Compressed Air Leakage Detection Using Acoustic Emissions with Neural Networks

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ABSTRACT

Compressed air is utilized in many branches of industry and one of the most expensive energy sources of industrial plants. Therefore, efficient detection of air pressure leaks goes hand in hand with cost savings and increased operational reliability. Some procedures of leakage detection for pressure lines are based upon the analysis of sound emissions. Such solutions detect specified ultrasonic emission patterns or, alternatively, personnel trained to hear the sounds are deployed for leakage detection.

In this paper, we evaluate the potential of using airborne sound emissions in the audible hearing range for the automated detection of compressed air leakage using artificial neural networks. Therefore, a novel dataset was created and published. It contains recordings from several microphones at different distances of adjustable leakage from a pneumatic contraption with different pressure levels. Additionally, industrial background noises were applied at different levels to simulate real-world sound environments. Using this dataset, a deep neural network was trained for leakage detection. The results show that leakage detection by means of airborne sound in the audible range using machine learning techniques is possible, and is a promising contactless and automatic detection method.

1. INTRODUCTION

The INTER-NOISE 2020 SEOUL Proceedings will be distributed to the congress participants on a memory stick.

The purpose of these instructions is to ensure the uniformity of the publication.

The manuscript should be submitted as a PDF file whose font is 12-point "Times New Roman". The length of a manuscript should be at most 12 pages and at least four pages.

Only manuscripts in English will be accepted for the Proceedings.

You must not insert any page number, header or foot note except the e-mail addresses in the first page of the manuscript [1].

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2. MANUSCRIPT FORMAT

2.1. Margin Settings

– The paper size is A4.

– Margin settings: Top (2.5 cm), Bottom (2.5 cm), Left (3.0 cm), Right (3.0 cm)

– The text should be justified from left to right.

– The first line of the paragraphs should be indented by 0.5 cm.

2.2. Paragraphs

– There should be one empty line between headings and subheadings.

– Major headings shall be numerically ordered as 1., 2., ..., in bold font.

– Level 2 subheading should be 2.1, 2.2, ..., in bold font.

2.3. Figures, Tables and Equations

All figures, tables, equations, photos, graphs, etc., must be shown shortly after they are mentioned, placed at the centre of a page.

The caption of figures and photos are put below the figures and photos in italic font [2](see Figure 1).

Figure 1: Logo of Inter-Noise 2020

The equations should be referenced as Equation 1, Equation 2, etc. Equation 1 is an example.

$$\bar{x} = \frac{1}{N} \sum_i x_i \tag{1}$$

The caption of tables should be placed just above the tables in italic font and the table number should be Table 1, Table 2, . . . like Table 1 below.

Table 1: Example

Value 1	Value 2	Value 3
1	1.1	a
2	2.2	b

3. IMPORTANT INFORMATION

3.1. Submission of Manuscripts

The manuscript should be submiited as a PDF file through the INTER-NOISE 2019 website (`www.internoise2020.org`).

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Before submission, you need to check your PDF file carefully to be sure that PDF conversion was done properly and there is no error when the PDF file is opened. The following problems may occur.

– Symbols are missed.

– Symbols are converted incorrectly, especially mathematical symbols.

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4. CONCLUSIONS

This is the conclusion section.

5. ACKNOWLEDGEMENTS

We gratefully acknowledge the authors for submitting their work to INTER-NOISE 2020 SEOUL.

6. REFERENCES

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