

# IEEE SPS Student Design Challenge

2024 Cycle 2 Member Driven Initiative

Chennai, India

25<sup>th</sup> February 2025



## IEEE SPS Student Design Challenge

### AV Zoom: Audio Visual Zooming Application for Smartphone

This challenge aims to inspire young minds to tackle practical technical problems. Smartphones are now indispensable, offering features that simplify daily tasks—from health tracking to entertainment. One exciting development is audio zooming, which allows smartphones to focus on specific sounds while reducing background noise. This feature is especially useful in noisy environments like public gatherings, railway stations, and stadiums. While this technology has appeared in high-end models, it remains limited or ineffective in many devices.

When capturing images with a smartphone, one typically focuses on the scene and takes a shot. If specific details in the scene need emphasis, optical zooming in the camera provides a solution. Nowadays, optical zooming is also available while shooting videos. However, regardless of where the camera is pointed or how zoomed it is, audio is also captured. This can lead to a mismatch in synchronization between the captured video and audio, resulting in an unnatural experience. While the camera has an optical field of view, it lacks an auditory field of view. Achieving synchronization between what is seen and what is heard is crucial for enhancing user experience. This concept, known as "audio-visual zooming," integrates visual zoom capabilities with enhanced audio capture, enabling synchronized focus on both visual and auditory details. This technology has the potential to revolutionize applications where precise audiovisual alignment is essential, such as photography, cinematography, and more.

*For more clarity: The participants are encouraged to watch the concept video of LG, Xiaomi and Samsung which it made available for public viewing.*

<https://youtu.be/SoX2rw9BbI4?feature=shared>

<https://youtu.be/FXZL5e-4Cdw?feature=shared>

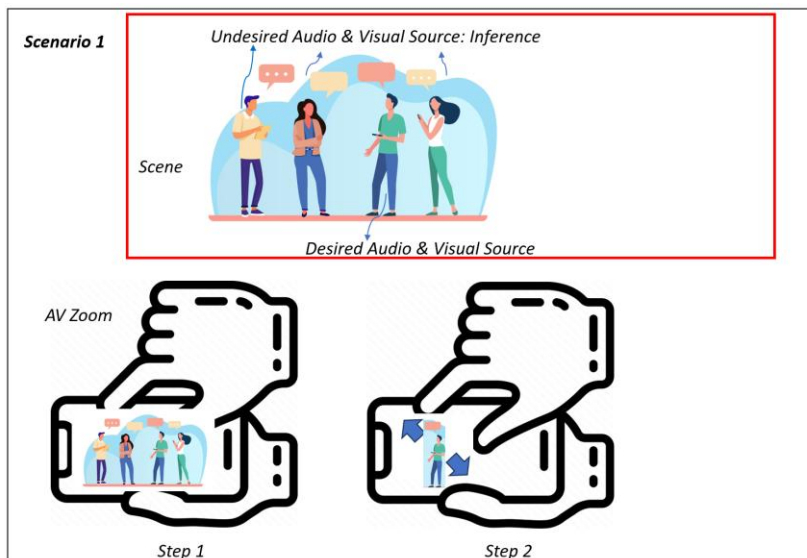
<https://youtu.be/weFBHhuDJUo?feature=shared>

#### ❖ Task Description

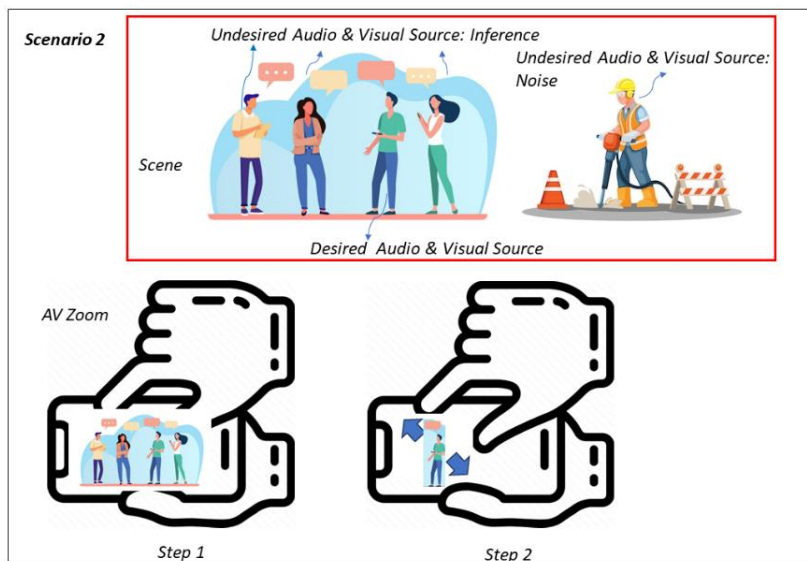
The audio zooming problem can be viewed as 'spatial filtering' in the array signal processing context. There are many contemporary methods available, not many for audio zooming but in different applications. In general, the resolution of the spatial filtering such as beamforming methods is a function of the number of sensors (here microphones). So, for better resolution, the number of microphones should be more; but all smartphones are equipped with at least two or a maximum of three because of space constraints. However, there is no restriction that this problem must be approached solely through beamforming, as both audio and visual zooming are required. Creative ideas and strategies, including classical approaches, artificial intelligence-based methods, or innovative approaches, are encouraged.

The focus of this challenge is to design a robust audio zooming system. This encompasses designing a microphone array configuration, developing algorithms, and creating application for Android or iOS. Additionally, it involves real-time implementation and evaluation of both Scenario 1 and Scenario 2, similar to the one presented. (Note: Sources on the subject can be of choice, and may even be identical to the concept videos listed above.)

*Scenario 1: AV zoom without the presence of "noise"*



*Scenario 2: AV zoom with the presence of "noise"*



❖ **Expected Demonstration**

When a participant performs a pinch gesture on the smartphone screen during video recording to zoom in or out. As the user zooms closer, the audio of the focused subject becomes amplified while zooming out restores the ambient sounds around it in the real-time scenario.

## ❖ Official Rules

### *Team Requirements:*

- Teams should consist of 3 to 5 undergraduate / postgraduate student members.
- Each team must include at least one mentor, who must be a faculty member or industry professional (mentors are not considered team members).

### *Team Ineligibility:*

In addition to the above requirements, teams will be disqualified if they meet any of the following criteria:

- Postdocs and research associates qualify as faculty members.
- Team members participate in more than one team simultaneously.

## ❖ Challenge Phases

The competition consists of three phases:

### **Phase 1: Proof of Concept (PoC) - Remote Mode**

- To register, teams must first submit a registration form that includes the team's name and composition. Then, the PoC report, which contains a brief description (using the provided template), must be submitted separately using the submission links. [[Check the Registration section on the event website \[www.ieeespsavzoom.in\]\(http://www.ieeespsavzoom.in\)](#)]
- A panel of three judges, including two expert faculty members and one industry professional, will evaluate the PoC based on innovation. The judging panel will adhere to conflict-of-interest guidelines.

### **Phase 2: Video Presentation (VP) - Remote Mode**

- Each team must create a video showcasing a detailed demonstration of their project.
- The video should not exceed 10 minutes in length.
- Teams must upload both the video and a report to the IEEE SPS website.
- The video will be evaluated by the same judging panel from Phase 1.

### **Phase 3: Real-Time Demonstration (RTD) - Physical Mode**

*[The venue details will be announced later]*

- Teams must submit a report using the provided template.
- Evaluation will include a live demonstration to the judging panel.
- Winners will be determined based on evaluation metrics and awarded prizes.

## ❖ Important Dates

1 November 2024	Registration for Phase 1 of the challenge
15 December 2024	Deadline for submission of Phase 1 - PoC
25 December 2024	Announcement of the Phase 1 results
1 February 2025	Deadline for submission of Phase 2 - VP
10 February 2025	Announcement of the Phase 2 results (Finalist)
25 February 2025 (FN)	Precursor lectures
25 February 2025 (AN)	Phase 3 – RTD; Prizes will be awarded

## ❖ Award Prizes

- Champion Team – USD 350
- Runner-up – USD 200
- Appreciation Prizes – USD 170 (total)\*

\*Excluding the Champion Team and Runner-up

For more information and updates visit: [www.ieeespsavzoom.in](http://www.ieeespsavzoom.in)

## ❖ Contact Us

For technical and challenge-related inquiries, please reach out to us at:

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