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PAPER

On the ability of consumer electronics microphones for environmental noise monitoring

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The massive production of microphones for consumer electronics, and the shift from dedicated processing hardware to PC-based systems, opens the way to build affordable, extensive noise measurement networks. Applications include *e.g.* noise limit and urban soundscape monitoring, and validation of calculated noise maps. Microphones are the critical components of such a network. Therefore, in a first step, some basic characteristics of 8 microphones, distributed over a wide range of price classes, were measured in a standardized way in an anechoic chamber. In a next step, a thorough evaluation was made of the ability of these microphones to be used for environmental noise monitoring. This was done during a continuous, half-year lasting outdoor experiment, characterized by a wide variety of meteorological conditions. While some microphones failed during the course of this test, it was shown that it is possible to identify cheap microphones that highly correlate to the reference microphone during the full test period. When the deviations are expressed in total A-weighted (road traffic) noise levels, values of less than 1 dBA are obtained, in excess to the deviation amongst reference microphones themselves.

Introduction

Noise annoyance is a major environmental problem in urbanized regions. Exposure to traffic noise is associated with a wide range of negative effects on human health and well-being. It was estimated that outside their homes, near 44% of the European population (in the year 2000) was exposed to road traffic noise levels above the World Health Organization's threshold for onset of negative health effects.[1] Examples of the adverse effects of exposure to traffic noise are not only annoyance,[2] but also sleep disturbance,[3,4] negative impacts on cognitive functioning (especially in children)[5] and the contribution to cardiovascular diseases.[6,7]

The European Environmental Noise Directive[8] obliges each member state to make noise maps of, amongst others, their major highways and highly populated agglomerations. A noise map is most often a calculation exercise, showing an estimation of long-term averaged noise levels with a fine spatial resolution. Based on such maps, action plans have to be proposed for problem areas.

However, producing accurate city noise maps is a hard task. The complexity of the sound propagation problem in a densely build-up environment is high.[9] Typically, geometrical acoustics approaches are applied for noise mapping calculations. However, even in a single street, a large number of multiple

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Environmental impact

Noise pollution is an increasingly growing threat for the well-being and the public health in industrialized countries. Although the large advances made in predicting tools for noise exposure assessment during the last decades, the full complexity of the sound propagation problem, together with an accurate representation of the distribution of noise sources, is most often not sufficiently captured in an urban environment. Therefore, measurements are still an important tool for assessing the public's exposure to noise. The work presented in this paper shows that the large cost for extended noise monitoring networks can be strongly reduced by using microphones appearing in consumer electronics devices. It was shown that it is possible to identify such microphones that result in only small level differences compared to reference equipment, making them useful in many environmental noise monitoring applications.