MORE ROAR! Doc - JR 02/11/24

MORE ROAR! is a collaboration between Dirty Electronics (John Richards) and Agnes Cameron. It is a DIY wavetable synth and noise circuit using the STM32 family of microcontrollers. It builds on Dirty Electronics' work of creating sound inside electronics and code, and low-level electronic music projects. The DIY version explores freeform and prototypic methods of construction and is built from a range of materials: wood, nails, wire, and electronic components.

MORE ROAR! has programs that can be selected. The programs are made up of 5 cores (wavetables) and 6 modes that are combined making 30 programs in total. The resulting sounds can also be interacted with by touching the nails of the device.

Version 02/11/24
Cores:
sine
saw
buzz - OR bitwise (sine progressively bitshifted each time a core is selected)
XOR bitwise (sine progressively bitshifted each time a core is selected)
corrupt - noisecopy (sine progressively shuffled each time a core is selected)

Modes include:
'Poor person's' FM synthesis and modulation
Random functions

The programs are selected with a 'Silly Switch' (wire to positive voltage/pull-up).
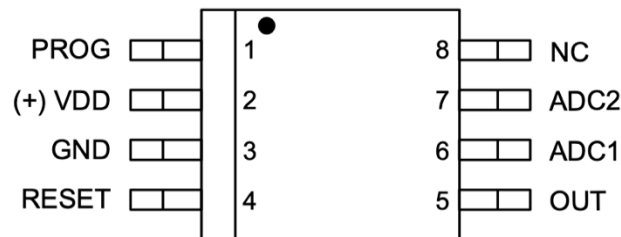
There are 2 analogue inputs. These typically control frequency and modulation but take on different functions per program. The Touch controls can be omitted or used with an alternative analogue input. The analogue input should match the VDD (3v), although the input is 5v tolerant.

RESET (pin 4) is internally wired to VDD (3v).

Designed for battery power 3 volts (2 x AAA).

A SOP8 to DIP8 adaptor is used for wire and nail construction (see Dirty Electronics Bed of Nails and derivatives).

PIN I/O

```
        PROG  ⊏□□ │ 1  ●    8 │ □□⊐  NC
     (+) VDD  ⊏□□ │ 2       7 │ □□⊐  ADC2
         GND  ⊏□□ │ 3       6 │ □□⊐  ADC1
       RESET  ⊏□□ │ 4       5 │ □□⊐  OUT
```

NOTES

Code download link (temporary)
https://www.dirtyelectronics.org/public/ROARx5.zip

Programming the chip/build version
STM32G031J6M6
CPU ARM Cortex-M0+
SOP8 package

IDE
STM32CubeIDE v. 1.15.1
STM32CubeProgrammer v. 2.16.0

Programmer
ST-LINK/V2 programmer built-in to the NUCLEO-G031J6 board (STM32G0316-DISCO - Discovery kit). See other available development boards and/or ST-LINK/V2 programmer or clones.

Arduino ready
The chip can be programmed using the Arduino IDE and a programmer/development board (*note current code will need to be adapted to compile with Arduino IDE).

See core support
https://github.com/stm32duino/Arduino_Core_STM32

https://community.st.com/t5/stm32-mcus/how-to-program-and-debug-the-stm32-using-the-arduino-ide/ta-p/608514

Website dedicated to Arduino for STM32
https://www.stm32duino.com/

Hardware
Where to buy components/tools
https://www.farnell.com/
https://www.rapidonline.com/ (UK)

DIY DAC/RC Filter
https://www.changpuak.ch/electronics/PWM-to-DC-Lowpass-Calculator.php

https://www.digikey.co.uk/en/resources/conversion-calculators/conversion-calculator-low-pass-and-high-pass-filter

See ROAR schematic for DIY circuit construction.

More stuff
Playlist/listening
Some noisy patterns, data stuff, code, and microcomputer music

Spotify
https://open.spotify.com/playlist/5DisfEOOL0KDHMCFegew1y

Soundcloud
https://soundcloud.com/dirty-electronics/sets/radical-nails

References
DDS - direct digital synthesis resources/PWM DAC
https://www.analog.com/media/en/training-seminars/tutorials/MT-085.pdf

Arduino based DDS (good place to start for programming microprocessors)
https://hackaday.com/2016/02/12/embed-with-elliot-audio-playback-with-direct-digital-synthesis/

See Dirty Electronics examples:
https://www.dirtyelectronics.org/docs/DDS_Arduino.zip
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Bowers, J., Richards, J. et al (2023). Raw Data, Rough Mix:Towards an Integrated Practice of Making, Performance and Pedagogy. *New Interfaces for Musical Expression (NIME) Conference Proceedings*.

Bowers, J., Richards, J. et al (2016). One Knob To Rule Them All: Reductionist Interfaces For Expansionist Research. *New Interfaces for Musical Expression (NIME) Conference Proceedings*.

Dirty Electronics (2024). *Bed of Nails*.
https://www.dirtyelectronics.org/docs/Bed_of_Nails.zip

Richards, J. (2018) Speculative Sound Circuits. *EVA Copenhagen 2018 - Politics of the Machines - Art and After*, EVAC18.33.

Richards, J & Wainwright, W. (2019). *Microcomputer Music*. Originally published as two-colour A2 risograph poster in January 2019 on 120gsm Fluweel paper together with the Radical Chip. Edition of 125.
https://www.dirtyelectronics.org/docs/microcomputer_music.pdf