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Chapter

Introductory Chapter: Is Noise Really Important? Should It Be Controlled?

Marco Caniato and Federica Bettarello

1. Introduction

Is noise really important? This is a very challenging scientific question. There are several literature works dealing with noise and its control. Anyway, why this physic phenomenon is so important for humans and specifically for scientists?

In years, researchers all over the word explored the entire acoustics field. If one writes "noise" on Google Scholar, almost 6 million results appear. This means that this parameter, this presence in our lives is of paramount interest and clearly occupies our minds and our thoughts.

Everybody knows that sound is a wave propagation in a dense mean. However, this is the academic definition. Aside of it, the perception is what makes the difference. And clearly what changes between *sound* and *noise*. The physics is the same, but sound is something positive such as music one likes or the voice of a beloved person. Noise is something disturbing such as industrial noise and traffic noise.

For these reasons, perception is what drives the research, rather than the physic phenomenon per se. Human perception varies from individual to individual. It is rather different, but some common trends are possible to find in literature. Thus, in the noise history, standards, scientific proposals, and law requirements were published, discussed, and imposed with the sole aim to control noise emission.

From what above reported, it is clear that the control of noise is needed for human purposes, for comfort reasons, and finally (and more importantly), for health issues and safety.

2. Noise control in literature

Literature is full of excellent works related to noise control. When one looks more in depth, some useful pieces of information can be derived. In order to do so, it is useful to picture the connection between the several different topics related to the "noise control" one.

When referring to **Figure 1**, it is possible to see that seven principal areas are related to the keyword "noise control," namely (in order of numerical importance given by literature papers:

1. noise related to electronic devices



Figure 1.

VoS Viewer picture of the first 2000 records available in Scopus, using the keyword "noise control".

- 2. noise relate to outdoor environment
- 3. noise related to networks and connections
- 4. noise related to telecommunications
- 5. noise related to perception and impairment
- 6. noise related to simulations and numerical models

However, it is clear how many treated topics are not cross-linked together. As example, materials and metamaterials are only linked with vibrations and mechanics and not to the other fields. In the same way, speech perception and hearing impairment are related only one to each other but not for example with quality control, control systems, etc.

From **Figure 2**, it is interesting to notice how, when using a density analysis, the most important parameter related to noise control is related to human (yellow spot at the right), then to quality control (center), and then to controllers and how to control noise (left). When specifically focusing on noise as keywords, this cross-linked relation between "noise" and "human" topic becomes the most relevant (**Figure 3**). Here, the connection between noise, human, quality, and the psychological effect is assessed, confirming the initial hypothesis.

This demonstrates how more science is needed, especially cross-disciplinary research studies that make it possible to solve problems, to formulate new hypotheses, and to confirm or negate the ones that are still open.

The vision of this book is then to continue on the path of innovation in science considering different issues, apparently diverse one from another, but with a common idea: implement the knowledge on noise control and spread it.

With this in mind, different topics are here handled:

a. control techniques and methods [1]

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nmunication repeaters satellitmed	dical imaging		
mimo systelignal to noise ra	quality control	diagnostic imagi	ng
feedback control	algorithm sign	nal noise ratio	
gaussian noise (electron	ic)	article anir	nal model
gaussian distribu sig	nal processing	human male	case control study
controllers	noise		cent
sliding mode control	ent noise pollution	physiology	ototoxicity
acoustic no	bise	voung adult	hearing
acoustic wave abso	orption dullibrium	pure	tone audiometry

Figure 2.

VoS Viewer picture of the first 2000 records available in Scopus, using the keyword "noise control" – density visualization.



Figure 3.

VoS Viewer picture of the first 2000 records available in Scopus, using the keyword "noise control" – specific connections.

- b.EVAC [2]
- c. Pollution during COVID pandemic [3]
- d.Outdoor Barriers [4]
- e. Mapping [5]

3. Conclusions

It is here briefly demonstrated how noise is part of everybody's life and that its control is manly necessary because of human perception. Many fields of noise control are present in literature, but they are not well interconnected. This book proposes further food for thought in relation to this paramount issue, which is impacting our everyday life.

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