The name of the project is not "ORS"

ORS Literature Review

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Introduction

It is not necessary (and counterproductive in fact) to describe what the lab as a whole does.

Instead, describe the problem that your research is trying to solve.

The MARGA Lab, led by Dr. Karthik Sundaresan, focuses on the various aspects of wireless networking, namely in sensing and communications for 5G/6G systems and in low-power wireless networking [1]. Within the lab, there is a subset of research focusing on communication and sensing via acoustic waves as opposed to the traditional electromagnetic waves used in RF technology. Such technology has significant potential in applications of biosensing and physical sensing [2] as they consume less energy than legacy sonar technology due to its reduced transceiver arrays [3]. Our research aims to manipulate acoustic waves and adapt optimization techniques to increase the accuracy in physical object detection and data transmission applications.

Good, but you also need to connect the discussions on existing applications to potential new applications (what is the project about).

With what exactly? I don't see the keyword even being mentioned. Let alone a description.

Are you sure this is the goal?

What is the target application we went over during meetings?

Also give a justification for given research problem being a problem (on top of actually stating the problem)

You only have one paragraph for the introduction? You can do much better.

Background and Significance

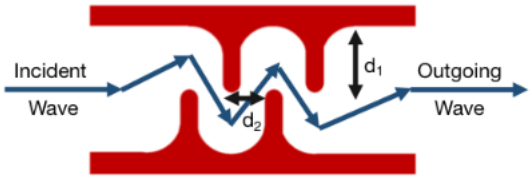
The propagation of acoustic waves can be manipulated to obtain unique properties for individual channels by passing them from the source, such as a speaker, through a metasurface [4]. This is advantageous as we can increase the diversity of such signals, and thereby increase the image quality of the signals being propagated back from the desired object [3] as shown in Figure 2. Figure 1 illustrates the cross-section of one cell in the described metasurface; the acoustic wave incident on the cell is manipulated via height and width parameters of the metasurfaces cell to achieve a specific outgoing signal with altered properties.

You need to mention this in your introduction too

Elaborate

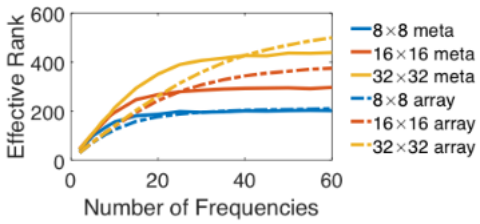
Mention names of works too and match approaches

Missing citation, also is there a name for such a cell structure?



[3]

Figure 1. Cross section of one metasurface cell illustrating width and height parameters.



[3]

Figure 2. Graph of the Effective Rank of the measurement matrix for different sized metasurfaces in comparison to transceiver arrays of the same size.

In general, I favor shorter captions, so try something like "Degrees of freedom in metasurfaces and arrays"

However, trends in Figure 2 also show that as the metasurface scales in size, the diversity in the audio signals tends to plateau. In comparison, when the transceiver array grows in number, the "Effective Rank" or image quality increases. Therefore, the accuracy of current audio imaging techniques via a metasurface decreases as the desired image gets larger. Methods to improve the resolution of images have then fallen onto optimization techniques that take the measured frequencies and manipulate the linear inverse equations that back them to have a better inference of what the image pixel values should be [3].

Since this is notable downside of a metasurface, you need to justify why anyone should bother with them.

What do arrays require that is costly compared to a metasurface?

Again, mention which works do this, and talk about how other works approach the problem.

The use of metasurfaces has only been in part to understanding more about near-field acoustics, specifically their scattering patterns made through constructive interference [5]. The MARGA Lab aims to understand more about the properties of near-field acoustic waves to produce more accurate images with minimal cost.

Don't name-drop words that aren't common knowledge. Explain what they are.

Or provide a citation, or better yet, both.

What is our target application? Also, don't mention the name of the lab, focus on what the research problem is.

References

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[3] Y. Fu, Y. Zhang, Y. Lu, L. Qiu, YC. Chen, Y. Wang, M. Wang, Y. Li, Y. Zhang, “Adaptive metasurface-based acoustic imaging using joint optimization” *Association for Computing Machinery* pp. 492-504, June 2024. Available: https://dl.acm.org/doi/pdf/10.1145/3643832.3661863

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