

Modeling Acoustic Propagation in Fluids

CS 419

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1 Introduction

Sound surrounds us every day. It is important to our everyday lives; we use hearing and sound for survival, productivity, and enjoyment. Sound is one of the most important aspects of living. Because of this, the understanding of sound and modeling its various properties today is important. Researchers use various models of sound to understand more finely its characteristics. How sound propagates in fluids, specifically water and air in most cases, can provide insight into a number of different systems. For example, modeling acoustics in a concert hall or similar musical venue can show engineers how best to build the room to optimize the musical or otherwise acoustic result of the performance. Another very important example in medicine is ultrasounds. Modeling how sound can propagate through fluids (and other mediums) enable doctors and software engineers to accurately represent and interpret the results of an ultrasound procedure. A third example is being able to locate objects underwater. The military uses models of sound propagation in water to locate submarines in the ocean while on patrol. Similarly, researchers use models of sound propagation to locate and identify whale pods. Each pod uses a unique frequency and patterns to communicate, a kind of pseudo-language. Understanding how various frequencies move in different ways through water help researchers track migration patterns, proximity of pods, and various other information vital to their research. These are only a few examples of sound modeling. There are many various fields these methods can be applied to. These examples show the importance of sound modeling, as well as the wide range of applications it can have.

2 Previous Work

Due to the wide array of applications, there are many methods to modeling sound, and each has certain aspects it focuses on. For example, some models focus on the density of the fluid, while others factor in temperature. There are also different methods for modeling one-dimensional, two-dimensional and

three-dimensional propagations. All of these various models make it difficult to find exact one needed for a given situation. The variability in application also means a variability in complexity. This means that overall, it is hard to find and compute the precise solution one wants.

3 Contribution

4 Prediction

5 Sources