ELECTRONIC ENGINEERING DEPARTMENT
FINAL YEAR PROJECT SPECIFICATION 2004/05

Supervisor: Martin Glavin

Title: Wireless MIDI Guitar Effects system

Project Overview:

This project describes a unique wireless digital effects system for guitarists, which is suitable for use in a live performances. Current wireless systems facilitate transmission of the guitar output to the amplifier, however the effects are generally hard wired into the system. The system will allow a guitar player the freedom to roam about the stage at will, yet retain full control of the guitar effects using wireless control of a digital effects system.

The first phase of this project will be the implementation of DSP effects for guitars, firstly, using MATLAB to quickly develop and prove the effects theory. Once the filters have been proven, they will then be implemented on an embedded DSP board. The filters must be designed such that their parameters can be modified in real-time.

The next part of the project will consist of a wireless pedal-board which implements a wireless MIDI (Musical Instruments Digital Interface) connection. There is not currently a standard wireless MIDI implementation, but this should not be too demanding given that MIDI is a relatively low-tech communications protocol by modern standards. The huge advantage of using MIDI is that it is the de-facto musical instruments interface, and there are many software tools available to deal with MIDI data streams.

This MIDI stream will be input to the embedded DSP board to control the DSP effects.

The final part of this project will be a GUI on a PC which will be used to configure the DSP effects. This GUI will facilitate fine tuning, and re-ordering of the application of effects (e.g. reverb, followed by chorus, or chorus followed by reverb etc.). These configurations will be programmable and stored as ‘scenes’. Given the MIDI connectivity of the embedded DSP effects system, these effects could be sequenced, or controlled by a third party to enable highly complex and dynamic effects utilisation.

Project Milestones:

The completion of the practical milestones identified below does NOT necessarily guarantee an award at the associated level. An award at the associated level will only be merited if all other aspects of the project (e.g. reports, presentation, attendance in lab and at meetings etc.) are completed to an equivalent level.

Pass

Implement a number of DSP effects in MATLAB. These effects will be applied to a number of guitar samples, recorded and stored in .wav format.To reach this level, the student should implement a number of the previously developed effects on a DSP development kit in real-time.

Average
To achieve this mark the student must build a wireless transmission system which will facilitate the transmission of MIDI data. The system will generate the MIDI messages and then transmit the data over the wireless interface. This system could be based on RF transceiver pairs or some other such technology.

Good
To achieve this level, the student should integrate the entire system, allowing the MIDI messages to modify the parameters of the digital filters over the wireless MIDI link.

Very Good
The configuration of digital effects is generally quite difficult and time consuming. A PC GUI will be developed to facilitate quick and easy modification of the effect parameters, and will also allow the order of application of the filters to be specified. Hosting the configuration on a PC will also facilitate storage of effects 'scenes' which will allow rapid reconfiguration of the effects system in a live performance scenario.

Excellent

The student will document the project in the form of a formal technical paper suitable for submission to a conference.

Health and Safety Issues

Since the project will involve design and construction of electronic circuitry, due care and attention will have to be paid to normal issues of laboratory safety.