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Acoustic Wave Propagation in Gusty Environments

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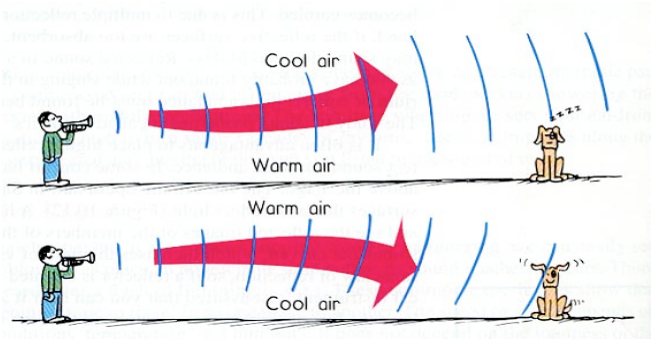
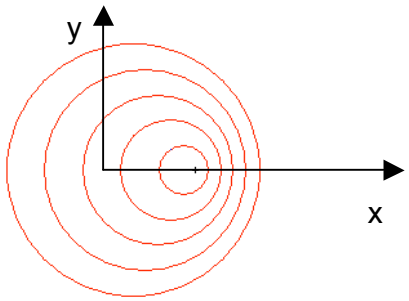
An acoustic wave is a sequence of compressions and rarefactions through a medium, an acoustic wave can be accurately described by its frequency, amplitude and phase. When an acoustic wave propagates through a medium it may be attenuated, i.e. there may be a reduction in amplitude or a change in frequency.

In an outdoor environment various the body of fluid through which an acoustic wave propagates, will have an ambient temperature, may have a temperature gradient and will most likely be moving, and often there will be gusts of wind.

The local speed of sound is directly proportional to temperature, meaning that sound travels faster through hotter air than it does colder air, and in the case of a temperature gradient sound becomes refracted.





The effect of a gust on a sound source

Fluid motion and in particular, gusts, have a significant effect on the propagation of sound, however acoustic sound pressure as a function of wind gust can be formulated so that its effects can be observed in models. Often these effects take the form of a doppler shift.

It is natural to be motivated to quantify the effects of these phenomena in terms of acoustic quality, this is typically treated subjectively by psychoacoustics, however I would propose to measure sound quality as the inner product of a sound measurements spectral error, with a function describing the human ears response to sound frequency.

Being provided with the means to study a subject of personal interest to me is, and was, very much appreciated, I would like to express my gratitude to AMSI and my supervisors.

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See http://www.ice-em.org.au/students.html#scholarships2007