

PROJECT ABSTRACT

MOTION USING ACOUSTIC LEVITATION

TEAM NAME : MOTION-SQUAD

MEMBERS :

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ABSTRACT DESCRIPTION :

- **Acoustic levitation** is a method for suspending matter in a medium by using acoustic radiation pressure from intense sound waves in the medium.
- The basic principle of acoustic levitation is to create standing waves of high frequency sound waves, and to balance the objects of the size about $\frac{1}{3}$ - $\frac{1}{2}$ the amplitude of the wave, at the node of the standing wave.
- The pressure is minimum at the node, and it increases on the either side of it. So the particle is trapped in the low pressure zone created by the standing wave.
- We can achieve motion of objects by using three levitator setups along the x,y,z-axes.
 1. Suppose the object is kept balanced against gravity by the setup in y-direction, then the x and z setups will displace the object in their respective directions, by changing the positions of the respective nodes.
 2. The node location along the y-axis can also be changed, which would give it motion in vertical direction also.
- Our basic goal would be to make such a system which would move small objects, of the size of about half the wavelength of wave. If completed well before time, we would work on making a system for larger objects.

TIMELINE :

1. WEEK 1 :
 - Gather required informations.
 - Procure required components.
 - Learn generation and manipulation of standing sound waves.

2. WEEK 2 :

- Make the required setup while considering the appropriate geometry needed for standing wave formation in all 3 dimensions. Now we would levitate the object at the node.
- After done with balancing, we will move the object by varying the frequency of the wave, which in turn, will change the position of the nodes.

3. WEEK 3 :

- Final testing, troubleshooting, making minor adjustments and improvements.

COMPONENTS REQUIRED :

- Sine-wave generators (about Rs. 6500) (3 units)
- Speakers (about Rs.1500) (3 units)
- Vernier calliper clamp stands (about Rs. 1000) (3 units needed)
- Metal reflectors (about Rs. 600) (3 units reqd)
- Glass chamber (about Rs. 2000) (5 units)
- Polystyrene balls

TOTAL COST : About Rs. 12000

REFERENCES :

- Acoustic levitation wiki : https://en.wikipedia.org/wiki/Acoustic_levitation
- <http://science.howstuffworks.com/acoustic-levitation.htm>
- <https://www.youtube.com/watch?v=odJxJRAxdFU>