Crap Re-Used with Lötklaus Pro: Notes on a Loop-Based Control Signal Sequencer

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Abstract

LKpro is a loop-based system to record, edit and play control signals. These signals can either be used to trigger cheap noisemaking children toys (aka *crap*) or to interrupt an audio line.

LKpro was primarily developed for stage purposes, but it is also intended for use as an educational tool for "hands on toy tinkering" workshops targeting musicians. The project sees itself as part of the Do It Yourself Cultural Movement. The system is open, the firmware source code is available and re-writable using the Arduino IDE (http://arduino.cc).

Keywords

Selfmade instruments, DIY Culture, eMusic, Recycling.

1   Introduction

In this paper we are describing a music intrument we developed.

First we provide some contextual information, then we describe the functionality of the system in detail. Finally, we illustrate empiric situations of use and sketch our further development schedule.

The Lötklaus Pro (LKpro) is predominantly a machine. As we will explain later on, hard- and software is developed and engineered for practical applications. As most inventions often are a result of thoughts around a certain problem or even theory, the LKpro project sees itself as reaction on different contemporary topics. The following introduction aims to give an idea of the underlaying background.

1.1   Recycling

Our life is surrounded by millions of electronic devices of all kind. Telephones, TVs, computers, cars, printers, etc. In almost every moment in a post-modern everyday life in the western world some electronic systems are active.

Even our children are involved with electronics by playing with toys based on electronic circuits, like soundmaking keyboards, toyphones, RC cars, etc.

But what happens, if it brakes? As we all know most of todays electronics are not made to be repaired, while the lifetime of some devices does not exceed several months. If we are lucky, it broke during warranty time. Otherwise we have to dump it, or in rare cases of being fortunate, we can sell it to some kind of garbage collector.

Most of the time it is just a little part e.g. a broken wire that causes the defect. Often there are not even screws to open the now useless object – the junkyards of the western hemispheres are being filled with high-tech.

This is where LKpro enters the scene, to get some music out of the *crap*. As a kind of meta-recycling system, we are not aiming to recreate the formally intended state – we are looking for its potential. With little soldering skills very much of todays electronic garbage can be reused, not necessarily in its original meaning, but for an artistic approach. The LKPro was developed as a result of our own experience: By strolling through flea-markets, electronics recycling places, the LÖTBERT duo finds nearly all kinds of parts and devices to perform live.

We wanted to share this new recycling approach – by inventing another electronic crap device.

1.2   DIY: exchange skills and build your own tools

Do It Yourself was in the 1950s mainly related to fixing and improving the things related to housing without hiring professionals. According to

Wikipedia it began becoming a subculture movement in the 1970s [1] widening this practice into crafts and music.

We also see it as an anti–consumeristic model as it is clearly questioning the predominant position of corporations indicating passive consumption as the main source of happiness. By this means it can be seen as a step within the emancipatory process of us as consumers towards being producers not only of content, but also of tools.

The open source initiatives of the software world show similarities to the tradition of DIY, especially in the attempt of providing transparent knowledge about underlaying methodology to anyone interested.

The DIY movement got a new boost through the diffusion possibilities of the internet in mid 1990s. Recently there is a strong focus on self-built electronics/hacking and the sharing of skills. Websites like instructables.com serve as a platform for providing step-by-step instructions for interested amateurs and artists offered by other members of the community. The quarterly Make Magazine [2] that started in 2005 is focusing solely on DIY projects and technology. Make Magazine is also sponsoring the annual circuit bending festival named Bent [3].

These indications even could be seen as a popularization, if not commercialization of this movement.

At the same time developments like Wiring, Arduino and now also Fritzing [4,5,6] help building a community that is able to enjoy the possibilities of electronic engineering without formal education in this field. The user is put in the position of being able to create the tools that perfectly suit their needs.

We are supporting this popularization and we hope the growth of different forms of non-institutional knowledge exchange will continue.

2 What is Lötklaus Pro (LKpro)?

LKpro (see Figure 1) is primarily developed as an electronic-toy-sequencer to play, record and edit rhythmic patterns, beats even melodies through all kinds of hacked electronic waste. This open source hardware system gives the opportunity to control the connected items in a musical way. Through the simple blank wire patch bay it is very easy to connect wires to the LKpro that are soldered directly to the conductive traces underlaying the toy´s buttons and knobs.

LKpro is a loop-based system with four digital channels providing full control over four of the buttons of any toy instrument.

There are four control buttons integrated, but LKpro also provides the option to connect any external button or switch. LKpro comes with 2 knobs for analogue output, these are typically intended for toys using a "resistor ladder" or for controlled tinkering of the internal clock speed of the hacked toy.

The LKpro works primarily as a sequencer, comparable to commercial sequencer systems. Each sequence consists of two bars, each in a resolution of 32 steps. The speed is fully adjustable via the speed control knob, but several LKpro can also be easily synchronized by connecting them to one master clock. A status LED shows the actual speed, by blinking every 4th note.

By powering the system, the loop is running, there is no start/stop button, the system is directly ready to work.

Figure 1: LKpro

There are four channels to record, while each signal output has its own channel and button. One of the main underlying ideas of the LKpro is its real-time functionality: All functions, like 'record', 'mute', 'delete', and speed variations are made during playing and directly take effect. E.g. if the LKpro is set to record mode, tapping the buttons will be recorded at the actual time position of the running sequence in its channel. This means a rhythm can be recorded by tapping the buttons, there is no need for off-line step sequencing. Like this, the creation and editing of rhythmic patterns and beats can be done during a live performance, like playing an instrument.

On the backside, the 24 blank-wire-connector patch bay is located (see Figure 3) which connects the LKpro to the physical world. These are four + two outputs and the following inputs: clock in, click out, supply voltage (3, 6, 9-12V) and common ground. All these are integrated for a maximum of flexibility in triggering *crap*.

Three different operation modes can be selected via the 'record', 'delete' and 'mute' switches (see Figure 2). In Firmware v1.1 there are as well some combinations possible to enter different modes.

2.1 Record (Overdub)

By setting the 'record' switch, this mode allows to record all inputs at its actual time in the running loop as a real-time operation. A rhythm tapped on button 1-4 will be recorded as notes in the corresponding channel 1-4. If the loop is over and repeats itself the recorded signals will be sent out to the outputs 1-4, while its still possible to record notes. This signals cause opened gates like a pressed button. A signal line e.g. from a toy button will be closed in this moment which will result in some toy action.

All movements, which were made with PWM knob 1-2 will be recorded as well and result in an output of analogue channel 1-2. These outputs differ, by providing a varying voltage between 0-5 volts, through pulse-width modulation (PWM). For the analogue channels the record mode does not have an overdub characteristic, it replaces all the recordings made before.
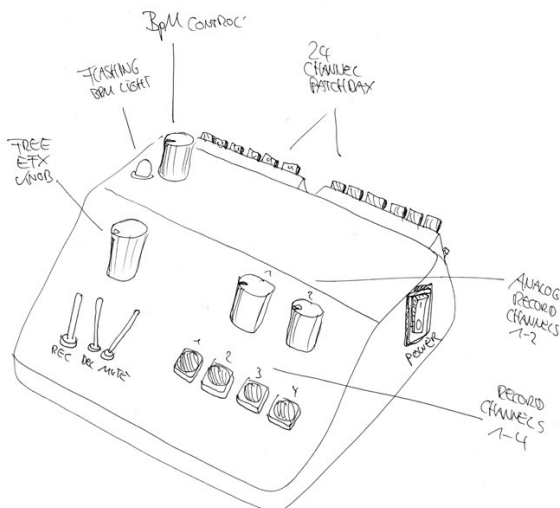

Figure 2: LKpro illustration (front)

2.2 Delete

In this mode its possible to delete recorded notes in real-time. While the 'delete' switch is set, pressing of one button e.g. No. 2 will delete the notes in this channel which appear at the moment while running. Like this it is possible to target already recorded notes and delete them while the loop is running.
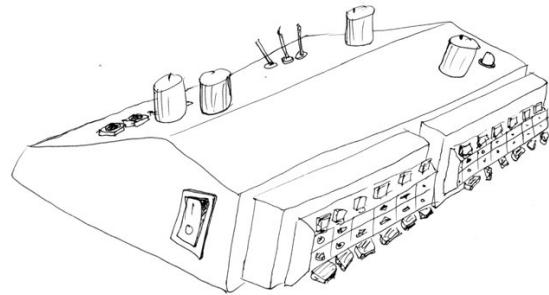

Figure 3: LKpro illustration (back)

2.3 Record (Replace)

By setting the 'record' and the 'delete' switch, notes can be recorded to one channel while deleting the old ones in this channel. It is like a tape recording: all what has been recorded until the actual moment will be replaced with new input.

2.4 Mute

If this switch is set, pressing one of the buttons or turning a knob will mute the actual channel. If it is done again the channel will be "un-muted".

3 Experiences Using Lötklaus Pro in Public

So far we have used the system only twice for public performances. The first one was as Lötbert with two not synchronized LKpro and two modified electrical megaphones on a small boat in Luxun Park, Shanghai, P.R. China. The second one took place as Hälfte Lötbert with one system in the same park on land (see Figure 4).

It turned out that LKpro is very well suited for performances in public space as power supply and instruments are connected quickly. Through using self-powered instruments the amplifying units can be distributed and therefore no extra amplifier is necessary. We also had good experiences with connecting sound sources to electrical megaphones, as they get pretty loud.

The local community visiting the park is used to electronically amplified sound as there are many people going to the park before work to practice dancing.

The community showed high interest in the unknown sounds. After a short moment there was a crowd of people watching and most of them stayed until the performance was over.

Figure 4: LKpro during a public performance

4 Further development

By end of January 2008 we want to have PCB's printed and are planning to have ten self-assembly sets ready for distribution to selected sound artists. We hope to get a feedback from the musicians using the system before the summer to take these experiences in consideration for the next step of development.

We are constantly working on the firmware and will change to the AVR Atmega168 to enhance the memory capacities.

We also hope to be able to develop an additional sound chip device that directly makes use of melody chips normally incorporated in toys. By this way we would save packaging waste.

By summer 2008 we hope to be able to conduct first workshops using LKpro with musicians showing an emerging interest in tinkering with toys.

5 Conclusion

We gave an overview about the system we developed and hope the project will proceed and will become a valuable tool for a growing group of experimenting musicians.

Ideally the used instruments controlled by LKpro would be re-used toys, not solely bought for taking them apart. We are aware of somehow supporting the sales of electronic noise making children toys (referred to as *crap*). *Crap* is not only seen in the sense of garbage, but also in the sense of useless annoying objects.

We hope to give these things a meaning in a new context. For further information, the schematics and the source code of the firmware, please visit:

http://i-will-steal-your-idea.com/lkpro/

6 Acknowledgements

References

[1] Wikipedia contributors. 2007. Do it yourself. *Wikipedia. The Free Encyclopedia.* http://en.wikipedia.org/wiki/Diy

[2] http://makezine.com/magazine/

[3] http://www.bentfestival.org

[4] http://wiring.org.co

[5] Arduino is a prototyping tool with the aim of simplifying the use of micro controllers http://arduino.cc

[6] Fritzing is a tool similar to Arduino & Wiring, but intended for PCB Layout. It is still in an early state of development (2007) http://fritzing.org