DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

(State the objective of the project, describe the research to be carried out, and present reasons for choosing the research topic - max. 1 standard type-written page)

One of the disadvantages of cities' development is noise. Because noise has a negative impact on people's health and concentration, there are legal principles regarding maximal noise levels. In Europe, the effective noise indicator (based on the premise that it is a measure of annoyance) is the yearly-averaged, day-evening-night equivalent sound level – L_{DEN}. Nevertheless, the results of many studies show that equal values of L_{DEN} do not mean equal annoyance caused by different types of sound sources. In other words, knowing the value of L_{DEN} for road traffic noise, we can only predict annoyance caused by that type of noise. That value cannot be used to predict the annoyance caused by another sound source, for example, railway noise.

In real environments, the inhabitants of cities are exposed to multiple concurrent sound sources. Between different cities' areas, the noise from these sources changes. Moreover, these different types of sound sources exist in different proportions (e.g. during 1 hour noise is emitted by 5 airplanes, 7 trams and 900 cars). Though there are models of annoyance caused by sound sources which exist simultaneously, their results are not reliable. It is quite common that conclusions from different studies contradict each other.

The aim of this project is to develop a new model for estimating total annoyance (TA) based on the annoyance assessment of three types of sound sources: cars, trams and airplanes, presented simultaneously. In the new TA model following factors will be taken into account: sound levels, number of sound events and individual factors (like, e.g., noise sensitivity). The number of sound events means the number of all pass-bys for one type of sound source (e.g. 900 car pass-bys in one hour means 900 sound events). That amount relates directly to the traffic intensity. One can imagine a situation, when the same sound level is measured for different number of acoustical events. Existing models of TA often neglect information about sound events, focusing mainly on the relation between annoyance assessment and sound level (L_{DEN} is most commonly used for this).

The proposed project can be divided into three main parts. In the first part, sources of road, tram and aircraft noises will be recorded using an ambisonic microphone and special noise scenarios will be created. Ambisonics is a technique which enables all the spatial information of an acoustical field to be registered. Then this information can be reliably presented in laboratory conditions using an array of dozens of loudspeakers. Every type of sound source will be recorded separately, so the annoyance caused by single types will be also assessed.

The second part is a psychophysical experiment which will be carried out with the participation of people. They will assess their annoyance caused by exposure to single types of sound sources (e.g. only road traffic noise) and annoyance felt during different noise scenarios constructed from sound sources in diverse combinations and proportions. Proportions will be taken from several points in Poznan to mimic real environmental conditions. In the third part, based on the results from the experiment, a new model of TA will be proposed. It will take into account not only the sound levels, but also the number of sound events.

Although several models of TA already exist, we still do not know how annoyance is integrated from multiple concurrent sound sources. Calculations from these models may lead to errors, and when using them we cannot predict total annoyance reliably or effectively. Until now, the relation between annoyance and the number of sound events (a factor which directly corresponds to the intensity of traffic flow) has not been studied. Considering the real numbers of sound events, a new model of TA will be established. Thanks to this we will broaden our knowledge concerning the nature of total annoyance and analyze it in the context of real environmental conditions.