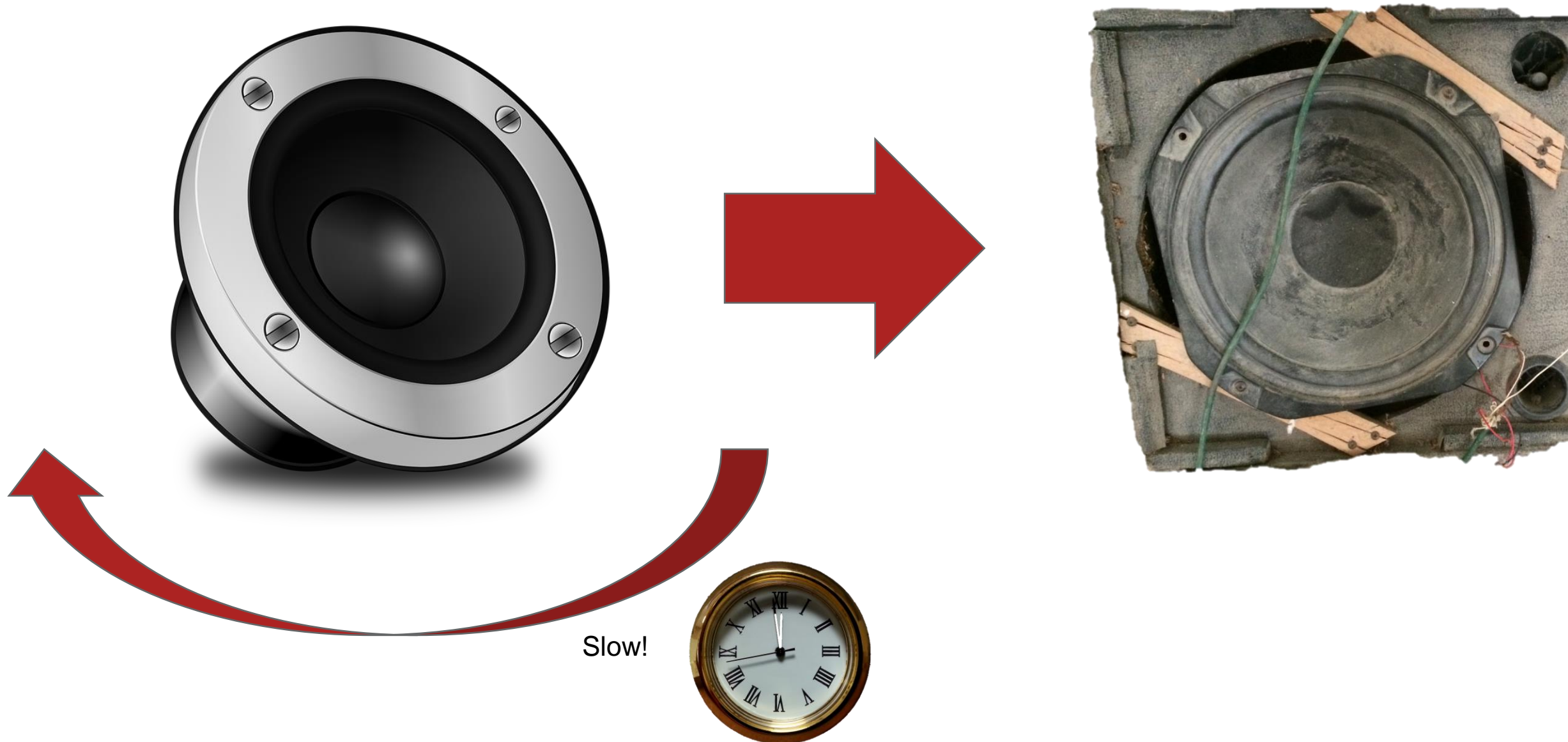


Can We Direct Sound Without Moving Anything?

Christopher Bakhos (cmb524), Advisor: V. Hunter Adams (vha3)

Is it possible?

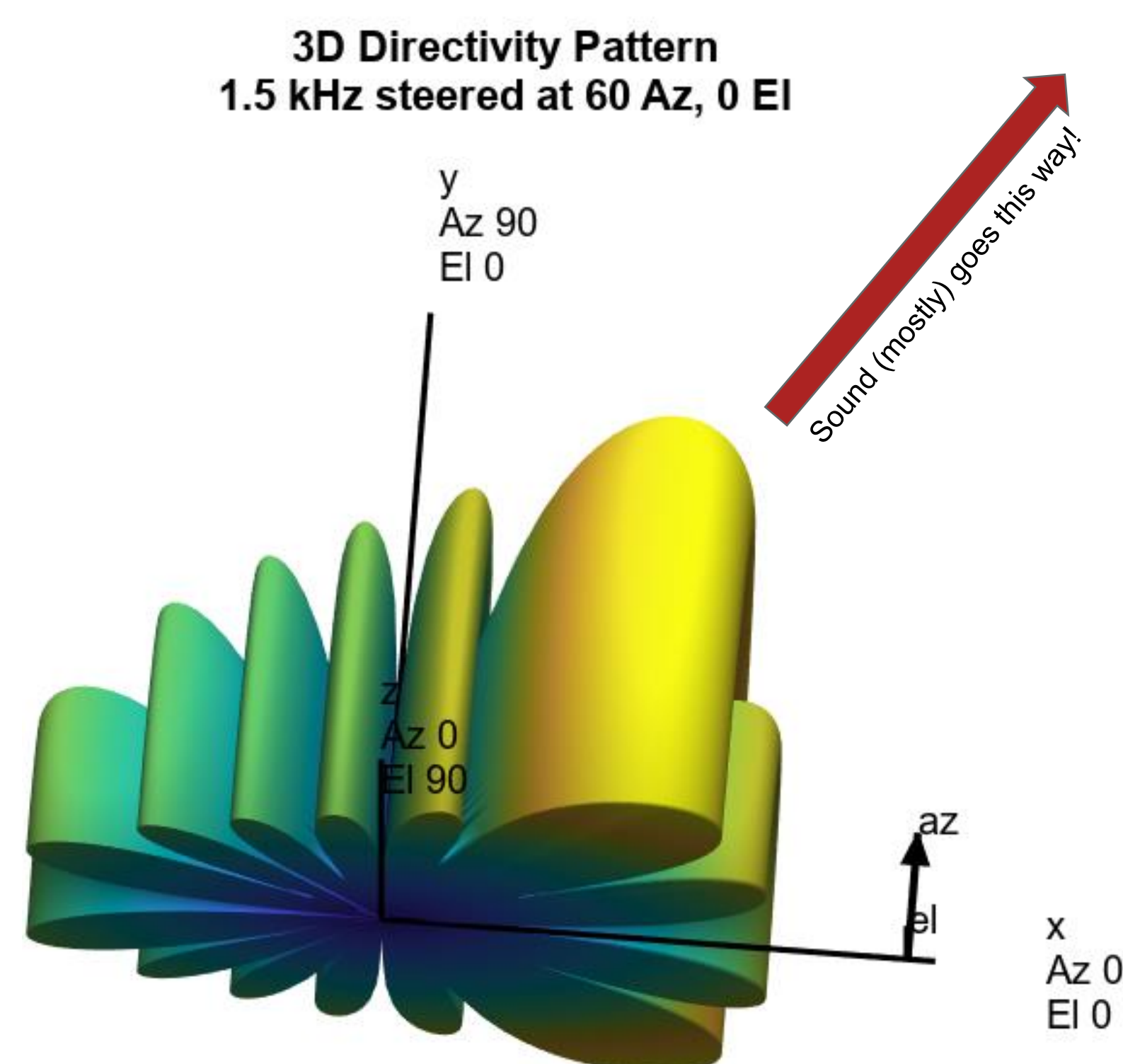
Directing sound by moving speakers can be slow and susceptible to mechanical failure.



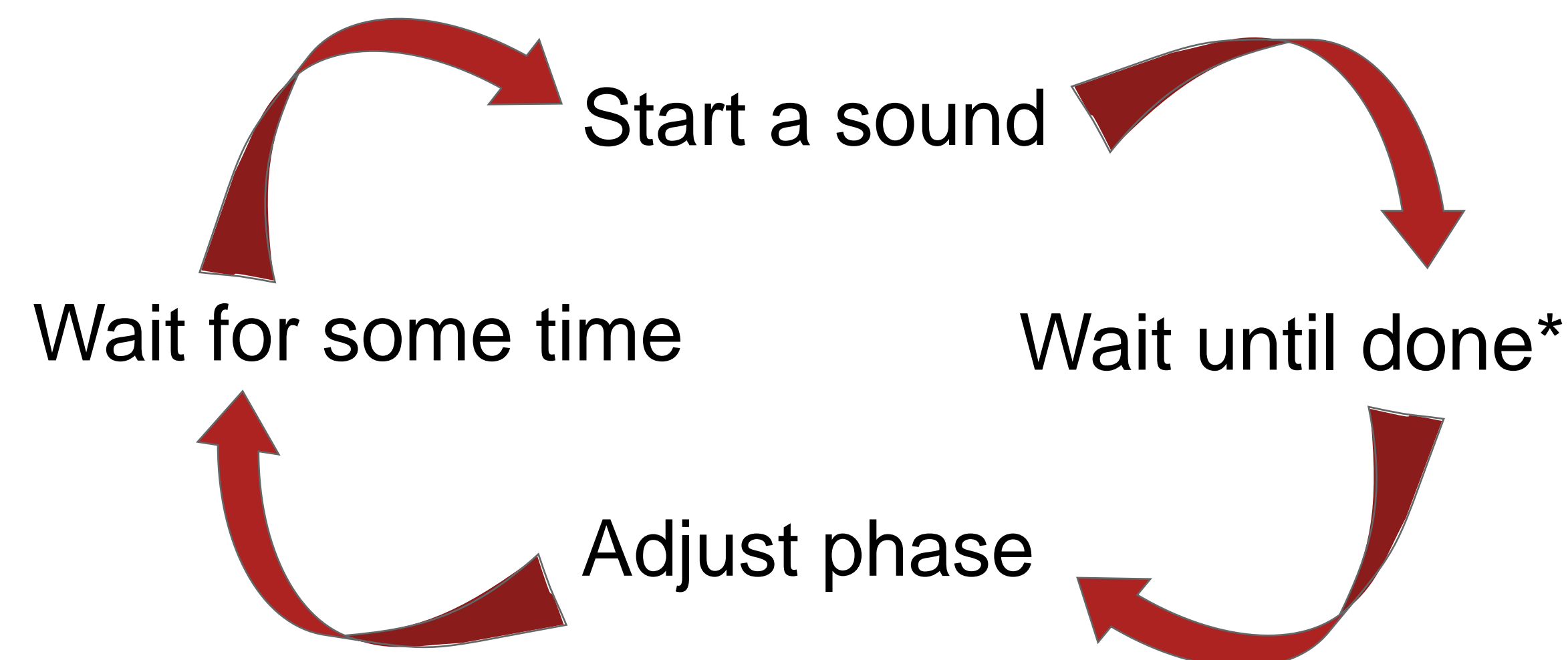
Is there a physical phenomenon that might be able to be used to help?

Steering Sound

Perhaps we can use certain phase offsets to create constructive interference patterns in the direction we want and destructive ones (or even just less constructive) in other directions.



Sound Generation



*Timer interrupt every 25 μ s during this period!

At each timer interrupt, do the following {

For each {

Sample a point on a sine wave

Pull chip select down

Send via SPI to the DAC

Pull chip select up

} Pull the LDAC down to release

Wait a very short time

Pull the LDAC up to start holding

Phased Speaker Array

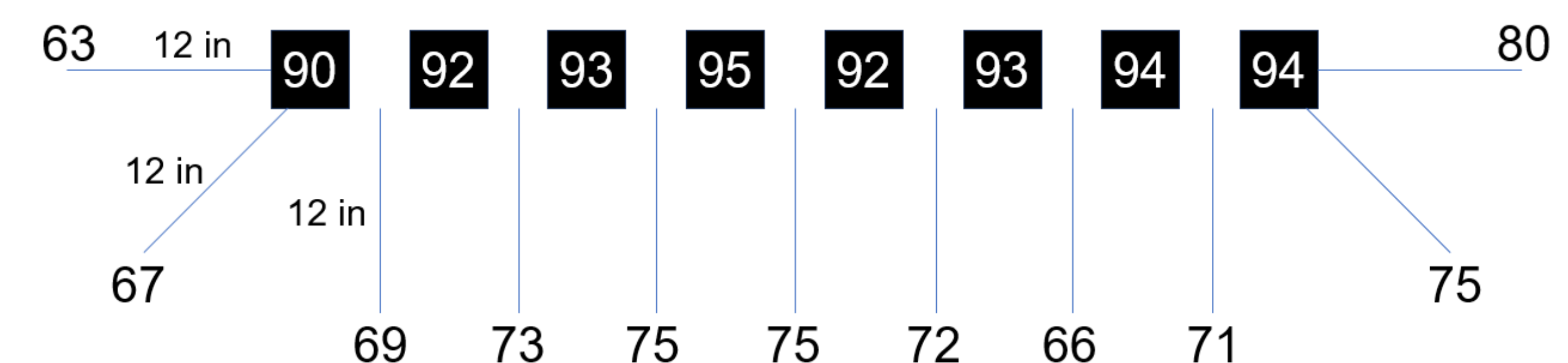


The Setup:

- 1 Raspberry Pi
- 8 speakers (4 DACs, 4 AUX ports)
- ~4.5 inches apart (measured from speaker center to speaker center!)
- Driven at 1500 Hz, steered to the right-middle

You can!

While the sound was audibly louder in the desired direction, it was loudest in the rightmost direction. The measurements below are in dB.



Acknowledgements

A very big thank you to Hunter Adams for his help through this whole project. And thank you to Bruce Land, who would oftentimes help me in the lab.

