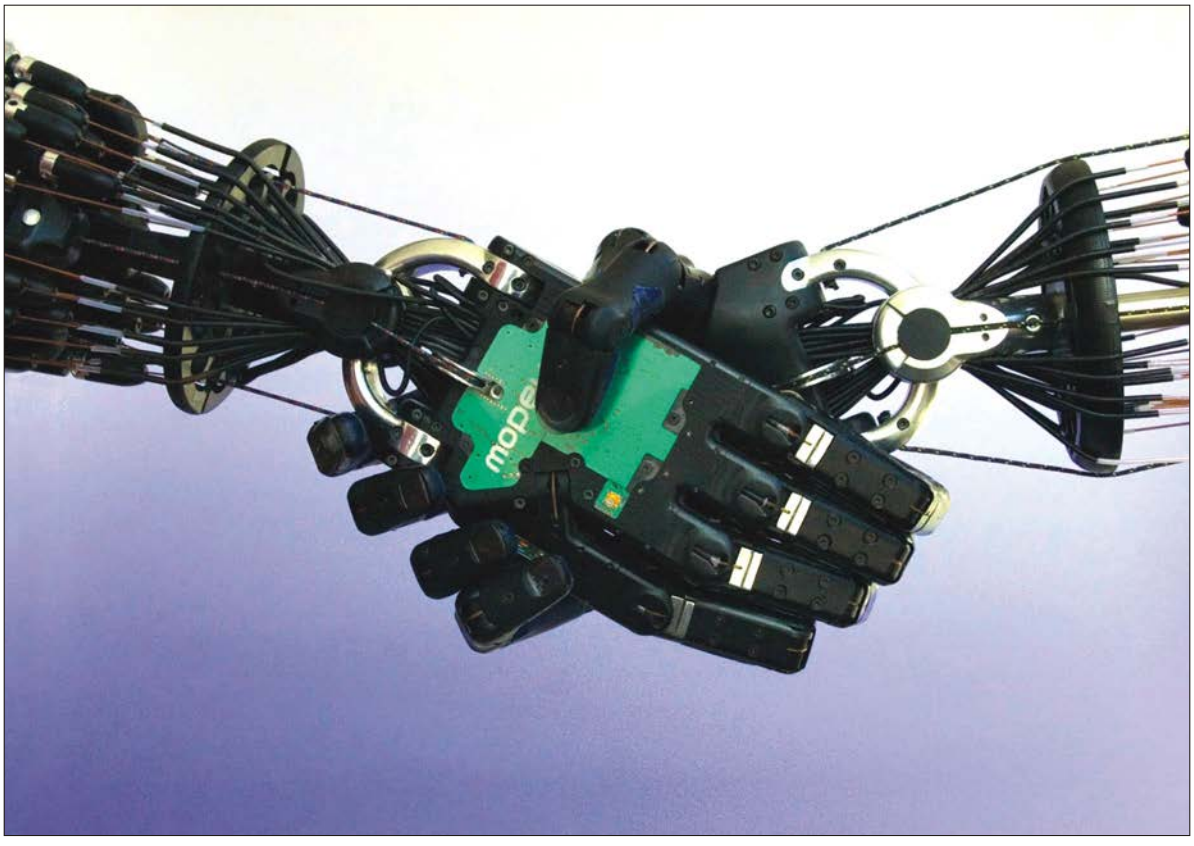

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Embedding a Noise Gate Pedal in an Instrument to Avoid Unwanted Noises

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ABSTRACT

In music there are many types of modifications that are done on the sounds such as filters, overdrive, dynamics, volume, pitch and ambience. The noise gate is one such effect which falls under the category of dynamics. Noise gate is something which helps in cutting of unwanted sounds be it below a certain level or be it at a particular decibel level. The level from which it can be cut off or from which it should be cut off is called the threshold level. There are three main functions that are present in a noise gate-threshold, attack, decay. The attack and the decay levels can be pre programmed or controlled by different equipment. Let us say that the attack levels are the same as what it is programmed in the other stomp boxes, effects or amplifiers or all three put together. The value of attack does not affect the noise gate. Our primary concern is to attenuate the unwanted sounds that are being generated.

Key words: Noise gate, noises, removal, embedded, dynamics, attack level

INTRODUCTION

The applications can be used on case of music and musical instruments as well. We can take the example of a guitar which has a separate sound processing unit. The sound processing units can either be digital or analog. Nowadays, we see that the processing units which are digital are almost as good as the ones which are analog. This is achieved by simulating the sounds using tube modeling oscillators. Though, it has its own drawbacks such as it is very fragile and cannot be kept under varying current (Somasundara *et al*., 2006) and voltage. It has been taken into consideration that a multi-effects processor cannot be directly embedded (O'Hara *et al*., 2008) into a particular instrument due to several constraints such as weight, change in density of the wood, size of the processor as a whole and the sound quality.

Many musicians prefer to use stomp boxes to control their pedals as they strongly believe that multi-effects pedals are not as good as analog pedals. After viewing multiple pedals and effects a conclusion can be reached that the noise gate pedal is the most optimal one to embed into the guitar or any stringed instrument. The chip to be embedded (Sunkam Ramanujam and Lin, 2009) will not be too large. It can be used as a substitute for an equalizer or even a better than a substitute as it can cut off noise levels to infinity rather than just minimizing the levels of a particular decibel (dB) level.

HISTORY

The effects pedals were first experimented in the 1940's and were commercially brought out in the year 1948. A trem troll effects unit was released which simulated the tremolo arm. This was done by passing the signals that were produced from the guitar to effects area which had a

water-based electrolytic fluid. A much more portable version of these effects zones were created in 1962 more popularly known as stomp boxes. These were more favored but then again with advancement in times we can use the basic concept of the technology to modify it for our needs. It is said that the circuits cannot be changed and placed anywhere but with experimentation it has been found that the stomp boxes can be placed differently to obtain different sounds (Abdullah and Green, 2011) given the fact that the parameters are changed accordingly.

IMPLEMENTATION

It can be implemented on the guitar or any musical instrument by embedding the circuitry inside the instrument and placing a knob for controlling the threshold levels that is, it is able to control the amount below which the levels need to be cut off. The threshold levels can be controlled using one knob only if we use a pull and rotate concept (Peiravi, 2008). That is the same concept as the coil tap. The coil tap is something that is used to change the humbuckers to pickups and vice versa which are solenoids (Lee, 2006). The coil tap has been diagrammatically shown in Fig. 1.

What actually happens is that the knob can be raised to a certain level in order to use it to control the threshold levels. The knob can be placed near the volume control and tone control knobs. It will be easy to access and control while playing. We notice that the noise gate is able to cut of dB levels that are below a certain level (Manikandan and Madheswaran, 2007). What if we want to set it in between two points? For this we cannot use a computerized system to decide what the noise levels that should be cut out are. The reason behind is that at times we like some unwanted sounds and are able to use it to our advantage. If we allowed this to be fully computerized then we would not be able to control the sounds that we want. Instead of installing an onboard equalizer like we do in acoustic guitars we can install a noise gate system which will comprise of a chip which will be soldered to the pickups and humbuckers so that the output sound is controlled (Nadhim, 2006). At the same time we are not going to compromise on the sound that is there. So what we are going to do is that we are going to use an analog signal and give it as an output as well.

Another such idea that can be implemented is that the coil tap can be used to cut off two different ranges of noise levels. That is one above a particular level and another below a particular level. An advantage of this is that different kinds of sounds can be produced when combined with different kinds of effects.

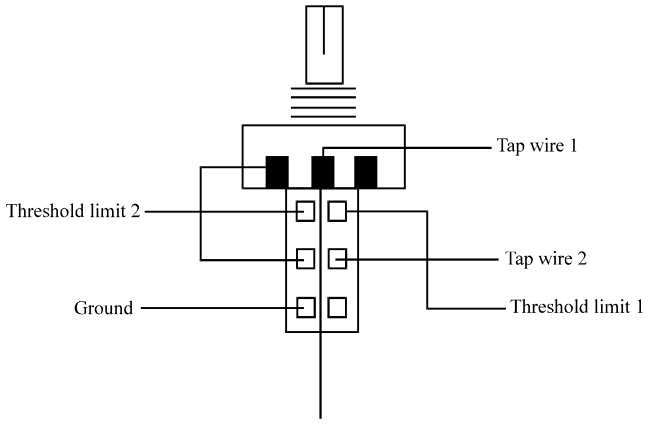

Fig. 1: The coil tap concept

CONSTRUCTION OF A NOISE GATE

The noise gate can be put in the top to control the sounds that are being brought in. The noise gate will have a knob to control the amount to which a sound has to be reduced. The levels can be between minus infinity to plus infinity. The noise gate will be an analog circuit so that it can preserve the sounds (Tlelo-Cuautle *et al*., 2010). Once it is passed to a digital circuit it must be maintained in that form to prevent unwanted loss of signals.

Along with the noise gate there will be a pre programmed chip with a display which will show the amount to which the threshold levels (Jia *et al*., 2000) are being set at. The other two parameters such as the attack and the decay levels are assumed to be preset. The values maybe defined to suit the other circuits that are to be placed ahead. The Attack and Decay levels (McIntire *et al*., 2012) set will also be displayed on the LCD and they can be modified with a knob for each. The display has been illustrated in Fig. 2. In the general circuitry of a noise gate pedal all three parameters are there and can easily be modified.

PROBLEM FACED

As for the problem of the power supply for the noise gate effect we can use a 9 V alkaline battery and set it up. In case the user wants to use a light instrument then it is possible to connect the noise gate circuit with an active pickup which will be having a battery supply in it. In case of passive pickups then the weight can put under the noise gate circuit. Since, we do not have a battery as it is under the pickups the weight is hence just been relocated and no excess weight has been added or removed. Another factor that must be taken into consideration is that the circuits have to be placed in blocks to prevent unnecessary loss in signals. That is all the analog circuits must be kept together and all the Digital circuits together. The battery will be connected to the noise gate board and the pickups if any and then they would soldered to the output line. This has been shown below with the aid of a diagram in Fig. 3. Many a time we notice that people use this pedal at the end of their circuit as they believe that it may land up compromising the original tonal signal that are produced with the help of the wood and other basic hardware. This is not true. The tone can be preserved and yet a desirable result can be obtained if the three major parameters are set correctly.

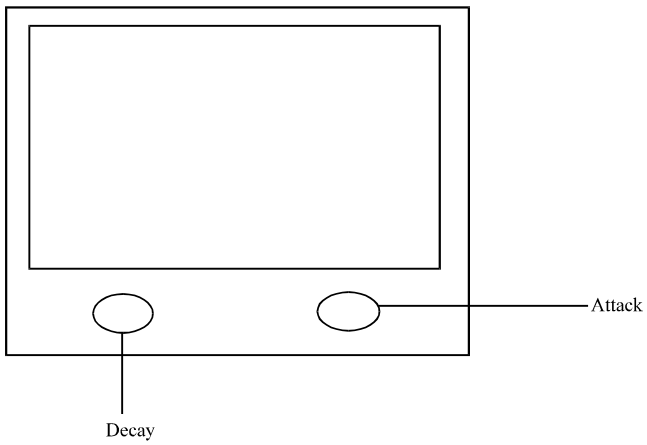

Fig. 2: The display of the noise gate

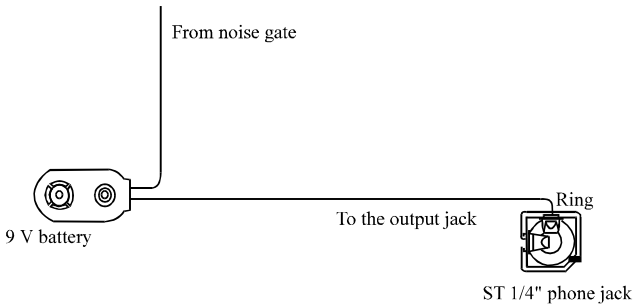

Fig. 3: The circuitry from the noise gate to the power source and the output

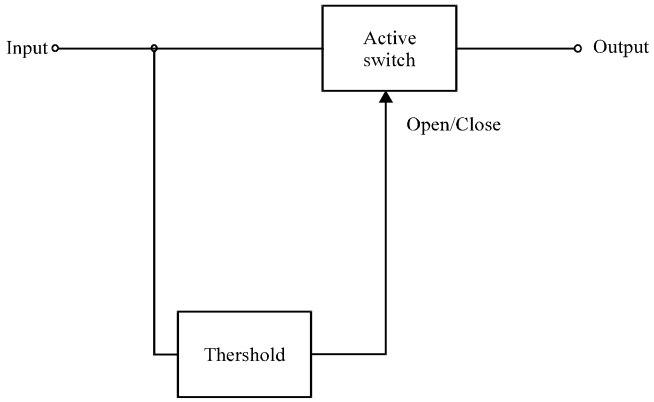

Fig. 4: The architecture and the circuitry

ARCHITECTURE AND CIRCUIT

The architecture and the circuitry are not very complex and have been illustrated and explained in the figures. The Noise gate pedal is connected to the 9 V battery which is the source of its power. The battery will have to be replaced from time to time depending on its usage. Other than this the connections between the display and the board is also present in Simplified Noise Gate Circuit. The circuit as we see is highly simplified and the knob that we can control is at the input. The values can be modified by turning it thereby changing the values in the threshold box. The active switch is where the coil tap becomes functional as we can input another value for the threshold. The architecture and the circuitry have been depicted in Fig. 4.

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