5. Introduction  
 1. Motivation (technical, maybe also personal)  
 2. Objectives  
 3. Structure of the Thesis

Imagine a party. You can hear a wide variety of sounds: music on the background, conversations between people, noises of somebody coughing, maybe even a dog barking outside… These sounds form a single stream, which comes to your ears in a form of a sound wave and then goes through a variety of physical, biological and psychoacoustical processes to the brain. Despite all these sounds from different sources are mixed on the way to your ears, your brain can segregate one (or several) of them. You can focus your hearing on these “target” sounds and separate them from this complex mixture, leaving other sounds in the background. This phenomena of focusing on specific sounds in a mixture has been described as a “cocktail party effect”, and the process of integrating separate sounds into meaningful streams (so called “auditory objects”) -- auditory scene analysis, or ASA.

In machine perception --- specifically in machine hearing --- the related concept is referred to as Computational ASA (CASA) and is tightly connected to the problems of sound recognition and digital signal processing.

The main objective for this thesis is to describe the principles and goals of CASA, along with existing applications and approaches. Another objective would be to practically apply the theoretical knowledge and implement a simple CASA system to separate monophonic music from noise. Finally, since this thesis is made for an IT-oriented audience, it is needed to make a brief introduction to the underlying physical and biological processes.

The thesis is structured as follows:

* Firstly, physical background theory will be provided, including an introduction to what a sound is. Special focus will be made on understanding how music works, describing periodic sounds and pitch perception.
* Secondly, having in mind that CASA tries to mimic the human auditory system, a brief introduction to the biological structure of the human ear will be made.
* Next, to cover the math in the implementation part, the basics of digital sound processing will be described. The related mathematical principles and functions used during the implementation will be also given some attention.
* In the following chapter, having all the related theory in mind, an introduction to the main principles and goals of CASA will be made, along with an overview of its applications and selected algorithms.
* In the practical part, the focus will be made on describing the implementation of specific parts of the CASA system built for this thesis.
* Finally, an overview of the experiments made to test the implemented system will be provided.