

Team Third: Speaker Salt

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12/18/18 - MCEN 5151-001



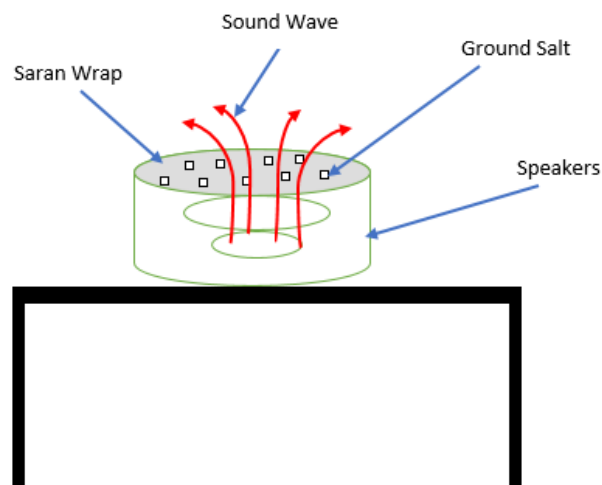
Image 1: Thumbnail from video

Photographic and Scientific Intent

The intent behind the video edit associated with this report is described by teammate Hana Kieger as follows: “This video was taken for a Flow Visualization course at the University of Colorado Boulder. For this project, we attempted to visualize sound wave patterns. We saw a beautiful video (<https://www.youtube.com/watch?v=Q3oltPva9fs>) that inspired us to attempt our own version. Artistically, experimenting with cymatics creates beautiful patterns and allows for scientific exploration.” This was a team collaboration between Ibrahim Alhajji, Chet Roe, Hana Kieger and myself.

Setup

The setup for this experiment was simple and is described by teammate Ibrahim Alhajji as the following: “As you can see in Figure 1 below, a KEF q300 speaker cabinet was used as a sound wave source. The speaker was covered with Saran wrap and a small amount of grounded pink Himalayan rock salt was placed on the middle of the Saran wrap. To start the sound waves and to generate vibration, songs were played together with a sliding tone generator. Desired vibration frequency was achieved by adjusting the volume using the sliding tone generator.”



Physics

The physics behind the effect seen in the video are described by teammate Ibrahim Alhajji as such: "Sound is a mechanical wave generated by the vibration of particles in the medium at which the vibration travels (air is the medium for this experiment). The sound generated by the speaker vibrates surrounding objects carrying the sound along. When the sound waves reach the salt particles, they start to vibrate the particles causing them to move and shake. Changing the volume or the frequency of the sound would change the salt particles movement (1)."

Visualization Technique

As mentioned previously, ground salt was used to visualize the effect of different frequencies on fine particulate. The black face of the speaker playing the frequencies was used as a background which helped contrast against the white salt. An LED light panel was focused directly on the salt, adding clarity to the footage and one or two floor lamps were placed at a distance to create ambient light and eliminate any hard shadows generated by the light panel.

Photographic Technique

The field of view of the video is roughly a foot wide, and the distance from the setup to the lens is roughly a foot. The video was taken on a Nikon d3200 digital camera. The original pixel ratio was 1920×1080 . The edits to the video were done in iMovie and were relatively minimal. The primary edit performed was to make the video completely black and white (it was already very close to being so) and increase the contrast to make the edges of the white salt clumps on the black speaker more defined. The video was also slowed down to better demonstrate the effect of each frequency on the patterns observed. Lastly, reverb was added to the audio, which consisted of the actual frequency being played to generate each shape, this simply made the audio more enjoyable to listen to and gave the video a sort of otherworldly feel.

Reflection

After completing the final edit of the footage gathered, I am quite pleased with the result. I think the video very clearly shows the effect of each frequency, as well as a continuous range of frequencies, has on the patterns displayed in the finely ground salt. I think it is fascinating to see the way different sound waves interact with small particulate and find the final video quite enjoyable to watch. Going forward, the only thing I would want to change is finding a way to increase the resolution and capture speed even further as it was very difficult to properly focus on the extremely fast moving and extremely small particles of salt.

Sources

[1] <https://study.com/academy/lesson/how-does-sound-travel-lesson-for-kids.html>