FAST ARTIFICIAL REVERBERATION USING SPARSE APPROXIMATION

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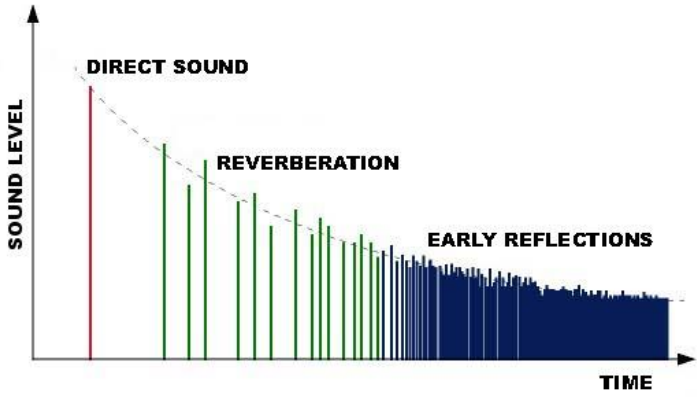
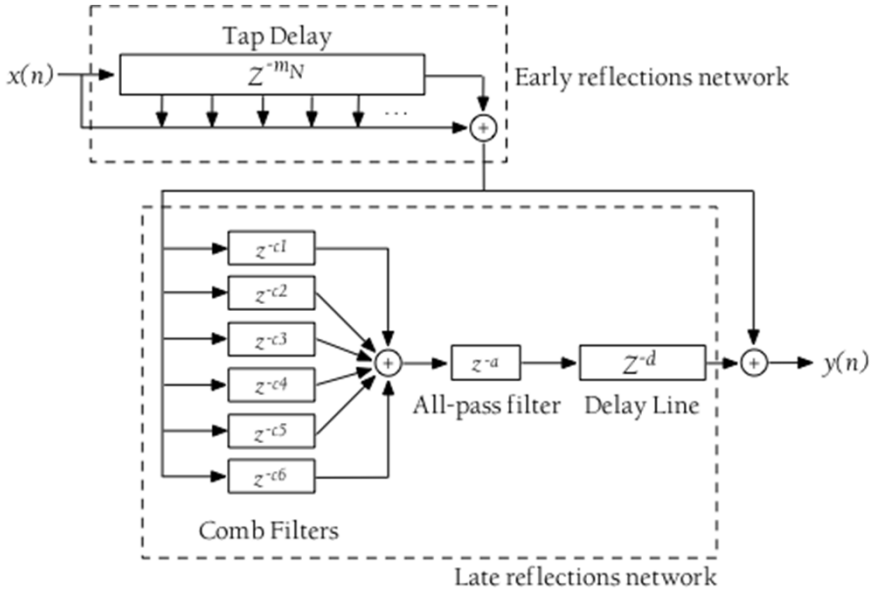
Introduction

- Artificial reverberation is used in music production, computer games, and sound reproduction to improve the naturalness.
- In principle, one could simply record the impulse reponse (IR) of a room and convolve this onto signals. But this would be computationally very demanding, as Irs may be several seconds long.
- Instead, computiationally simple methods, like structures of comb and allpass filters are used.

The Idea

- Reverbs are frequently constructed from delay networks and allpass and comb filters.
- The parameters of these are often hand-tuned and are difficult to map to user parameters.
- The IRs of rooms are often sparse (in particular the early parts).
- In this project, we will explore the application of recent advances in sparse approximation and compressed sensing to artificial reverberation.





The Project

- The goal of the project is thus as follows: Given a measured IR of a desired room, find a computationally simple implementation of it using sparse approximation.
- The concept of sparse linear prediction could be used as a starting point for finding a sparse auto-regressive model of the IR.
- This auto-regressive model of the IR can then be factored into parts corresponding to comb (and allpass) filters, which can be implemented efficiently.
- Alternatively, sparse approximation techniques such as matching pursuit could be used.
- An open question is how to change the parameters of the room.
- The research is carried out in MATLAB using CVX. Implementation of the final reverb could be in a smart phone app, a VST plugin, or a DSP board implementation.

Literature

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