
Digital Guitar Effects

Project Report
Group 17gr641

Aalborg University
Electronic Engineering and IT

Copyright © Group 17gr641, Electronic Engineering and IT P6, Aalborg University 2018

This report is compiled in L^AT_EX. Additionally is Mathworks MATLAB, Adobe Illustrator, Inkscape, Lucidcharts.com, Altium Designer, and Xfig used to draw figures and charts.



AALBORG UNIVERSITY
STUDENT REPORT

Electronic Engineering and IT
Aalborg University
<http://www.aau.dk>

Title:

Digital Guitar Effects

Theme:

Signal processing

Project Period:

BSc, 6th Semester 2017

Project Group:

Group 17gr641

Participants:

Mohamed Gabr
Jonas Buchholdt
Sebastian Schiøler

Supervisor:

Sofus Nielsen

Number of Pages: ??

Date of Completion:

26th may 2017

Abstract:

The paper deals with the creation of different sound effects for an electric guitar on the a Digital Signal Processor. Some of these effects are the reverb, the flanger and the equalizer. The report includes a thorough explanation of each of the effects followed by the used design approach. Simulations on MATLAB were done to verify the design. All the effects have been coded in assembly for the DSP implementation. The Assembly code works with the TMS320C5515 DSP from Texas Instruments. In order to make the DSP usable on a variety of electric guitars, a preamplifier was built. All details relating to the design and the implementation of this component are included in the paper as well.

The content of this report is freely available, but publication may only be pursued with reference.

Preface

This report is composed by group 17gr641 during the 6th semester of Electronic Engineering and IT at Aalborg University. The general purpose of the report is the development and implementation of a digital guitar effects which is a part of the overall theme *Signal processing*.

For citations, the report employs the Harvard method. If citations are not present by figures or tables, these have been made by the authors of the report. Units are indicated according to the SI standard.

This project uses the Assembly language for the TMS320C5515 processor, and furthermore, the C programming standard C99.

Aalborg University, February 7, 2018

Mohamed Gabr

<mgabr16@student.aau.dk>

Jonas Buchholdt

<jbuchh13@student.aau.dk>

Sebastian Schiøler

<sschia14@student.aau.dk>

Contents

Chapter 1

Introduction

One of the most known instruments in the world and maybe the one that most people play is the guitar. The two main categories of guitars are the acoustic guitars and the electric guitar, with millions of players having the one, the other or both. If one is playing the electric guitar one will quickly find that to get the real feeling of being a guitarist, some additions have to be made to the setup. The first step might be an amplifier, but once the taste for guitar gear has awakened, the next natural step will be to buy effects for the guitar. Guitar effects can be an integrated part of an amplifier, but guitar effects can also be bought as isolated effects pedals or as multi effect boards. The two "religions" within guitar effects are the analog effects and the digital effects, where the analog ones often are more expensive than the digital ones. This project will aim to make a system that will work as one or more guitar effects. In ?? a real life drawing of the system is illustrated.

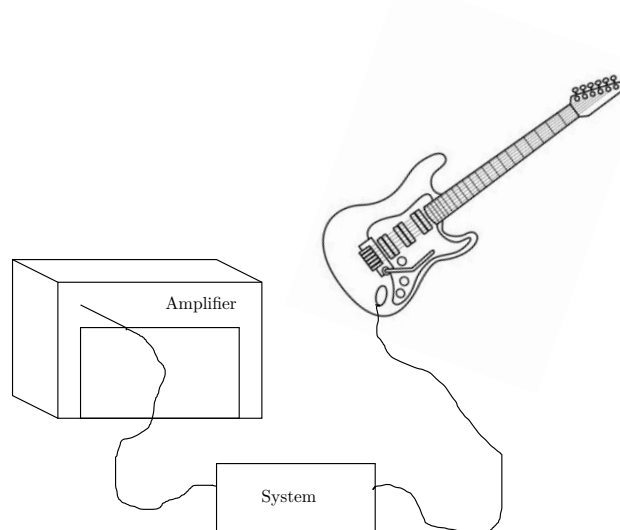


Figure 1.1: Real life illustration of the system setup.

The ?? shows a signal from a guitar, going through the system and sent to an amplifier. The person playing the guitar should be able to choose which effect the system should make and also be able to change different parameters on the chosen effect.

1.1 Initial problem statement

The following questions are made with the intention of gathering the necessary knowledge, to be able to answer a later stated problem statement. The initial questions, which will be answered in the analysis, are:

- Which parameters can be adjusted on an electric guitar, in order to adjust the sound?
- Which effects can be applied to the signal from an electric guitar and how do they work?
- Which platforms can be used for the implementation of the above mentioned effects?

Part I

Analysis & Requirements

Chapter 2

Analysis of the Guitar and its Effects

Chapter 3

Product Requirements

Part II

Design & Construction

Chapter 4

Component Choices

Part III

Tests

Chapter 5

Tests of the Stated Requirements

Part IV

Discussion and Conclusion

Part V

Appendix

