

The Harvester: A DIY Sampler and Synthesizer - Demo

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ABSTRACT

This paper describes the Harvester, a DIY sampler and synthesizer. The Harvester provides users with a low-cost, accessible platform for making music with everyday sounds via open-source hardware and software tools that anyone can use or modify. This paper goes over the motivation, methodology, features, and use cases of the Harvester instrument, with the intention of the instrument being demonstrated for people to play with and use at NIME 2023.

Author Keywords

Musical instrument, Open-source Hardware, Open-source Software, DIY, Raspberry Pi, Pure Data

CCS Concepts

• Applied computing → Sound and music computing

1. INTRODUCTION

The Harvester is a DIY hand-held sampler and synthesizer that lets you play music with everyday sounds. It is an open platform for encountering new musical possibilities with yourself and others. The Harvester allows you to record sounds around you and play them back in a musical scale, allowing for a rich palette of wild expressivity. Most importantly, the instrument is spatially aware, allowing a player to affect the sonic output by moving the instrument in three planes of axes. This paper will outline the motivations for making this instrument, methodology for its conceptualization and construction, some of its features, and some of the output generated from this instrument.

2. MOTIVATIONS

There are two driving motivations for creating the Harvester. One is to create an instrument that better attends to the needs of musicians who want to leverage the advancements of digital electronic music outside of the context of a studio or sitting at a desk in front of a computer. The second motivation is to provide the public with a low-cost, open-source alternative to a sampler and synthesizer that they can build and modify themselves for their own needs.

2.1. Creating music “off the grid”

One of the most important qualities of the Harvester is its portable form factor. It is hand-held and runs on a rechargeable LiPo battery, allowing for hours of continuous use before needing to be recharged. With the Harvester, you are able to bring the best of digital technology to the outside world. No longer does a musician need to chain themselves to the desk or be confined to the studio to leverage the advancements made by digital electronic music. We can reveal new sonic possibilities off the grid - through both resisting the grid of digital audio workstations, and also the grid of conventional digital music making practices, bringing digital electronic music making to places and environments like never before.

2.2. Low-cost, open-source alternative to present offerings

The Harvester is completely open source, from the hardware down to the software, allowing for people of all abilities, skills, and backgrounds to customize the instrument to their own liking. Someone can buy a pre-fabricated instrument, or dive into the deep end and build it themselves or with others from the ground up, learning the ins and out of instrument tool making in the process. The total cost of the parts for the Harvester is <\$150 as of writing. The vision of the Harvester is to provide an easy way for people to build, play and interface with musical technology. The Harvester provides an accessible platform for a new generation of experimental sound makers that are underrepresented in and intimidated by music technology. The Harvester helps develop a new relationship to playful “music”-ing, one that incorporates our larger world and environment.

3. METHODOLOGY

The methodology for creating the Harvester consists of three parts. 1) User feedback in the form of a questionnaire 2) Workshops and 3) Field research

3.1. User feedback in the form of a questionnaire

Initial development of the Harvester came from the author’s own motivation and desire to build an open-source sampler and synthesizer for their own creative needs. After building a number of prototypes and teaching workshops on the instrument, the author conducted user research in the form of a Google Form questionnaire to receive feedback from a wide audience on what they would like to see in the current version of the Harvester. This questionnaire surfaced some insights that were then incorporated into the current version of the Harvester, including its portable battery power supply and the gyroscope which allows the user to affect the sound output of the instrument by moving it in three planes of axes.

3.2. Workshops

The author also conducted a number of workshops with the Harvester to understand how people were able to build it from instruction, as well as to gain insight into what people would like to see in the instrument moving forward. With the code being open-source, the author has received pull requests from developers who have introduced new features to the code base, expanding its use to different platforms and introducing new features.

3.3. Field Research

Finally, the author has developed the Harvester from their own use of the instrument in the field. In this way, the author engaged with an “autoreflexive” methodology to drive the development of the Harvester, informed by their lived experience as an artist, musician, and performer [1]. The author has used the instrument on multiple music recordings and artistic residencies in order to test the instruments use, functionality, and durability in the outside world. These research expeditions have resulted in the author revising some of the hardware and software designs of the instrument, making it more durable for long-term use and more functional for different needs encountered while using the instrument for long periods of



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time. Some of these outputs are shared in the section “Uses of the Harvester”.

4. FEATURES

The Harvester is a completely open-source hardware and software sampler and synthesizer. With the instrument, you are able to capture sounds around you (your voice, another musical instrument, environmental noises etc.). The instrument provides an interface that lets you play back the sampled sound based around a musical, pentatonic scale. This allows for a wildly expressive sonic palette that can be used for musical performance and sound art installations. The instrument is similar in function to Teenage Engineering’s OP-1 or Critter and Guitari’s Organelle, but at a fraction of the price point [2] [3].

4.1. Hardware

The DIY spirit and nature of the Harvester’s hardware design, as well as its commitment to using low-cost, accessible and easily available parts, is inspired by the work of hardware hackers and their open-source documentation for home-made instruments [4]. The hardware of the Harvester is designed in EaglePCB. The designs are available on Github and can be modified by anyone for their own needs. These designs can be sent to any number of PCB manufacturers worldwide to easily fabricate the circuit boards. The hardware of the Harvester uses a Raspberry Pi (version 3 as of writing), as well as affordable hardware components that are easily available from electronics distributors worldwide. The hardware features eight buttons for sample playback on a musical scale, a record button, a looper button, an audio I/O component for recording samples with a microphone and playing them back through a speaker or 1/4” audio output, as well as a gyroscope for affecting the sound by moving the instrument in three planes of axes. The Harvester also features an on/off switch and a LiPo battery that you can recharge.

4.2. Software

The software of the Harvester runs on Linux, an open-source operating system used on many different hardware platforms. The Harvester’s sampler and synthesizer software uses Python, an open-source programming language, to send input from the Raspberry Pi’s GPIO pins to Pure Data, an open-source audio environment, to generate and playback musical sounds. The software of the Harvester takes a small audio sample (1 second) and maps it to a pentatonic scale by adjusting the playback speed of that sample, allowing the user to play back that sample musically.

5. USES OF THE HARVESTER

As mentioned, the Harvester has been used as part of a number of musical creations by the author, that have been released by record labels and distributed worldwide. This includes *Greetings* by Glass Salt (a musical collaboration between Caylie Stapes and Johann Diedrick), released in July 2020 on the record label Whatever’s Clever [5]. The Harvester has been also been the focus of a number

of artistic residencies for the author, including one at Wave Farm where Glass Salt produced *Celeste* [6].

6. CONCLUSION

The Harvester was invented to be a tool to help assist in fulfilling a desire for encountering and playing with new sonic and musical possibilities “off the grid” - away from the grid of the screen, of the DAW, of the rectilinear, grey/black computer box, as well as the grid of conventional music making practices that find us inside of a home or studio and interfacing with digital music workstations while teathed to a desk or chair. Instead the Harvester was made with the intention of creating an interface that calls in, invites mess and play into its very nature, gives us a heads up / ears out experience, lets us move around, reminds us of our body, and invites it in, and is fundamentally surprising and unpredictable as its always informed and responding to the environment and other elements of sonic encounter. Ultimately, the author envision a world in which liberated access to creative expression leads to better well-being for people, society, and our planet. The Harvester seeks to do that with its “open-source”-first approach, its relative affordability, and its low barrier to entry into the wonderful world of frugal sound making.

7. ETHICAL STANDARDS

Development of the Harvester has been self-funded. There are no potential conflicts of interest in the submission of this paper. All research was self-conducted, and all participants in the questionnaire opted-in with their own consent in filling out the form. No research involved any animals.

8. REFERENCES

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9. APPENDIX

The following links should give a more clear illustration of the Harvester and how it works.

Open-source hardware and software documentation can be accessed:

<https://github.com/aquietlife/harvester>