

CLAMS-Forth for Forth Nerds

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The Prime Directives

Forth 2012 compatibility?

- ▶ Extended subject of Forth 2012 (Forth 200x Committee 2012) standard
- ▶ Not all CORE words implemented
- ▶ Some non-standard word sets implemented
- ▶ But ...
 - ▶ CLAMS-Forth words *in* Forth 2012 work the same way.

Run on a Raspberry Pi Pico WH

- ▶ Documentation: (Raspberry Pi Ltd Accessed 2023-11-18)
- ▶ RP2040 CPU: Dual-core Arm Cortex M0+ with 264 KiB of SRAM
- ▶ Co-processors for division and digital signal processing
- ▶ I/O state machine (PIO) and ***oodles*** of real-world connectivity
- ▶ 2 MiB of flash
- ▶ 2.4 GHz WiFi / Bluetooth
- ▶ \$7US with debug connector / headers for breadboarding
- ▶ Dozens of compatible devices!

Initial target device: Pimoroni PicoVision

- ▶ Documentation: (Pimoroni Ltd Accessed 2023-11-18)
- ▶ Raspberry Pi Pico W
- ▶ “GPU” - an overclocked RP2040
- ▶ I2S audio output
- ▶ HDMI output
- ▶ MicroSD card
- ▶ USB
- ▶ ~ \$37US

Premature optimizations

- ▶ Dictionary split between RAM and flash
- ▶ Subroutine threading
- ▶ Inline compiling / assembly
- ▶ Top of stack / stack pointer in registers
- ▶ Engine in assembly
- ▶ Support multiprocessing and multitasking
- ▶ High-performance vector block floating point DSP library

Build with Raspberry Pi Pico C/C++ SDK

- ▶ Documentation: (Raspberry Pi Ltd Accessed 2023-10-22)
- ▶ Reference: (Smith 2021)
- ▶ Why require Pico SDK?

Why?

Because coding libraries / drivers are ***each*** multi-month projects in ASM / Forth!

- ▶ USB
- ▶ WiFi / Bluetooth
- ▶ I2S audio / HDMI
- ▶ SD card
- ▶ FreeRTOS

Project status / road map

Rough schedule

- ▶ 2023-11-17: Most of the inner interpreter is done
- ▶ Text interpreter should be done November 24
- ▶ Basic colon compiler should be done December 1
- ▶ I2S audio / HDMI should be done December 8
- ▶ Spend the rest of 2023 building PicoVision demos!!

Implementation Details

Workflow

Languages

The Forth virtual machine

The dictionary

The terminal and USB serial I/O

I2S audio output

HDMI video output

References

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